Prevalence and Risk Factor Investigation of *Campylobacter* Species

Consumer Storage Period and Temperature for Peanut Butter

General Interest Paper - History of Consumer Food Safety Education
The PATHATRIX® system is widely used and approved by multi-national companies, contract laboratories, regulators, and researchers. PATHATRIX® AUTO has been developed in response to our customers increasing demand for automation.

PATHATRIX® AUTO BENEFITS

- Fully Automated
  - at the press of a button
- High Sample Throughput
  - 150 samples per hour
- High Volume
  - 10 to 60 ml sample size
- Enhances Detection
  - PCR, ELISA, Selective Agar Plate
- Save up to 60% of your PCR costs using our AOAC-RI approved PATHATRIX® Pooling methods

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

If you want to know more...
Contact us at:
sales@matrixmsci.com
US Tel: 303 277 9613
www.matrixmsci.com
A Legacy of Food Safety Innovation

Beginning with the introduction of 3M™ Petrifilm™ Plates to the recent honor of the prestigious Black Pearl Award, 3M Microbiology has built a legacy of food safety innovation. As the leading manufacturer of proven and reliable testing solutions that include quality, pathogen and toxin testing and monitoring, 3M Microbiology remains committed to delivering innovative solutions to protect the worldwide food supply.

Go to www.3M.com/microbiology or call 1-800-328-6553 ext. 998.
ARTICLES

780 Prevalence and Risk Factor Investigation of Campylobacter Species in Retail Ground Beef from Alberta, Canada
Sherry J. Hannon, G. Douglas Inglis, Brenda Allan, Cheryl Waldner, Margaret L. Russell, Andrew Potter, Lorne A. Babiuk and Hugh G.G. Townsend

787 Consumer Storage Period and Temperature for Peanut Butter and Their Effects on Survival of Salmonella and Escherichia coli O157:H7
A. Kilonzo-Nthenge, E. Rotich, S. Godwin and T. Huang

793 General Interest Paper – History of Consumer Food Safety Education Focus on Beef: Impact on Risk of Foodborne Illness
Christine M. Bruhn

ASSOCIATION NEWS

773 Sustaining Members
776 Vickie's View from Your President
778 Commentary from the Executive Director
808 New Members

DEPARTMENTS

810 What's Happening in Food Safety
813 Industry Products
816 Coming Events
817 Advertising Index

EXTRAS

800 Award Nominations
821 Journal of Food Protection Table of Contents
822 Audiovisual Library Order Form
823 Booklet Order Form
824 Membership Application
Microbiology Media Solutions for Food Safety

BBL™ CHROMagar™ Salmonella prepared plated medium for the isolation, detection and presumptive identification of Salmonella species from a variety of foods, including peanut butter.

- Detects as little as 1 cfu of Salmonella in 25 grams of peanut butter
- Correlates 100% to official reference methods

- Reduces plated media costs by 50% compared to official methods
- Provides a faster time to result

Microbiology – it’s what we do.

Find out what we can do for you. Visit us on the web at www.bd.com/ds
International Association for Food Protection
6200 Aurora Avenue, Suite 200W
Des Moines, IA 50322-2864, USA
Phone: +1 800.369.6337 +1 515.276.3344
Fax: +1 515.276.8655
E-mail: info@foodprotection.org
Web site: www.foodprotection.org

FPT JOURNAL STAFF
David W. Tharp, CAE: Executive Director
E-mail: dtharp@foodprotection.org
Lisa K. Hovey, CAE: Managing Editor
E-mail: lhovey@foodprotection.org
Donna A. Bahun: Production Editor
E-mail: dbahun@foodprotection.org
Pam J. Wanninger: Proofreader

INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION STAFF
David W. Tharp, CAE: Executive Director
E-mail: dtharp@foodprotection.org
Lisa K. Hovey, CAE: Assistant Director
E-mail: lhovey@foodprotection.org
Donna A. Bahun: Design and Layout
E-mail: dbahun@foodprotection.org
Farrah L. Benge: Accounting Assistant
E-mail: foenge@foodprotection.org
Julie A. Cattanach: Membership Services
E-mail: jcattanach@foodprotection.org
Tamara P. Ford: Communications Coordinator
E-mail: tford@foodprotection.org
Donna Gronstal: Senior Accountant
E-mail: dgronstal@foodprotection.org
Karla K. Jordan: Order Processing
E-mail: kjordan@foodprotection.org
Didi Loynachan: JFP Editorial Assistant
E-mail: dloynachan@foodprotection.org
Leilani K. McDonald: Association and Affiliate Services
E-mail: lmcdonald@foodprotection.org
Pam J. Wanninger: Proofreader
Trinette R. Worthington: Executive Assistant
E-mail: tworthington@foodprotection.org

ADVERTISING
David Larson
Phone: +1 515.440.2810
Fax: +1 515.440.2809
E-mail: larson6@mchsi.com

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

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

Copyright © 2009 by the International Association for Food Protection. No part of the publication may be reproduced or transmitted in any form, by any means, electronic or mechanical, including photocopy, recording, or any information storage and retrieval system, except in limited quantities for the non-commercial purposes of scientific or educational advancement, without permission from the International Association for Food Protection Editorial office.

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

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

Orders for Reprints: All orders should be sent to Food Protection Trends, Attn: Donna Bahun, International Association for Food Protection.

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

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

ADVERTISING
Food Protection Trends is printed on paper that meets the requirements of ANSI/NISO Z39.48-1992.
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.
**EXCLUSIVE BOARD**

**PRESIDENT**, Vickie Lewandowski, M.S., Kraft Foods, 1 Kraft Court, Glenview, IL 60025-5066, USA; Phone: 847.646.6798; E-mail: vlewandowski@kraft.com

**PRESIDENT-ELECT**, Lee-Ann Jaykus, Ph.D., North Carolina State University, Dept. of Food Science, Schaub Hall, Room 339A, 400 Dan Allen Drive, Raleigh, NC 27695-7624, USA; Phone: 919.513.2074; E-mail: leeann_jaykus@ncsu.edu

**VICE PRESIDENT**, Isabel Walls, Ph.D., USDA—The National Institute of Food and Agriculture, 800 – 9th St. SW, Room 3423, Washington, D.C. 20024-2475, USA; Phone: 202.401.6357; E-mail: iwalls@nifa.usda.gov

**SECRETARY**, Katherine M. J. Swanson, Ph.D., Ecolab, 655 Lone Oak Dr., Eagan, MN 55121-1649, USA; Phone: 651.795.5943; E-mail: katie.swanson@ecolab.com

**PAST PRESIDENT**, J. Stan Bailey, Ph.D., bioMérieux, Inc., 1290 Creekshore Midwest Airlines Center Dr., Athens, GA 30606-6229, USA; Phone: 706.201.7564; E-mail: stan.bailey@na.biomerieux.com

**AFFILIATE COUNCIL CHAIRPERSON**, Dan Erickson, Harold Wainess & Associates, 2460 1st Ave. E., North St. Paul, MN 55109-3243; Phone: 651.779.3700; E-mail: djerickson2460@aol.com

**EXECUTIVE DIRECTOR**, David W. Tharp, CAE, 6200 Aurora Ave., Suite 200W, Des Moines, IA 50322-2864, USA; Phone: 515.276.3344; E-mail: dtharp@foodprotection.org

**SCIENTIFIC EDITOR**

David A. Golden, Ph.D., University of Tennessee, Dept. of Food Science and Technology, 2605 River Dr., Knoxville, TN 37996-4591, USA; Phone: 865.974.7247; E-mail: david.golden@tennessee.edu

"The mission of the Association is to provide food safety professionals worldwide with a forum to exchange information on protecting the food supply."
There are **MORE THAN 3,400 reasons** for your organization to join IAFP as a **SUSTAINING MEMBER**.

As a SUSTAINING MEMBER, consider the more than 3,400 members of the International Association for Food Protection (IAFP) who share your commitment for ensuring the safety of the world’s food supply.

- Members will see your organization’s name in our monthly publications.
- Members will interact with you at IAFP’s Annual Meeting.
- Members will appreciate your sponsorship of keynote speakers at our Annual Meeting.
- Members will link to your Web site from the IAFP Web site.

As a SUSTAINING MEMBER, your organization will enjoy these and other outstanding benefits of being associated with an organization representing more than 3,400 food safety professionals dedicated to Advancing Food Safety Worldwide® and that is the best reason of all for joining IAFP.

Visit [foodprotection.org](http://foodprotection.org) to learn more about the various Sustaining Membership programs available to organizations like yours.
**SUSTAINING MEMBERS**

| **3M** | 3M Microbiology Products  
St. Paul, MN  
www.3m.com |
| **Applied Biosystems** | Applied Biosystems  
Foster City, CA  
www.appliedbiosystems.com |
| **BD** | BD Diagnostics  
Sparks, MD  
www.bd.com |
| **bioMérieux, Inc.** | bioMérieux, Inc.  
Hazelwood, MO  
www.biomerieux.com |
| **Bio-Rad** | Bio-Rad Laboratories  
Hercules, CA  
www.biorad.com |
| **Cargill** | Cargill  
Minneapolis, MN  
www.cargill.com |
| **The Coca-Cola Company** | The Coca-Cola Company  
Atlanta, GA  
www.thecoca-colacompany.com |
| **ConAgra Foods** | ConAgra Foods, Inc.  
Omaha, NE  
www.conagrafoods.com |
| **DuPont Qualicon** | DuPont Qualicon  
Wilmington, DE  
www.dupont.com |

| **Ecolab Inc.** | Ecolab Inc.  
St. Paul, MN  
www.ecolab.com |
| **Kellogg’s** | Kellogg Company  
Battle Creek, MI  
www.kellogg.com |
| **Kraft Foods** | Kraft Foods  
Glenview, IL  
www.kraftfoods.com |
| **Maple Leaf Foods** | Maple Leaf Foods  
Toronto, Ontario, Canada  
www.mapleleaf.com |
| **PepsiCo** | PepsiCo  
Chicago, IL  
www.pepsico.com |
| **SGS North America** | SGS North America  
Fairfield, NJ  
www.us.sgs.com |
| **Silliker Inc.** | Silliker Inc.  
Homewood, IL  
www.silliker.com |
| **VLM Food Trading International Inc.** | VLM Food Trading International Inc.  
Kirkland, Quebec, Canada  
www.vlmtrading.com |

(Continued on next page)
# SUSTAINING MEMBERS

## SILVER

<table>
<thead>
<tr>
<th>Company Name</th>
<th>Location</th>
<th>Website</th>
</tr>
</thead>
<tbody>
<tr>
<td>AEGIS Food Testing Laboratories</td>
<td>North Sioux City, SD</td>
<td><a href="http://www.aegisfoodlabs.com">www.aegisfoodlabs.com</a></td>
</tr>
<tr>
<td>AIV Microbiology &amp; Food Safety Consultants, LLC</td>
<td>Hawthorn Woods, IL</td>
<td><a href="http://www.aifoodsafty.com">www.aifoodsafty.com</a></td>
</tr>
<tr>
<td>Chemstar Corporation</td>
<td>Lithia Springs, GA</td>
<td><a href="http://www.chemstarcorp.com">www.chemstarcorp.com</a></td>
</tr>
<tr>
<td>Dubai Municipality</td>
<td>Dubai, United Arab Emirates</td>
<td><a href="http://www.dm.gov.ae">www.dm.gov.ae</a></td>
</tr>
<tr>
<td>F &amp; H Food Equipment Co.</td>
<td>Springfield, MO</td>
<td><a href="http://www.fhfoodequipment.com">www.fhfoodequipment.com</a></td>
</tr>
<tr>
<td>3-A Sanitary Standards, Inc.</td>
<td>McLean, VA</td>
<td><a href="http://www.3-a.org">www.3-a.org</a></td>
</tr>
<tr>
<td>Abbott Nutrition</td>
<td>Columbus, OH</td>
<td><a href="http://www.abbottnutrition.com">www.abbottnutrition.com</a></td>
</tr>
<tr>
<td>ABC Research Corporation</td>
<td>Gainesville, FL</td>
<td><a href="http://www.abcr.com">www.abcr.com</a></td>
</tr>
<tr>
<td>Advanced Instruments, Inc.</td>
<td>Norwood, MA</td>
<td><a href="http://www.aicompanies.com">www.aicompanies.com</a></td>
</tr>
<tr>
<td>AEMTEK, Inc.</td>
<td>Fremont, CA</td>
<td><a href="http://www.aemtek.com">www.aemtek.com</a></td>
</tr>
<tr>
<td>ASI Food Safety Consultants, Inc.</td>
<td>St. Louis, MO</td>
<td><a href="http://www.asifood.com">www.asifood.com</a></td>
</tr>
<tr>
<td>Bentley Instruments, Inc.</td>
<td>Chaska, MN</td>
<td><a href="http://www.bentleynstruments.com">www.bentleynstruments.com</a></td>
</tr>
<tr>
<td>Biolog, Inc.</td>
<td>Hayward, CA</td>
<td><a href="http://www.biolog.com">www.biolog.com</a></td>
</tr>
<tr>
<td>Burger King Corp.</td>
<td>Miami, FL</td>
<td><a href="http://www.burgerking.com">www.burgerking.com</a></td>
</tr>
<tr>
<td>Charm Sciences, Inc.</td>
<td>Lawrence, MA</td>
<td><a href="http://www.charm.com">www.charm.com</a></td>
</tr>
<tr>
<td>Chemir Analytical Services, Maryland Heights, MO</td>
<td><a href="http://www.chemir.com">www.chemir.com</a></td>
<td></td>
</tr>
<tr>
<td>Chestnut Labs, Springfield, MO</td>
<td><a href="http://www.chestnutlabs.com">www.chestnutlabs.com</a></td>
<td></td>
</tr>
<tr>
<td>DARDEN Restaurants, Inc., Orlando, FL</td>
<td><a href="http://www.darden.com">www.darden.com</a></td>
<td></td>
</tr>
<tr>
<td>Decagon Devices, Inc., Pullman, WA</td>
<td><a href="http://www.decagon.com">www.decagon.com</a></td>
<td></td>
</tr>
<tr>
<td>Deibel Laboratories, Inc., Lincolnwood, IL</td>
<td><a href="http://www.deibellabs.com">www.deibellabs.com</a></td>
<td></td>
</tr>
<tr>
<td>Food Safety Net Services, Ltd.</td>
<td>San Antonio, TX</td>
<td><a href="http://www.food-safetynet.com">www.food-safetynet.com</a></td>
</tr>
<tr>
<td>JohnsonDiversey</td>
<td>Sharonville, OH</td>
<td><a href="http://www.johnsondiversey.com">www.johnsondiversey.com</a></td>
</tr>
<tr>
<td>Orkin Commercial Services</td>
<td>Atlanta, GA</td>
<td><a href="http://www.OrkinCommercial.com">www.OrkinCommercial.com</a></td>
</tr>
<tr>
<td>Quality Flow Inc.</td>
<td>Northbrook, IL</td>
<td><a href="http://www.qualityflow.com">www.qualityflow.com</a></td>
</tr>
<tr>
<td>DeLaval Cleaning Solutions, Kansas City, MO</td>
<td><a href="http://www.delaval.com">www.delaval.com</a></td>
<td></td>
</tr>
<tr>
<td>Delhaize Group, Brussels, Belgium</td>
<td><a href="http://www.delhaizegroup.com">www.delhaizegroup.com</a></td>
<td></td>
</tr>
<tr>
<td>Diversified Laboratory Testing, LLC, Mounds View, MN</td>
<td><a href="http://www.dqci.com">www.dqci.com</a></td>
<td></td>
</tr>
<tr>
<td>DNV, Orland Park, IL</td>
<td><a href="http://www.dnvcert.com">www.dnvcert.com</a></td>
<td></td>
</tr>
<tr>
<td>DonLevy Laboratories, Crown Point, IN</td>
<td><a href="http://www.donlevylab.com">www.donlevylab.com</a></td>
<td></td>
</tr>
<tr>
<td>Electrol Specialties Co., South Beloit, IL</td>
<td><a href="http://www.esc4cip.com">www.esc4cip.com</a></td>
<td></td>
</tr>
<tr>
<td>Elena's, Auburn Hills, MI</td>
<td><a href="http://www.eleanas.com">www.eleanas.com</a></td>
<td></td>
</tr>
<tr>
<td>Fisher Scientific</td>
<td>Pittsburgh, PA</td>
<td><a href="http://www.fishersci.com">www.fishersci.com</a></td>
</tr>
</tbody>
</table>
SUSTAINING MEMBERS

Food Directorate, Health Canada, Ottawa, Ontario, Canada; www.hc-sc.gc.ca
Food Lion, LLC, Salisbury, NC; www.foodlion.com
Food Research Institute, University of Wisconsin—Madison Madison, WI; www.wisc.edu/fri/
HiMedia Laboratories Pvt. Limited, Mumbai, Maharashtra, India; www.himedialabs.com
IBA Inc., Millbury, MA; 508.865.69
Idaho Technology, Inc., Salt Lake City, UT; www.idahotech.com
Institute for Environmental Health, Lake Forest Park, WA; www.iehinc.com
Iowa State University Food Microbiology Group, Ames, IA; www.iastate.edu
Jimmy Buffett's Margaritaville, Orlando, FL; www.margaritaville.com
Kim Laboratories, Inc., Champaign, IL; www.kimlaboratories.com
The Kroger Co., Cincinnati, OH; www.kroger.com
Lester Schwab Katz & Dwyer, LLP, Short Hills, NJ; www.lskdnylaw.com
Malt-O-Meal Company, Northfield, MN; www.malt-o-meal.com
Michelson Laboratories, Inc., Commerce, CA; www.michelsonlab.com
Michigan State University—ProMS in Food Safety, East Lansing, MI; www.msu.edu
Microbial-Vac Systems, Inc., Bluffdale, UT; www.m-vac.com
Microbiology International, Frederick, MD; www.800ezmicro.com
Micro-Smedt, Herentals, Belgium; www.micro-smedt.be
Nasco International, Inc., Fort Atkinson, WI; www.nasco.com
The National Food Laboratory, Inc., Dublin, CA; www.thenfl.com
Nelson-Jameson, Inc., Marshfield, WI; www.nelsonjameson.com
Neogen Corporation, Lansing, MI; www.neogen.com
Nestlé USA, Inc., Dublin, OH; www.nestle.com
NSF International, Ann Arbor, MI; www.nsf.com
OpGen, Gaithersburg, MD; www.opgen.com
Oxoid Canada, Nepean, Ontario, Canada; www.oxoid.com
Penn State University, University Park, PA; www.psu.edu
Process Tek, Des Plaines, IL; www.processtek.net
Publix Super Markets, Inc., Lakeland, FL; www.publix.com
Q Laboratories, Inc., Cincinnati, OH; www.qlaboratories.com
R&F Laboratories, Downers Grove, IL; www.rf-labs.com
Randolph Associates, Birmingham, AL; www.raiconsult.com
REMEL, Inc., Lenexa, KS; www.remel.com
Rochester Midland Corporation, Rochester, NY; www.rochestermidland.com
rtech laboratories, St. Paul, MN; www.rtechlabs.com
Seiberling Associates, Inc., Dublin, OH; www.seiberling.com
Siemens Building Technologies, Inc., Buffalo Grove, IL; www.building-technologies.usa.siemens.com
Sodexo, Downers Grove, IL; www.sodexo.com
The Steritech Group, Inc., San Diego, CA; www.steritech.com
Strategic Diagnostics Inc., Newark, DE; www.sdix.com
Texas A&M University—Center for Food Safety, College Station, TX; www.tamu.edu
ThermoDrive LLC, Grand Rapids, MI; www.thermodrive.com
United Fresh Produce Association, Washington, D.C.; www.unitedfresh.org
Walmart, Bentonville, AR; www.walmart.com
Walt Disney World Company, Lake Buena Vista, FL; www.disney.com
Wegmans Food Markets, Inc., Rochester, NY; www.wegmans.com
WTI, Inc., Jefferson, GA; www.wtiinc.com
Fall season is in full swing as I write this column. The leaves are turning, apples have ripened and pumpkins are starting to show up everywhere! The football season has begun while the baseball season is winding down. My six-year-old son, Jack, is participating in flag football this year. His team is the "Skeletons." He is just beginning to learn about the intricacies of the game of football, without some of the roughness we observe each Sunday on national television! Each player wears a belt with two flags attached by Velcro strips on either side. The goal is to pull one of the flags from the belt of the player running with the ball, rather than tackle him to end the play. At the end of the play, the flag is either off and no points are scored, or it's still on and it's a touchdown. It's very black and white, with little to no room for dispute.

Max, my eight-year-old son, is playing baseball. He was "called up" to play on the 9- to 10-year-old team, the "Angels." Unlike Jack's flag football, there is plenty of opportunity for disputes in baseball—or so many fans, parents, players and coaches would like to believe. At a recent game, Max was up to bat; he had a fairly decent hit but was called out at first base on a very close call. The players, parents and fans immediately called out the familiar protest, "The tie goes to the runner!" The umpire stood his ground in solitude. Was Max the victim of another bad call, or did the umpire know something nobody else did? As it turns out, if you consult the Official Rules and Regulations of Baseball, you will not find the rule "the tie goes to the runner." What Section 7.00—The Runner does say is: Rule 7.01, "A runner acquires the right to an unoccupied base when that runner touches it before being put out." Rule 7.08 (e) states: "Any runner is out when...the runner fails to reach the next base before a fielder tags said runner on the base." And in Section 6.00—The Batter, Rule 6.05 (j)(1) says: "A batter is out when...after hitting a fair ball, the batter-runner or first base is tagged before said batter-runner touches first base." The key word in each of these rules is before. The burden of proof is on the runner that he is safe and failure to meet this burden results in the runner being called out. There is no tie in baseball; Max was called out fairly.

By now you're probably wondering what this has to do with food safety; after all, that's the focus of this column. Perhaps an analogy can be made between this baseball situation and food safety. In this scenario, the consumer is the batter-runner (offense) and the manufacturer/processor is the fielder (defense). The regulatory body is the umpire and the fans; studiers of the game—the ones who keep and analyze the stats—are academics (I didn't want to leave anybody out of the game!). Or, is it the other way around? Is the consumer on the defense (the fielder) and the manufacturer/processor the offense (batter-runner)?

In any case, historically, in a foodborne illness outbreak, the burden of proof has been on the regulators, epidemiologists, and even consumers. For legal consideration, all the data had to line up to prove that product X from manufacturer/processor X was the reasonably likely source of food contamination. Without solid, conclusive evidence, a manufacturer/processor could not be held liable. While this is probably still true, I believe there has been a shift in the last 10 years or more with manufacturers/processors stepping up and taking a role, not only in accepting the burden of proof, but also in preventing occurrence of the burden in the first place.

In the past six months there has been tremendous focus on food safety by virtually everyone along the food supply chain, from farmer to consumer. Intense focus by US lawmakers recently has resulted in a significant legislation. On September 8, 2009, legislation came...
into force that will do even more to guarantee the elimination or prevention of foodborne illness by removing contaminated products from commerce, preventing such products from ever reaching the consumer. The title of a September 2009 US Food and Drug Administration (FDA) news release stated it succinctly: “FDA Opens the Reportable Food Registry Electronic Portal for Industry: Food facilities now required to report potentially dangerous products.” The new system replaces a voluntary approach to reporting with a legally binding requirement to notify the FDA about potential adulteration of food products. The Reportable Food Registry (RFR) helps to make the system less reactive and more preventive. Facilities that manufacture, process or hold food for consumption in the United States (responsible party) must now tell the FDA within 24 hours if they find a reasonable probability that an article of food will cause severe health problems or death to a person or an animal. This requirement applies to all foods and animal feed regulated by the FDA, except dietary supplements and infant formula. Examples of a reportable incident include bacterial contamination, allergen mislabeling, or elevated levels of certain chemicals. Once a report on a product is submitted through the RFR portal, the responsible party must: (1) investigate the cause of the adulteration if the adulteration may have originated with the responsible party; (2) submit initial information, followed by supplemental reports; and (3) cooperate with the FDA to help determine the cause. Companies must also notify relevant suppliers and distributors of the potential food safety issue. This requirement applies only to product that has already been shipped.

Getting back to the baseball analogy, this new legislation is equivalent to a well-fielded pop-fly; it takes the ball and the runner out of play. The new requirement will work to eliminate the burden of proof. Since there will not be a play at the base, so to speak, there is nothing for the batter-runner to prove. The consumer is no longer the defense or the offense, but should now have peace of mind when serving and consuming food. The manufacturer/processor is now both the offense and the defense, identifying and eliminating hazards before they can reach the consumer. As baseball great Leo Durocher once said, “You don’t save a pitcher for tomorrow. Tomorrow it may rain.” That’s very relevant to those of us dedicated to food protection, because there are no rainouts in food safety. This new legislation should inspire everyone involved with the manufacture and distribution of foods to aim out of the ballpark in providing the highest level of food safety possible in every product, everyday. As always, feel free to contact me at anytime at VLewandowski@kraft.com.

Request for Preproposals for Research Support

The Technical Committee on Food Microbiology of the International Life Sciences Institute (ILSI) North America is accepting preproposals for financial support of research in the area of “Technology and Process to Control Salmonella in Low-Moisture Foods.” The committee is prepared to fund research in the following research areas:

1. Persistence of Salmonella in low-moisture foods and the processing environment;
2. Salmonella mitigation processes for use in the production of low-moisture foods; and
3. Non-aqueous sanitation processes that eliminate Salmonella from dry manufacturing equipment and processes, and strategies to validate the new processes.

The deadline for submission of preproposals is December 15, 2009.

Preproposals can be obtained from the ILSI North America office or electronically from http://www.ilsina.org.

For more information contact, Darinka Djordjevic, ILSI North America, 1156 15th Street, NW, Suite 200, Washington, D.C. 20005, USA.

Phone: 202-659-0074, Ext. #155 • E mail: ddjordjevic@ilsi.org.
E-mail and today's world — they naturally go together. The world today moves at a faster pace than ever before; communication is the driving force behind this fast movement. How did we ever get along without E-mail just 10 to 15 years ago?

When I started with the Association in 1993, we had a fax machine and telephones (of course). At that time, we seldom, if ever, made an intercontinental telephone call. We did receive a number of faxes from outside of North America, but the image quality was many times difficult to read. A funny story about our fax machine comes to mind. There was a promotional brochure with the fax machine that stated, “Imagine, being able to receive documents from around the globe in just a matter of minutes.” Now in our present time, can you imagine waiting minutes to receive an E-mail from around the world with an attached document?

There are a number of times I have been on the phone with someone from outside of North America and they will say they have just sent an E-mail with a document attached. We both wait for what seems to be an eternity (maybe 15 to 30 seconds) for the E-mail to make its way anywhere from 4,000 to 7,000 miles (6,400 to 11,000 kilometers)! We become very impatient waiting for just those few seconds — how ironic is that?

The same thing happens when a person sends E-mail today. Most people expect a very fast answer to questions posed in E-mail communication. I know many times when I send E-mail with questions posed, I believe a rapid reply is forthcoming. Many times we even send E-mails to our coworkers with whom we might even have eye contact or are located as neighbors in cubes or offices. Sometimes it is just not possible to receive a fast reply for a number of reasons. First, if dealing with someone internationally, you must consider their work hours compared to your own. You might also be sending to someone who travels a lot and cannot always reply quickly. I’m sure many of our IAFP Members travel in their jobs and sometimes when this happens, E-mail does not come to the top of the priority list. Also, some people are well disciplined and only look at their E-mail periodically during the day (two, three or four times during the day).

Meetings, inspections, presentations, conferences all take people away from E-mail. So, someone invented the BlackBerry and iPhones to take care of this problem. Now, it is easy to at least see E-mail as it is coming in from around the world. I don’t know about you, but one of the main functions of my BlackBerry is to let me know how much “important” work I have to do once I finally make it to my laptop to make replies. Or, I can monitor communication over the weekend again, to know what might need my attention on Monday morning. This just adds to the stress knowing all those E-mail messages are waiting (patiently, I might add) for a reply.

Oh sure, for those messages needing only a quick word or two of an answer, I might go ahead and reply through the BlackBerry. But if it requires a more lengthy reply, I’m waiting to do it on my laptop or I’ll pick up the phone to make a reply! With E-mail, the telephone is another form of communication that seems to be dwindling away. Phone calls seem to be few and far between now and that is really too bad. When you talk with someone, you can understand their intent much clearer than when communicating with E-mail. Also, there are times we rely on E-mail for our communication only to find that there was a technical problem and the message was not delivered (or it was overlooked by the receiver).
Phone calls can help to move a project forward. When you talk together, an understanding of time commitments comes to the surface. You know more easily that an important report is due on Thursday at 9 a.m. and there is not a question remaining about a time or place for the completed report to be turned in.

Now with even more communication tools like Facebook, Twitter, text messaging, and others, our communication plans get more and more complicated. You may know that IAFP has a presence on Facebook. We are beginning to place additional information here and hope to open new lines of communication for our Members. If you have not already done so, look us up under the full Association name (International Association for Food Protection) and become a fan of IAFP. Then when we send messages through Facebook, you will be sure to receive the communication.

What am I trying to say by all of this? I'm not really sure. I think it is just interesting to see the massive changes in the way that people communicate. In just 100 years or so, we have gone from the telegraph to telegrams to telephones and fax machines and now electronic communication. For better or worse, this is where we are. Now, we just need to learn to manage the volumes of information and communications that come to us each day!
Prevalence and Risk Factor Investigation of Campylobacter Species in Retail Ground Beef from Alberta, Canada

SHERRY J. HANNON,1 G. DOUGLAS INGLIS,2 BRENTA ALLAN,1 CHERYL WALDNER,1 MARGARET L. RUSSELL,4 ANDREW POTTER,3 LORNE A. BABIUK1 and HUGH G.G. TOWNSEND1,3

1Dept. of Large Animal Clinical Sciences, Western College of Veterinary Medicine, University of Saskatchewan, 52 Campus Drive, Saskatoon, Saskatchewan, S7N 5B4, Canada; 2Agriculture and Agri-Food Canada (Lethbridge Research Centre), 5403-1st Ave. S, Lethbridge, Alberta, T1J 4B1, Canada; 3Vaccine and Infectious Disease Organization, 120 Veterinary Road, University of Saskatchewan, Saskatoon, Saskatchewan, S7N 5E3, Canada; 4Dept. of Community Health Sciences, Faculty of Medicine, University of Calgary, 3330 Hospital Drive NW, Calgary, Alberta, T2N 4N1, Canada

ABSTRACT

Campylobacteriosis is the most commonly reported (notifiable) bacterial enteric disease in Alberta, Canada. The purpose of this study was to assess the prevalence of Campylobacter species in retail ground beef based on a survey of 60 stores (four supermarket chains, three cities) in southern Alberta. None of the 1,200 retail lean and regular ground beef packages were culture positive. Direct PCR results from a subset of samples (n = 142) indicated that 46% of packages tested were positive for Campylobacter DNA. By species, 14.8% (21/142), 26.8% (38/142) and 1.4% (2/142) of packages were PCR positive for C. jejuni, C. coli and C. hyointestinalis DNA, respectively. The presence of campylobacters varied depending on the dates of collection. However, type of package (regular or lean), whether the store cut/packaged poultry in the meat department, type of meat used as the beef source (market trim, coarse grind tubes or a combination of these), whether meat portions were previously frozen, and package weight were not associated with the odds of finding Campylobacter spp. DNA by use of PCR. The high levels of Campylobacter DNA in the beef suggest that breaks in food safety protocols within slaughter plants, processors or grocery stores could have potentially important public health repercussions.

A peer-reviewed article

*Author for correspondence: Phone: 403.938.5151; Fax: 403.938.5175
Email: sherryh@feedlothealth.com

780 FOOD PROTECTION TRENDS | NOVEMBER 2009
INTRODUCTION

In Alberta, Canada, campylobacteriosis is the most common bacterial enteric illness, with 36.1 cases per 100,000 people reported in 2005 (25, 27). *Campylobacter jejuni* (*C. jejuni*), the most frequently isolated species in human disease, is responsible for approximately 85% of all human *Campylobacter* infections (21). While consumption of contaminated poultry meat is generally considered the primary source of infection for people (14), other routes of transmission may exist. Similarity between human and domestic livestock *Campylobacter* isolates has been reported based on molecular typing studies (6, 12, 18, 22).

In studies in Alberta feedlot cattle near the end of the feeding period, fecal prevalences for *Campylobacter* spp. and for *C. jejuni* have been estimated to be up to 87% and 61%, respectively (2, 11, 16). Other species of *Campylobacter* of potential public health importance, including *C. coli*, *C. fetus*, *C. hyointestinalis*, and *C. laniarce*, have also been isolated from cattle feces in Alberta (16, 17). However, research into the prevalence of *Campylobacter* spp. in retail ground beef in Alberta has been limited. In Edmonton, Alberta, a city in northern Alberta which was not part of the sampling area for our study, a recent retail ground beef survey reported no positive samples from the 100 packages tested (4). The prevalence of *Campylobacter* spp. in retail ground beef has ranged from 0–20% worldwide on the basis of culture and biochemical or molecular identification of species; however, commonly less than 5% of samples tested have identified campylobacters (4, 7, 28, 30).

The goals of this project were to assess the prevalence of *Campylobacter* spp. (in particular *C. jejuni*) and to investigate risk factors potentially associated with the presence of *Campylobacter* spp. in retail ground beef. This paper reports the results of a culture survey of retail ground beef (*n* = 1,200) and PCR of a subset of these (*n* = 142) from 60 retail grocers of four major chains in three cities in southern Alberta.

MATERIALS AND METHODS

Sample size calculation

For a survey using simple random sampling, 179 packages of ground beef would have been necessary to measure a 3% expected prevalence of *C. jejuni* (29) with 2.5% precision and 95% confidence (Epi-Info, version 3.01, CDC, USA, 2003). After application of an inflation factor formula (9) to account for clustering of the expected frequency of *Campylobacter* within retail stores, the survey required 1,200 packages from 60 stores (assuming an intraclass correlation coefficient (ICC) of 0.3, an unadjusted sample size of 179, and collection of 20 packages per store). An ICC describing clustering of *C. jejuni* within source was not available from previous publications; the choice of 0.3 was slightly more conservative than previously published ICCs for non-enteric cattle conditions (19).

Sampling protocol

The goal of sampling was to identify grocery chains likely to supply the largest sales volume of ground beef to consumers. Four chains with the highest numbers of retail stores from three cities in southern Alberta were identified, and a sampling frame of individual stores was compiled from telephone book white and yellow pages (chain name and pharmacy headings) and internet searches (chain name). Stratified random sampling (by city and by chain within city) ensured that meat samples were taken from all chains in all cities. Fifteen stores were sampled from chain 1, 22 from chain 2, 16 from chain 3 and seven from chain 4. Forty-six stores were sampled in city 1, six stores in city 2 and eight stores in city 3. Five packages per store per collection were randomly sampled from the 60 stores, using a hand-held randomization program (Handy Randy, Stevens Creek Software, Cupertino, CA, USA), for a total of 1,200 retail packages of regular or lean ground beef. Three hundred packages were purchased during each of four collection periods: two winter (Nov. 21–23, 2004, and Jan. 9–11, 2005) and two summer (May 30–31, June 1, 2005 and July 18–20, 2005). After purchase, each package of ground beef was placed into a pre-labeled Ziploc bag (SC Johnson, Racine, WI, USA) and then packed into a cooler (The Coleman Company Inc., 5286B, Wichita, KS, USA) with six ice packs (Ice-Pak/Hot-Pak, Montreal, QC, Canada). A Hobo H08 Pro temperature monitor (Onset Computer Corporation, Pocasset, MA, USA) was included in one cooler from each of the 12 meat shipments. Each cooler was sealed and shipped to the Vaccine and Infectious Disease Organization (VIDO, Saskatoon, SK, Canada) by bus (Greyhound Transport Canada Corporation) overnight. Ground beef packages were processed within approximately 24 hours of collection. Transport temperature ranges were evaluated from two hours after closure to two hours before the cooler was opened.

Employees knowledgeable about in-store meat practices were identified by phone inquiry or observed directly working with meat, and were asked questions regarding their meat department practices. Information on the cutting and packaging of raw poultry, the type of meat used to produce the ground beef (coarse tubes, market trim or both) and whether the ground beef contained meat that had previously been frozen were collected.

Experimental inoculation of retail ground beef as sensitivity analysis

A pure culture of *C. jejuni* (NCTC 11168) that had been previously suspended in 25% glycerol/50% Brain Heart Infusion broth and frozen to −70°C was used as the source strain for this experiment. The culture was thawed on ice and plated on a Mueller-Hinton agar plate. The plate was then incubated microaerobically (85% N₂, 10% CO₂, 5% O₂) at 42°C for 48 hours and checked to ensure the culture was pure by use of the Gram stain. The culture was then suspended in 0.85% NaCl (normal saline) to an absorbance of 0.5 at 600 nm (Ultrospec® 3000, Pharmacia Biotech) to form a 10 colony forming units (CFU)/ml solution. To create the final 1 x 10⁴, 1 x 10⁵, 1 x 10⁶, or 1 x 10⁷ CFU/g dilutions, *C. jejuni* stock solution was further diluted with normal saline to a total volume of 1 ml, which was added
with each meat sample to the enrichment broth.

For each package of fresh retail ground beef, the plastic wrap over the middle was sliced with a sterile scalpel blade. A deep core sample of 25 g (24-26 g) of raw ground beef was removed with a sterile spoon. Each ground beef sample was placed into a 55-ounce Whirl Pak bag (82007-726, VWR International, Mississauga, ON, Canada) with 1 ml of fresh C. jejuni solution and 100 ml of enrichment broth (Bolton broth (# CM0983 Oxoid Ltd., Basingstoke, UK) and 5% horse blood mixture) and mixed thoroughly for 30 s. The homogenate was then microaerobically incubated for 48-72 hours. Each culture plate was then examined visually for colonies characteristic of Campylobacter spp. Each incubation included a laboratory strain C. jejuni plate as positive control.

**Detection of campylobacters by polymerase chain reaction (PCR)**

At the same time as samples were taken for culture, ground beef from approximately 10% of the 1,200 packages collected (52 of 60 stores represented) were frozen for subsequent DNA extraction and application of taxon-specific PCR for campylobacters. Each subsample (1 g) was thawed and placed in a bagPage 100 filtered blending bag (EW-36840-58; Canadawide Scientific Ltd., Ottawa, ON, Canada) containing 9 ml of Columbia broth (Becton, Dickinson and Company, Sparks, NV, USA), and the sample was homogenized for 120 s at high setting in a Stomacher 80 blender (Seward Ltd., West Susse, UK). The homogenate was then removed from the bag and centrifuged at 1,750 x g for 10 minutes, the supernatant containing Campylobacter cells was collected. To concentrate Campylobacter cells, the supernatant was centrifuged at 24,050 × g for 10 minutes, and the supernatant removed and discarded. The pellet was re-suspended in 1 ml of Columbia broth, 200 μl aliquots were placed in 2 ml tubes, an internal amplification control (IAC; 10 μl containing 700 copies/μl) was added to each tube (15), and DNA was extracted using the DNAeasy Tissue Kit (Qiagen, Mississauga, Canada) according to the manufacturer's protocol. Direct PCR was applied for Campylobacter genus, IAC, C. jejuni, C. coli, C. fetus, C. hyointestinalis, and C. lari- niae (15). In addition, nested PCR to detect C. concisus and C. upsaliensis was applied (Inglis et al., unpublished). In all instances, negative and positive PCR controls were included, and arbitrarily-selected amplicons (including weak amplicons) were sequenced to ensure specificity. Samples were deemed to be negative for Campylobacter DNA only if amplification of the IAC occurred (i.e., in the absence of a Campylobacter genus amplicon).

**Data analysis**

Descriptive analyses were conducted using SPSS (version 15.0; SPSS, Chicago, US). A second commercial software package (MLwiN version 2.02; Centre for Multilevel Modeling, Institute of Education, London, UK) was utilized for the hierarchical model analysis. The hierarchical models (9) were specified with a logit link, binomial distribution, restricted iterative generalized least square and second order penalized quasi-likelihood nonlinear estimation. The outcome was whether or not a ground beef sample was positive for Campylobacter spp. DNA. Variables included "poultry cutting" (whether or not poultry was cut or...
TABLE 2. Unconditional analyses of risk factors for whether a sample was positive for Campylobacter spp. by direct PCR (n = 140)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Level</th>
<th># of packages</th>
<th>% packages C. spp. positive at each level</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chain</td>
<td>1</td>
<td>28</td>
<td>42.9</td>
<td>0.936</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>45</td>
<td>46.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>47</td>
<td>51.1</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>20</td>
<td>35.0</td>
<td></td>
</tr>
<tr>
<td>City</td>
<td>1</td>
<td>109</td>
<td>45.0</td>
<td>0.891</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>9</td>
<td>55.6</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>22</td>
<td>45.5</td>
<td></td>
</tr>
<tr>
<td>Collection period</td>
<td>1</td>
<td>30</td>
<td>30.0</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>30</td>
<td>66.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>31</td>
<td>80.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>49</td>
<td>20.4</td>
<td></td>
</tr>
<tr>
<td>Frozen portions</td>
<td>No</td>
<td>124</td>
<td>47.6</td>
<td>0.459</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>16</td>
<td>31.3</td>
<td></td>
</tr>
<tr>
<td>Package type</td>
<td>Lean</td>
<td>86</td>
<td>40.7</td>
<td>0.158</td>
</tr>
<tr>
<td></td>
<td>Regular</td>
<td>54</td>
<td>53.7</td>
<td></td>
</tr>
<tr>
<td>Poultry cutting</td>
<td>No</td>
<td>94</td>
<td>48.9</td>
<td>0.937</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>40</td>
<td>45.0</td>
<td></td>
</tr>
<tr>
<td>Trim type</td>
<td>Coarse grind tube</td>
<td>56</td>
<td>41.1</td>
<td>0.876</td>
</tr>
<tr>
<td></td>
<td>Market trim</td>
<td>50</td>
<td>50.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Both</td>
<td>34</td>
<td>47.1</td>
<td></td>
</tr>
<tr>
<td>Weight_c</td>
<td>≤ 0.499 kg</td>
<td>17</td>
<td>35.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.500–0.999 kg</td>
<td>113</td>
<td>48.7</td>
<td></td>
</tr>
<tr>
<td></td>
<td>≥ 1.000 kg</td>
<td>10</td>
<td>30.0</td>
<td>0.343</td>
</tr>
</tbody>
</table>

*Reference category; †Data unavailable for one store (six packages)

C. spp.: Campylobacter species

RESULTS

Experimental inoculation

Of the 40 ground beef samples inoculated, only one sample (1 × 10^2 CFU/g) did not yield C. jejuni. Positive control plates and all other samples, including 100% of samples inoculated with 1 × 10^2 CFU/g, were positive for C. jejuni using the study protocol. None of the negative control plates grew Campylobacter spp.

Prevalence survey using culture

All 60 stores reported that they did a final grind of beef in-store, and that the source beef for grinding came from local (Alberta) slaughter plants or processors. Twenty-seven stores used coarse ground tubes, 17 stores used market trim, and 16 stores used a combination of both for their second in-store grind. Forty stores did not package or cut raw poultry in the department, 19 stores reported cutting or packaging some poultry products (e.g., wings), and for one store data were unavailable. Fifty-six stores used fresh meat only, while in four stores the retail ground beef may have included previously frozen portions. Of the 1,200 packages of retail ground beef, 726 were lean and 474 were regular ground beef. Twenty-eight packages were labeled as a "discount." By weight, 121 packages were less than 0.500 kg, 1,030 packages were 0.500 kg to 0.999 kg, and 49 packages were greater than or equal to 1.000 kg. Transport temperatures ranged...
from 3.31°C to 9.03°C in the six summer shipments and -2.44°C to 9.42°C in the six winter shipments. Campylobacter species were not isolated from any of the 1,200 packages of retail ground beef.

**PCR detection of campylobacters**

Of the 142 samples tested using PCR, 65 (46%) were positive for DNA of Campylobacter spp. origin while 77 were negative (Table 1). Two of the 142 samples tested with use of PCR could not be linked to store or chain and were omitted from all subsequent analyses. The remaining 140 ground beef samples represented 52 different stores. Twelve stores had more than one meat sample tested from the same collection period. Of these 12 stores, only four stores had more than one meat sample positive for DNA of Campylobacter spp. origin. Ten of these 12 stores had either four or five samples from the same collection period tested with PCR, and the most any store had positive for DNA of Campylobacter spp. origin was two samples.

**Factors associated with PCR detection of Campylobacter spp.**

For one sample, data were missing for whether or not the source store cut poultry. This sample was included in risk factor analysis, and designated 'missing' in the "poultry" analysis. Supermarket chain did not explain an important part of the variance in the null model (chain level variance 0.000, standard error 0.000) and was not included as a random effect in the final analysis. After accounting for clustering within the store of origin, only the package type and the collection period variables were selected for consideration in the development of a final model ($P \leq 0.25$) (Table 2). None of the other risk factors considered (chain, city, inclusion of frozen portions, on-site poultry cutting, kinds of trim in the ground beef or package weight) were associated with the odds of detecting campylobacters by PCR (Table 2).

When package type (regular or lean) and collection period (1: Nov 21–23, 2004, 2: Jan 9–11, 2005, 3: May 30–31, June 1, 2005, and 4: July 18–20, 2005) were examined together, only the collection period was significantly associated ($P \leq 0.05$) with detection of Campylobacter spp. by PCR. The odds of a retail ground beef package testing positive for Campylobacter spp. DNA was 5.6 times greater if the package was from collection period 2 than if it was from collection period 1 (OR 5.6, 95% CI 1.8–17.5). Further, a package had 12 times greater odds of testing positive for Campylobacter spp. DNA if it was from collection period 3 than if it was from collection period 1 (OR 12.0, 95% CI 3.5–42.0). Ground beef from collection period 4 was not statistically different from beef from collection period 1 (OR 0.6, 95% CI 0.2–2.0).

**DISCUSSION**

The samples from this large retail ground beef survey represented four different supermarket chains and three cities in southern Alberta. Random selection of packages in stores, multiple collection periods, and limiting the number of packages purchased per store were used to avoid oversampling the same meat batches. In 2005, source beef for ground beef likely came from the six federally inspected slaughter plants in Alberta (1), or from provincially inspected facilities. Because retail chains likely purchased meat from the same plants or processors, it was expected that variation within each chain would be small. As a result, only five packages of ground beef were purchased from each store at each collection time.

Hazard analysis critical control points (HACCP) have been identified and programs implemented in all federally registered beef slaughter plants in Canada (5). In previous surveys in cattle, poultry and swine, significant reductions in Campylobacter isolation rates from slaughter to post-chill have been reported (20, 24, 26). Protocols in cattle slaughter plants, including hide-on-carcaß, lactic acid, hot water, and carcass washes, chilling, and the ability to remove potentially contaminating components (e.g., hides and intestinal tracts) quickly and intact may have all contributed to bacterial numbers below detectable levels in the retail ground beef surveyed here.

It can be difficult to compare laboratory protocols with other published research because many incubation and temperature protocols, culture media, and antimicrobial supplements are available, and because viable but non-culturable Campylobacter strains may exist (8, 23). Using the culture technique described, we were able to isolate C. jejuni at $1 \times 10^5$ CFU/g in experimentally inoculated ground beef samples; this level is below the estimated dose required for human infection (3, 14). However, none of the 1,200 packages of retail ground beef collected as part of this study were culture positive for viable Campylobacter spp., an encouraging finding for public health in Alberta.

The very low prevalence of culturable Campylobacter levels in retail ground beef observed in this study is similar to those seen in other North American ground beef surveys (4, 28) and lower than the 60–90% prevalences reported in raw retail chicken (4, 30, 31). In a survey in the United States from 2002–2005, campylobacters were identified in only 1 of 2,073 packages of ground beef using culture (28), and a smaller Alberta survey found zero of 100 packages positive (4). However, it is possible that the laboratory sensitivity of the culture method used here may not have been high enough to pick up very low numbers of organisms. Further, if campylobacters were sufficiently stressed, it is possible the method was not able to resuscitate these pathogens sufficiently for growth with culture. Three of the meat shipments dipped below the 0°C mark during shipping; however, campylobacters have been isolated from ground beef frozen at -18°C for 90 days (10), and culture recovery in our study did not vary between summer and winter samplings.

Traditionally, PCR has been used to confirm isolates as campylobacters rather than as a survey tool in retail meat studies (13, 30, 31). This is because from a food safety point of view, viable campylobacters are usually the targets of interest and the identification of Campylobacter DNA by use of PCR does not ensure viability. However, from our direct PCR results, C. jejuni, C. coli, and C. hyointestinalis were identified in the retail ground beef. None of the samples were positive for C. fetus or C. lanienae, species which may be carried by cattle, or for C. concisus or C. upsaliensis, which are pathogens responsible for infections in people but are putatively not carried by livestock (14, 21). Finding 27% (38/142) of samples PCR positive for
C. coli and only 15% (21/142) of samples PCR positive for C. jejuni was interesting. C. jejuni is the most frequently isolated species from cattle (11, 17), while C. coli is the most common Campylobacter species found in swine (21, 24).

PCR positive for C. jejuni was interesting. C. coli and only 15% (21/142) of samples C. jejuni infection in humans. J. Infect Dis. 157:472–479.

CONCLUSIONS

None of the 1,200 packages were culture positive for campylobacters in this retail ground beef survey, supporting the adequacy of food safety practices in the province. The prevalence of Campylobacter DNA with PCR detection, however, was moderate to high (46%); thus continued research into potential interventions in the slaughter-to-retail continuum could be of use. The high levels of Campylobacter DNA in the beef suggest that breaks in food safety protocols within slaughter plants, processors or grocery stores could have potentially important public health repercussions.

ACKNOWLEDGEMENTS

Financial support for this study has been provided by the Agriculture Council of Saskatchewan through the Advancing Canadian Agriculture and Agri-Food Saskatchewan (ACAAFS) program. Funding for the ACAAFS program is provided by Agriculture and Agri-Food Canada. We also gratefully acknowledge funding and support from the Natural Sciences and Engineering Research Council (NSERC; A. Potter holds an NSERC Senior Industrial Research Chair in food and water safety vaccines), Agriculture and Agri-Food Canada (Lethbridge Research Centre, AAFC-LRC), BC Cattlemen’s Association, Vétoquinol and the Western College of Veterinary Medicine Interprovincial Graduate Student Fellowship. Special thanks to C. Reiman, G. Crockford, N. Rawlyk (VIDO) and K. House (AAFC-LRC) for technical assistance.

REFERENCES

1. Agriculture and Agri-Food Canada. 2006. Livestock market review, Table 23 (2005 data). Animal Industry Division, Red Meat Section, Ottawa, ON.


Consumer Storage Period and Temperature for Peanut Butter and Their Effects on Survival of Salmonella and Escherichia coli O157:H7

A. KILONZO-NTHENGE, E. ROTICH, S. GODWIN and T. HUANG

School of Agriculture and Consumer Science, Tennessee State University, 3500 John A. Merritt Blvd., Nashville, TN 37209 USA; Auburn University, Auburn, AL 36849, USA

ABSTRACT

Recent recurrence of Salmonella contamination of peanut butter has become a serious food safety concern for consumers. A study was conducted to identify storage periods and temperature conditions of peanut butter in domestic kitchens and to determine the effects of those storage periods and conditions on survival of Salmonella and Escherichia coli O157:H7. Surveys assessed consumer storage periods of peanut butter in 150 households in Middle Tennessee. To simulate consumers' peanut butter storage conditions, Salmonella and E. coli O157:H7 were inoculated in peanut butter and held at 4 and 25°C for up to 15 weeks. Initial populations of Salmonella and E. coli O157:H7 were 4.78 CFU/g and 5.56 CFU/g, respectively. After 15 weeks of storage at 4°C, Salmonella and E. coli O157:H7 populations had decreased to 3.72 and 2.73 log CFU/g, respectively. A significantly higher reduction (P < 0.05) of Salmonella and E. coli O157:H7 was observed in peanut butter stored at 25°C than in that stored at 4°C for the same duration. Our results indicate that post-process contamination of peanut butter with Salmonella and E. coli O157:H7 may result in survival of these pathogens during their shelf life, posing health risks to consumers.

INTRODUCTION

Foodborne pathogens have a significant impact on the food processing industry, consumers, and regulatory agencies. In the past, most outbreaks of Salmonella and Escherichia coli O157:H7 have been linked to consumption of animal products such as meat, poultry, and eggs (17). However, the presence of Salmonella and E. coli O157:H7 in non-animal products has emerged as a serious food safety concern. Foods low in water activity, such as chocolate and cheese, have been implicated in Salmonella outbreaks (5). Several reports have suggested that Salmonella in foods with low water activity and high lipid content tend to have increased resistance to heat (8, 9, 11).

In 1996, an outbreak of Salmonella Mbandaka infection in Australia was associated with peanut butter, a food of low water activity (16). Salmonella Agona infection has also been linked to consumption of peanut butter-coated savory in England and Israel (10, 18). In 2007, a multistate outbreak of Salmonella Tennessee associated with peanut butter consumption was reported in 47 states (3). This was the first reported outbreak of
Salmonella contamination of peanut butter is possible during growth, harvest, transportation, and even post-process contamination during repackaging may lead to its presence at the point of consumption. Because of the frequency of outbreaks of Salmonella associated with peanut butter and the associated substantial economic burden on society, additional studies on consumers' peanut butter storage conditions are needed. In addition, the survival of E. coli O157:H7 in peanut butter has not been evaluated. F. coli O157:H7 has a low infective dose (19) and is one of the most serious foodborne known pathogens (1, 12). Therefore, this study recruited participants from the general public to gain a better understanding of preferred duration and storage temperatures of peanut butter in consumers' domestic kitchens, and of how these conditions affect the survival of Salmonella and E. coli O157:H7.

MATERIAL AND METHODS

Survey of consumer storage of peanut butter

A total of 150 households in Middle Tennessee participated in this study. Participants were recruited through posted flyers at senior housing communities, churches, and community organizations. Researchers contacted the subjects and used a script/screener to determine eligibility. Each household, the person mainly responsible for food purchase, storage, and preparation, and at least 18 years old, was interviewed. To mirror the general population, the participants were in the following categories: less than high school (13.3%), high school diploma (26%), bachelor's degree or higher (32%), and some college (28.7). Most respondents had incomes between $15,000 and $75,000 a year. The survey questionnaire inquired about consumers' peanut butter purchasing, storage conditions, and storage period. Consumers were also questioned whether they ever threw away peanut butter after a certain period of storage and if so, why.

Laboratory simulation of consumer peanut butter storage conditions

Storage periods and temperatures of peanut butter in domestic kitchens and their effects on the survival of Salmonella and E. coli O157:H7 were evaluated in a laboratory setting. Peanut butter was contaminated with Salmonella and E. coli O157:H7 and thereafter stored either at room or refrigeration temperature to simulate consumers' storage conditions.

Preparation of bacterial cell suspension

S. Mission (isolated from rectal swabs), S. Typhimurium (associated with peanut butter), S. Enteritidis (isolated from human feces), E. coli O157:H7 204P (pork isolate), E. coli O157:H7 301C (chicken isolate), and E. coli O157:H7 505B (beef isolate) were used in this study. These bacterial strains were obtained from Auburn University (Department of Nutrition and Food Science, Auburn, Alabama, USA) and have been linked to foodborne illnesses in the past. Information on the survival of these organisms in peanut butter is lacking. To test for ability to maintain genes associated with antibiotic resistance, antibiotic-resistant Salmonella and E. coli O157:H7 strains were grown in a series of broth-to-agar media inoculated with the respective antibiotics (Salmonella, 100 ppm nalidixic acid; E. coli O157:H7, 200 ppm nalidixic acid and 0.025 ppm novobiocin; Sigma, St. Louis, MO).

Bacterial cell cultures were maintained on Tryptic Soy Agar (TSA, Difco, Lawrence, Kansas) plates and subjected to two successive transfers into 10 ml Tryptic Soy Broth (TSB) and incubation at 37°C for 20 h. Cells were harvested by centrifugation (3,500 x g, 15 min) at 4°C and washed three times in Butterfield's phosphate buffer (BPB). Bacterial cell pellets were resuspended in 5 ml of sterile BPB and combined to form a three serotype cocktail for each bacterium. Concentration levels of each cocktail were quantified by spread plating 100 µl onto TSA plates inoculated with the appropriate antibiotics for Salmonella and E. coli selection. To facilitate recovery and eliminate background flora, antibiotic-resistant strains of Salmonella (100 ppm nalidixic acid) and E. coli O157:H7 (200 ppm nalidixic acid; 0.025 ppm novobiocin) were used.

Inoculation of peanut butter with Salmonella and E. coli O157:H7

Commercially processed jars of peanut butter were purchased at a local grocery store. Creamy peanut butter (Kroger Co., Cincinnati, OH) listed ingredients were roasted peanuts, sugar, 2% molasses, fully hydrogenated vegetable oils (rapeseed, cottonseed, and soybean) and salt. Peanut butter sample...
icles (100 g) were placed in sterile 500-
ml glass beakers and kept in a heated
water bath at 44°C. Warm water resulted
in less viscous peanut butter and there-
fore minimized large pockets of inocu-
lum in the peanut butter. Each bacterial
cocktail (1 ml) was added separately to
different batches of peanut butter and
mixed with sterile spatula. Four 100-g
portions of contaminated peanut but-
ter were pooled into sterile blenders to
form six 400-g peanut butter samples,
each contaminated with Salmonella and
E. coli O157:H7. To ensure uniform dis-
tribution of the inoculums, the pooled
peanut butter samples were stirred for
4 minutes. The achieved concentrations
of Salmonella and E. coli O157:H7 in
the peanut butter samples were 4.78
and 5.56 log CFU/g, respectively. An-
other set of 400-g peanut butter samples
were contaminated with antibiotic-sen-
sitive Salmonella (4.74 log CFU/g) and
E. coli O157:H7 (5.05 log CFU/g) to
compare their survival capacity with
that of antibiotic-resistant mutants. All
samples were aseptically transferred to
sterile jars and stored at either 25
room temperature) or 4°C (refrigeration
temperature) for up to 15 weeks.

Microbial analysis
Jars of contaminated peanut butter
were opened every week and analyzed
for detectable Salmonella and E. coli
O157:H7. Approximately 25-g samples
of peanut butter were placed in sterile
stomacher bags and 225 ml of BPB was
added. To achieve homogeneous suspen-
sions, samples were pulsed at 230 rpm
for 2 minutes. Aliquots (1 ml) of the
homogeneous samples were plated (pour plate) onto TSA plates that con-
tained the appropriate antibiotic. The
plates were incubated at 37°C for 20 h.
Salmonella was confirmed by plating
typical colonies on xylose-lysine-tergitol
agar plates and by using the Reveal for
Salmonella complete System- SC (Neo-
gen, Lansing, MI). The MacConkey agar
plates and Reveal for E. coli O157:H7
complete systems were used to confirm
E. coli O157:H7.

Statistical analysis
All experiments were performed in
triPLICATE. MEANS were analyzed by one-
way ANOVA, followed by the Tukey
TEST. Significance implies \( P < 0.05 \) unless
stated otherwise.

RESULTS AND DISCUSSION
Consumer survey of peanut
butter storage
Peanut butter, which is found in
about 75% of American homes, is con-
sidered by many to be a staple like bread
and milk. Peanut butter is spread on a
slice of bread, is melted into a soup, and
finds its way into everything from break-
fast to dessert. In our study, 80% of the
participants consumed peanut butter in
their households; most surveyed were fe-
male (76%) rather than male (24%). The
survey targeted the person mainly re-
sponsible for food purchase, storage, and
preparation in each household, and for
the most part, this person tended to be
female. Most respondents had incomes
between $15,000 and $75,000 a year
(Fig. 1). Findings from this study indi-
cate that a Salmonella or E. coli O157:H7
outbreak associated with peanut butter
consumption could affect consumers re-
gardless of income levels.

In this study, 1.3% of the particip-
ants had children under 2 years of age,
and 20% were adults over 60 years of age.
Persons affected by the recent Salmon-
ella Typhimurium outbreak associat-
ed with peanut butter ranged in age from
< 1 to 98 years (4). Participants in this
study were within this age range; it must
be borne in mind that immunocompro-
mised individuals, as well as the old and
young, are at increased risk for foodborne
illness. Previous reports have shown that
Salmonella infections can lead to severe
and potentially fatal conditions such as
bacteremia, septic arthritis, meningitis,
and pneumonia, especially in infants and
immunocompromised hosts (6).

Our results suggest that 87% and
13% of the householders stored pea-
nut butter at room temperature and
at refrigeration temperatures, respecti-
vely. Consumers’ commonly used areas for
storage of peanut butter included: cabi-
nets (80%), inside refrigerators (13%),
top of refrigerators (4%), counter tops
(1%), ledge of a window (1%) and on
dinner or breakfast table (1%). The du-
ration of consumers’ peanut butter stor-
age ranged from less than 2 weeks to
about 6 months. The storage period of
peanut butter was independent of edu-
cation level and age group; there was no
association between education level and
storage period or between age and stor-
age period (Tables 1, 2). During those
storage times, some consumers ate all
the peanut butter purchased while others
threw away part of it for specific reasons.
Some prominent reasons why consum-
ers discarded peanut butter were: (1) the
peanut butter “smelled funny” (5%); (2)
there was a peanut butter recall (7.5%)
especially due to a Salmonella Typhimu-
rium outbreak, and (3) the peanut butter
was too old to eat (16%). Commercial
peanut butter requires no refrigeration
and can be kept up to six months after
opening. Unopened jars can be stored
up to one year in a cool, dark location.
TABLE 2. Percentage of consumers at different age groups who store peanut butter for < 2 to > 24 weeks

<table>
<thead>
<tr>
<th>Age (yrs)</th>
<th>&lt; 2 weeks</th>
<th>2–4 weeks</th>
<th>5–12 weeks</th>
<th>13–24 weeks</th>
<th>&gt; 24 weeks</th>
</tr>
</thead>
<tbody>
<tr>
<td>18–29</td>
<td>1.7</td>
<td>5.9</td>
<td>10.1</td>
<td>0.8</td>
<td>2.5</td>
</tr>
<tr>
<td>30–44</td>
<td>5.9</td>
<td>8.4</td>
<td>5.9</td>
<td>5.0</td>
<td>3.4</td>
</tr>
<tr>
<td>45–59</td>
<td>6.7</td>
<td>10.1</td>
<td>11.8</td>
<td>4.2</td>
<td>4.2</td>
</tr>
<tr>
<td>60–69</td>
<td>0.0</td>
<td>1.7</td>
<td>3.4</td>
<td>0.0</td>
<td>0.8</td>
</tr>
<tr>
<td>70+</td>
<td>0.0</td>
<td>2.5</td>
<td>4.2</td>
<td>0.0</td>
<td>0.8</td>
</tr>
</tbody>
</table>

TABLE 3. Populations of Salmonella and E. coli O157:H7 in peanut butter stored at 4 and 25°C for up to 15 weeks

<table>
<thead>
<tr>
<th>Storage Temperature</th>
<th>Population (log CFU/g)(^a) over storage time (weeks) of:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td><strong>Salmonella</strong></td>
<td></td>
</tr>
<tr>
<td>4°C</td>
<td>4.72(^{aw})</td>
</tr>
<tr>
<td>25°C</td>
<td>3.83(^{aw})</td>
</tr>
<tr>
<td><strong>E. coli O157:H7</strong></td>
<td></td>
</tr>
<tr>
<td>4°C</td>
<td>3.47(^{aw})</td>
</tr>
<tr>
<td>25°C</td>
<td>2.82(^{aw})</td>
</tr>
</tbody>
</table>

\(^a\)Initial population of Salmonella was 4.78 log CFU/g; initial population of E. coli O157:H7 was 5.56 log CFU/g.

\(^w\)Mean values (log CFU/g) in the same column within pathogen that are not followed by the same letter(s) are significantly different (P < 0.05).

\(^b\)Mean values in the same row within pathogen that are not followed by the same letter are significantly different (P < 0.05).

The results of this study raise concerns in that peanut butter recalled because of a Salmonella Typhimurium outbreak was mentioned by about 7.5% of consumers surveyed in our study. Our results obviously indicate that extended periods of storage time of contaminated peanut butter pose risks of foodborne disease to consumers.

Viability of Salmonella and E. coli O157:H7 under simulated domestic kitchen conditions

Viable Salmonella and E. coli O157:H7 cells recovered were entirely attributed to the inoculated peanut butter; no traces of Salmonella or E. coli O157:H7 were detected in uncontaminated peanut butter (control). Populations of Salmonella and E. coli O157:H7 in inoculated peanut butter stored at either 4 or 25°C is shown in Tables 3. The initial populations of Salmonella and E. coli O157:H7 in peanut butter were 4.78 CFU/g and 5.56 CFU/g, respectively. All reductions were tabulated in reference to the initial concentrations of tested pathogens.

There was no significant (P < 0.05) difference in Salmonella reduction within weeks 1, 2 and 3 of peanut butter storage at 4°C (Table 3). However, Salmonella reductions of approximately 0.95 to 4.00 log CFU/g of tested peanut butter samples were observed during storage at room temperature (25°C). At 9, 12, and 15 weeks of peanut butter storage at 4°C, Salmonella populations were significantly (P < 0.05) lower than populations noted during the first 6 weeks of storage of the peanut butter. When the Reveal for Salmonella complete System kit was used, the presence of Salmonella was confirmed in peanut butter at weeks 12 and 15 (Table 3). Storage of peanut butter at 4°C resulted in the least reduction of Salmonella, which ranged from 0.06 to 1.06 log CFU/g, compared with the peanut butter stored at 25°C. Generally, reductions of Salmonella were significantly (P < 0.05) higher at 25°C than at 4°C for up to 15 weeks (Table 3). These results are in agreement with the report of Burnett et al. (2) that Salmonella deaths were more prevalent in butters...
and spreads stored at 21°C than in those stored at 5°C.

The pattern of E. coli O157:H7 reduction was generally similar to that of Salmonella (Table 3). The E. coli O157:H7 reductions in samples stored for 1, 2, 3, weeks at 25°C were 2.74, 2.95, and 3.33 log CFU/g, respectively (Table 3). When stored much longer, to 9 weeks at 25°C, E. coli O157:H7 reductions in the peanut butter were significantly higher (P < 0.05) than those of peanut butter stored at 25°C for 1, 2 and 3 weeks (4.46 log CFU/g vs 2.74, 2.95 and 3.33 log CFU/g, respectively).

Overall, E. coli O157:H7 cell count reductions of peanut butter stored at 4°C ranged from 2.73 to 3.53 log CFU/g (Table 3). The E. coli O157:H7 was confirmed by the Reveal for E. coli O157:H7 20 h complete system method at 12 and 15 weeks of peanut butter storage. E. coli O157:H7 reductions were significantly (P < 0.05) higher with storage at 25°C than at 4°C for up to 15 weeks of peanut butter storage. These observations are in agreement with previous reports (20) that E. coli O157:H7 reductions in mayonnaise were higher when storage was at room temperature (25°C) than when storage was at refrigeration temperature (4°C). Antibiotic-sensitive Salmonella cell counts in samples stored for 6 and 15 weeks at 25°C were 3.37 and 1.72 log CFU/g, respectively. After 6 and 15 weeks at 25°C, antibiotic-sensitive E. coli O157:H7 showed cell counts of 2.73 and 1.01 log CFU/g, respectively. Survival capacity of antibiotic-resistant mutant strains exhibited slower growth rates, compared with antibiotic-sensitive strains. These results suggest that the use of antibiotic resistance as a selective marker could present different growth rates in laboratory media and show different resistance to stresses. This possibly will result in overestimates of any treatment, such as heat, against antibiotic-sensitive Salmonella and E. coli O157:H7.

Findings in this report indicate that post-process contamination of peanut butter with Salmonella and E. coli O157:H7 may result in survival of these pathogens during their shelf life. This premise is in agreement with previous studies showing that Salmonella populations decreased more rapidly in peanut butter at 22°C than at 4°C storage (13). Similar results were observed when Salmonella populations decreased more rapidly in a butter and margarine blend stored at 21°C, compared to 4°C (7). It is most probable that at 25°C, the conditions are highly conducive to bacterial growth in the peanut butter, resulting in accelerated growth and hence attainment of a stationary phase sooner than when storage is at 4°C.

It is well documented that storage temperature of colloidal food products influence the environmental conditions conducive to bacterial growth and hence attainment of a stationary phase sooner than when storage is at 4°C.

CONCLUSIONS

Salmonella grows over a wide range of temperatures and will survive long periods of dehydration. As demonstrated in our results, Salmonella and E. coli O157:H7 can survive in contaminated peanut butter stored at room and refrigerated temperatures for long periods of time and therefore, can pose a health risk to consumers. To minimize or eliminate such risks in peanut butter, Food Safety Programs (FSP) should be imposed in peanut butter processing facilities. Such actions would eliminate Salmonella, E. coli O157:H7 or other foodborne pathogens. In addition, plant sanitation and verification of any heat processes are crucial and must be key components of an inclusive FSP to ensure food safety to the public. More research on the survival of foodborne pathogens in peanut butter will be of great importance to the food industry and will translate to fewer recalls of products, recapturing of lost prestige and improvement of the income potential of the food industry. Peanut butter processing facilities must have in place Food Safety Programs to eliminate and control foodborne pathogens in the product.

ACKNOWLEDGMENTS

This study was supported by US Department of Agriculture (USDA). The authors thank Cindy Thompson and Lou Pearson for their help in the field portions of this work.

REFERENCES


In Memory
Ms. Carol Adair
Sharnbrook, Bedfordshire, United Kingdom

We extend our deepest sympathy to the family of Carol Adair who recently passed away. IAFP will always have sincere gratitude for her contribution to the Association and the profession. Ms. Adair has been a member of IAFP since 2008.
GENERAL INTEREST PAPER

History of Consumer Food Safety Education
Focus on Beef: Impact on Risk of Foodborne Illness

CHRISTINE M. BRUHN
Center for Consumer Research, Dept. of Food Science and Technology, University of California—Davis, Davis, CA 95616, USA

SUMMARY
In the past, food safety topics of public concern appeared to be limited to chemical contamination, pesticide residues, and the occasional case of stomach flu that made the victim miserable for a few hours. In recent years, the public has come to recognize that microbiological safety can have serious, long-term consequences. This paper traces the history of consumer food safety educational programs over the past three decades by examining food safety references and the content of educational material. Over this period, advice to the consumer has evolved from general guidelines to specific targeted messages. Changes in consumer knowledge and behavior, as indicated by surveys and actual observation, indicate that programs have had a positive but limited effect. These findings suggest that additional measures are required by the food production/processing and retail/food service industries to reduce the incidence of life-threatening foodborne illness. While this article focuses on ground beef, the findings apply to many food categories, including fresh produce.

EDUCATIONAL PROGRAMS
Food safety education is delivered by the federal government through the US Food and Drug Administration (FDA) and the US Department of Agriculture (USDA). States are involved in development and delivery of educational programs through Cooperative Extension at land grant institutions. Food industry organizations engage in general or product-specific information on safe handling, often combined with guidelines on selection and preparation for flavorful dishes. Since the late 1990s, a partnership of educators and government, food industry, and non-government organizations has played a major role in defining and delivering food safety information.

FOOD SAFETY OVER THE DECADES
Awareness of pathogens and food safety messages has evolved over the past three decades. Textbooks used in college and university food science classes designed for home economists and dietitians provide only a cursorily overview of food safety. Classic textbooks published in the 1950s and 1960s address the chemical, physical and nutritional changes that take place in food during food preparation but do not address food safety(13, 20, 25). Botulism, staphylococcal food poisoning, salmonellosis and Clostridium perfringens are briefly mentioned by Bennion in 1980 (72). An extensive discussion of food safety is included in Foundations of Food Preparation, which was published in 1987 (19). Major pathogens such as Clostridium botulinum and Salmonella are mentioned, but pathogenic E. coli is not identified. The authors state that the most important factors to prevent foodborne illness are the application of heat, adequate refrigeration, safe thawing, length of storage, storage conditions, and proper sanitation. Details are provided on appropriate refrigerator temperature and storage time; however, end cooking temperatures are indicated only for stuffed turkey.

Information from the FDA food safety material in the early 1980s is more extensive than that in college-level textbooks, but food safety guidelines lack specific details that would result in safe handling. For example, "Who, Why, When and Where of Food Poisons (And What to Do about Them)" published in the FDA Consumer reports that Salmonella could be found in raw meat (10). To prevent foodborne illness, readers are advised to handle food in a sanitary manner, cook foods thoroughly, and promptly and properly refrigerate foods. Similarly, the discussion of staphylococcal food poisoning indicates that a toxin is formed when food, including meat, is held at room temperature for too long. Advice for preventing this condition, the same general precautions associated with Salmonella control, is repeated here. People are advised to handle food in a sanitary manner with prompt and proper refrigeration. Because details of handling are not specified, consumer adoption of effective food handling practices is unlikely.

Food safety material developed by USDA ten years later is more specific. The publication, Is
Women, children, and people with specific health conditions are encouraged to “take control” to reduce the risk for foodborne disease. The reasons why people with specific health conditions are more vulnerable to foodborne illness is explained in a clear and understandable manner. Specific handling guidelines are provided for shopping, cold storage, safe thawing, proper food preparation, serving, and handling leftovers. The recommended temperature for the home refrigerator is specified at 40°F or colder, and readers are advised to cook ground meat to 160°F.

Other publications by USDA provide specific recommendations consistent with current knowledge of foodborne illness. Food News for Consumers, for example, recommends that foods should be marinated in the refrigerator, foods should be cooked completely rather than partially cooked, held and reheated, and meat should be cooked to 160°F (31). Similarly, A Quick Consumer Guide to Safe Food Handling includes specific information as to temperature control and safe storage time (45).

USDA's Meat and Poultry Hotline, established in 1985, provides answers to consumer questions through a toll free telephone call, fact sheets, articles in educational publications such as Food News, and fact sheets available through the internet (47). Hotline representatives also respond to media calls, reaching an even larger audience. Reports of the hotline activities are posted periodically (46).

Another USDA consumer publication, Preventing Foodborne Illness, provides detailed food handling information (44). Sections are devoted to safe shopping, storage, preparation, serving, and handling of leftovers. Escherichia coli O157:H7 is mentioned, and consumers are advised to cook ground beef to 160°F. Listeria is discussed and pregnant women are identified as being at increased risk for this pathogen. Those at high risk are advised to reheat processed meats.

In 1991, the FDA also provided more comprehensive and specific consumer food safety guidelines. Preventing Foodborne Illness provides foodborne illness prevention tips, including sections on cleaning and cooking, safe storage with recommended storage times, symptoms and sources of bacteria and sources for additional information (3). The minimum recommended cooking temperatures for beef is 140°F. A higher temperature for ground beef is not advised. Although this document was reprinted and revised in 1997, a recommended end point cooking temperature for ground beef was not added.

College textbooks published in the 1990s reflect a more comprehensive coverage of foodborne illness. Food Safety, by Julie Jones, includes a discussion of significantly more microbial pathogens than books from the previous decade, including Salmonella, Campylobacter jejuni, Toxoplasma gondii, Staphylococcus aureus, C. perfringens, Shigella, Escherichia coli, Trichinella spiralis, Bacillus cereus, Vibrio, Listeria monocytogenes, Yersinia enterocolitica, and others. Raw meat and meat products are identified as a source of Salmonella, C. perfringens, and L. monocytogenes. Jones notes that E. coli is a common resident of the intestinal tract of warm-blooded animals. She notes that for many years it had been considered harmless; however, particular strains of E. coli were the cause of enteric disease in the 1980s, with soft cheeses and ground beef identified as the food sources. Sanitary handling to avoid cross-contamination, thorough cooking, and keeping foods out of the danger zone are specified as ways to reduce the probability of illness.

Consumers indicate that they obtain safe handling information from cookbooks and magazines (35). A review of classic cookbooks, such as Better Homes and Gardens or Joy of Cooking, indicates that virtually all limit food handling information to culinary issues such as the temperature for roasts cooked to rare, medium, or well done. Even books published in the 1990s and later, specializing in ground beef or grilling, address preference for degree of doneness rather than food safety considerations. There are exceptions. The 1997 edition of Joy of Cooking lists the recommended end point temperature of 160°F for meat loaf (page 722) but incorrectly advises consumers to cook ground beef to 155°F (page 646) (38). Further, readers are advised that risk is lessened by buying top-grade beef and grilling it themselves. This is a potentially risky practice, since the opportunity for cross contamination in the kitchen is high. Some cookbooks provide current, accurate information. The Complete Meat Cookbook, for example, recommends 160°F or 155°F for 15 seconds as the end point cooking temperature for ground beef (1).

**LANDMARK FOOD SAFETY EVENT**

A landmark event in food safety occurred in 1993. Consumption of undercooked hamburger contaminated with E. coli O157:H7 resulted in 501 illnesses, 151 hospitalizations, and 3 deaths (11). This outbreak received extensive publicity because the source of illness was a popular food and many victims were children. In 1994, USDA declared E. coli O157:H7 an adulterant in raw beef, and a program began to test for the pathogen in raw ground beef from federally inspected establishments and retail stores (15). In 1994, the public was advised to cook ground beef until it is brown and juices run clear; however, in 1997, FSIS revised this recommendation. Cooked ground beef color was demonstrated to be an inaccurate predictor of end point temperature. Consumers were advised to use a meat thermometer and cook to 160°F rather than rely on color.

Since 1994, USDA has required safe food-handling labels on retail packages or raw and partially cooked meat and poultry products. The label advises consumers to refrigerate the product, avoid cross contamination, cook thoroughly, keep hot food hot, and handle leftovers properly. Interview and survey data indicate that 51% or more of consumers contacted recalled seeing the label. Of these, 79% or more remember reading the label, and 37% of these said they changed the way
they handle raw meat as a result of reading the label (34, 39, 48). These studies found that people were more likely to remember the message to avoid cross contamination than any other.

In 1997, President Clinton announced the National Food Safety Initiative (15, 33). This measure established the Partnership for Food Safety Education, a not-for-profit organization of government agencies, food industry, nutrition/food safety professional societies, and consumer groups. The Partnership’s mission is to educate consumers to protect themselves from bacteria (FightBAC®) and reduce risk of foodborne illness by following 4 simple practices:

CLEAN: Wash hands and surfaces often
SEPARATE: Don’t cross-contaminate!
COOK: Cook to proper temperature
CHILL: Refrigerate promptly

The partnership provides a coordinated and consistent set of food safety messages based upon consumer-tested information and graphics. Messages are developed through public opinion research and expert scientific and technical review. Information is distributed through mass media, public service announcements, the Internet, point-of-purchase, and school and community initiatives. Material is available to use nationwide by public health, nutrition, food science, education, and special constituency groups.

USDA, FDA, and others in the Partnership sponsor a “Partner’s Toolkit” that contains flyers, posters, and a CD with additional educational material. “Consumer Education Planning Guides” mailed to food safety educators include media material such as a press release and public service announcements as well as fact sheets, FightBAC brochures, and food-safety related games and activities.

Although these tools are available, they are not used as widely as they could be. Food safety educators indicate that their available time is a limitation (16). Over 30% of educators responding to a USDA survey report that they spend less than 25% of their time on food safety education, with the rest of the time devoted to various other food, nutrition, and health topics. Only 15% of educators spend 50 to 75% of their time on food safety education. Restricted funding is also a limitation. Twenty percent of educators have annual budgets for food safety education of less than $5,000. The availability of additional resources in terms of both finances and staff could result in more extensive delivery of the FightBAC message.

Use of a thermometer to verify adequate cooking is a key component of the Partnership message to cook to proper temperature. The Research Triangle Institute evaluated the effectiveness of the Thermy™ educational material used nationally to promote use of a food thermometer (37). McCurdy and colleagues also explored consumer attitudes toward food thermometers (26). Both groups found that participants already believed they prepared meat safely. People relied on color and were not aware of the importance of using a food thermometer. Some were not familiar with food thermometers and did not know how to read or interpret the results. Consumers suggested developing messages that emphasized that using a thermometer is the only way to be sure the food has reached a sufficiently high temperature to destroy foodborne bacteria, using a thermometer will help protect children or elderly persons, and using a thermometer improves food quality because the food will not be over-cooked. Consumers report that they are reluctant to use thermometers to cook small or thin meat items because they lack the time, forget, are too lazy, or lack confidence in accurately positioning the thermometer in thin cuts of meat (26).

As a result of these findings, comprehensive guide to using a thermometer when cooking thin portions of meat was developed by Washington State University Extension and the University of Idaho (41). Now You’re Cooking ... Using a Food Thermometer! uses color illustrations to demonstrate that brown meat may not have reached 160°F. Further, the brochure describes different types of thermometers, demonstrates how to use a thermometer to determine end point temperature in burgers, and describes with text and illustrations how to most effectively cook a burger to the recommended end point temperature.

USDA, in partnership with others, developed educational material targeted to specific audiences. Listeriosis and Pregnancy — What is Your Risk? produced by the Association of Women’s Health, Obstetric and Neonatal Nurses, the International Food Information Council Foundation, USDA, and US Department of Health and Human Services in 2001 utilizes the four FightBAC messages in conjunction with text and photos to explain Listeria risk and protection practices. Protecting Your Baby and Yourself from Listeriosis, written by USDA in 2004, includes additional pictures and repeats the same basic messages. To Your Health! Food Safety for Seniors, published in 2000, targets older Americans with larger print, simple pictures, and updated end-point cook temperatures.

A team of food safety educators from Washington State University, Ohio State University, and Colorado State University developed food safety materials for highest risk consumers. Available for free download are materials for persons living with HIV/AIDS, cancer, bone marrow transplants, and others (21, 28–30). These materials, developed in consultation with the target audience, included specific information on shopping, storing, cooking, and handling leftovers. Tips for using a thermometer are included, as well as updated information on safe end point temperatures of various foods.

**EFFECT OF EDUCATIONAL PROGRAMS ON BEHAVIOR**

While food safety messages are tested with the consumers, changing consumer practices is challenging. Survey results on consumer attitudes and practices indicate increased awareness in several areas:

**Hand washing**

People appear to be more aware that hand washing is an important component of food safety.
In an annual survey repeated over several years, consumers were asked to volunteer practices they follow to keep food safe. In 1990, no consumers volunteered that they wash their hands (32). In 2005—2007, between 74 and 76% identified washing hands as something they do “every time” (18). Further, a review of select safe-handling practices indicates that more consumers report washing their hands with soap after handling raw meat or poultry, with 66% reporting washing in 1993, 76% in 1998 and 82% in 2001 (4). In 2009, 87% reported washing their hands with soap and water, but this percentage had decreased from 92% in 2008 (23).

Do consumers really wash every time? The American Society for Microbiology has repeatedly shown that actual behavior is frequently different from reported behavior. For example, 92% of Americans say they wash their hands after using a restroom, but when observed, only 88% of women and 66% of men actually wash their hands (5). Video taping consumers in their homes while preparing a meal revealed that 45% of subjects attempted to wash their hands before starting meal preparation, of which 38% used soap (2). This indicates that consumers know that hand washing is important, but people may not always wash as frequently as food safety authorities recommend.

Cross-contamination
Consumer response to a question on cleaning cutting boards indicates an increasing percentage respond with recommended behavior. In 1996 and 1997, 7% of consumers acknowledged that they do not always wash their hands after handling raw meat or poultry, and 7% also admitted that they do not always wash the cutting board after cutting raw meat or poultry was reported by 68% of consumers in 1993, 79% in 1998, and 85% in 2001 (4). In contrast, in 2009, only 50% of consumers reported using different or freshly cleaned cutting boards between raw meat and poultry and produce (23). Others found that in 1999 and 2002, 18% of consumers did not wash the plate between using it to hold raw and cooked meat (14).

People may overstate what they perceive as the recommended behavior. Actual observation again reveals that consumers do not always follow recommended practices. When consumers were observed during meal preparation, over 477 cross-contamination events occurred. Most of these, 84%, involved contamination of ready to eat foods with raw meat or poultry (2).

Thorough cooking of ground beef
A national telephone survey conducted between December 1992 and February 1993 found that 23% of consumers served home prepared hamburgers rare or medium (24). In 1996 and 1997, 10% of consumers interviewed said they had eaten undercooked hamburger in the five days prior to the interview, while 30% said they preferred undercooked hamburger (39). In 1998 and 2001, those who said they had eaten rare or medium hamburgers decreased to 17 and 18%, respectively (4).

Use of meat thermometer to determine doneness
More consumers reported owning a meat thermometer in 2001, at 60%, compared to only 46 in 1998 (4). In 1998, 22% of consumers reported using a meat thermometer to determine when roasts or large pieces of meat are done. This percentage increased to 32% in 2001. Use of a thermometer is not an ingrained behavior. In 2009, 71% responded that they cook food to the required temperature. However, only 25% said they used a thermometer to check doneness of meat and poultry items (23). The percentage using a meat thermometer when cooking hamburgers is much lower. Only 3% indicated that they used a thermometer in 1998, and 6% in 2001 (4). Consumers can accidentally undercook ground beef that is used as part of a large meal item. Even though consumers believed their meatloaf was fully cooked, 46% of the meatloaves had not reached the recommended temperature of 160°F (2).

Popular sources of recipes do not encourage use of a thermometer but rather rely on time of cooking and color. Celebrity chef Bobby Flay describes several tasty ways to cook burgers in the Sunday newspaper insert, Parade magazine (17). Readers are told to “Grill for 3-4 minutes on each side, until golden brown and cooked medium inside.” The September 2009 issue of Saveur magazine featuring The Burger Bible focuses on flavorful ingredients. Readers are advised to “cook burgers, flipping once, until cooked to desired doneness, about 12 minutes total for medium rare” (6). In the article “Ultimate Burgers,” Sunset Magazine advises readers to grill burgers 4 to 6 minutes, turning once for rare, and ten minutes for medium to well-done burgers (42). Cooks are advised to “check doneness,” but use of a thermometer is not mentioned. Perhaps the most shocking advice comes from the New York Times (40). The writer interviewed several chefs from around the country, gleaning tips from each to share with the reader. None mention use of a thermometer. The paper reports that Seamus Mullen, the chef and an owner of the Boqueria restaurants in the Flatiron district and SoHo, uses a wire cake tester to determine doneness. “We stick it in the middle through the side,” he said. “If it’s barely warm to the lips, it’s rare. If it’s like bath water, it’s medium rare. The temperature will never lie. It takes the guesswork out of everything.”

Knowledge and behavior
Surveys indicate that consumer knowledge of several key messages on safe handling has increased, but knowledge gaps still exist (4, 36). In some cases, people are not familiar with details of the recommendation. They do not know the appropriate end-point temperature for cooked hamburger or the appropriate temperature for the refrigerator. People do not realize the importance of hand washing, and they think that rinsing hands or a cutting board with water constitutes adequate cleaning.

Even if they know the recommendations, people do not always follow them. People say that the recommendations do not apply to them, or that they are too busy.
and the recommended practices are inconvenient (9, 36). Taste preference also plays an important role in food choice. Some prefer their burgers cooked to rare (35). McIntosh and coworkers found that awareness of the danger of improperly cooked hamburger, knowledge of foodborne pathogens, and knowledge of food safety practices had no effect on willingness to change burger cooking practices (27).

Knowledge and behavior of those at highest risk

Athearn et al. (8) found that pregnant women interviewed through focus groups expressed moderate concern about food safety and had made some changes since becoming pregnant; however, many were not following seven of 12 recommended practices. Women believed their food was safe and resisted change because of convenience or taste preference. Pregnant women and those at increased risk for Listeria infection said that they did not want to reheat luncheon meat.

Focus group discussions revealed that persons with HIV/AIDS had “weakly positive” attitudes toward food safety and that many consumed foods that would be considered risky (22). Initially, people were resistant to and confused about many safety recommendations. Initially, project participants did not want to use a food thermometer and did not want to avoid favorite foods, such as unheated deli meats. Barriers to accepting the food safety recommendations include lack of understanding why the practices are necessary, willingness to take risks, resistance to change, feeling that someone else, such as food processors, should control food-related risks, and belief that risks could be controlled by their own food preparation actions. Even after hearing why extra food safety precautions are appropriate for their health conditions, participants were not willing to adopt all recommendations. The most widely accepted recommendation was that regarding hand washing. Resistance was strongest for the recommendations to avoid unheated lunchmeats and to use a thermometer to determine safe cooking temperature.

SUMMARY AND IMPLICATIONS

Food safety education is available in more venues today than in previous decades. Messages are directed to the general audience as well as populations at increased risk, such as children, pregnant women, older people, and those whose immunity is compromised. Guidelines are specific, with details on how to wash hands and cooking surfaces, how cool to keep the refrigerator, and the appropriate end temperature for cooked ground beef. Messages are presented nationwide, but consumers do not remember the details of how cold or how hot food should be held. Many do not follow all the recommendations. People think they already handle food safely and are reluctant to change habitual behavior. Many will not sacrifice flavor preference for safe handling.

In summary, a substantial number of consumers continue to follow unsafe food handling practices. Education alone is not sufficient to protect against foodborne disease. According to the International Food Information Council Foundation’s fourth annual Food & Health Survey, more than half of Americans think foodborne illness from bacteria, such as E. coli and Salmonella, is the most important food safety issue today (23). Failure to offer food that is free of pathogens has a profound impact on consumer confidence in the food supply and likelihood to select specific food items in the future. A 2009 nationwide survey found that less than 20% of consumers trust food companies to develop and sell food products that are safe and healthy (7). Consumers indicated that when they heard of recalls, they changed their buying practices, with 63% saying they will not buy the food in question again until the source of contamination has been found and eliminated. Although most consumers in this survey recalled contamination incidents with peanut butter, spinach, tomatoes, and ground beef, recalls and foodborne illnesses traced to these products continues to be in the news.

This author believes that to reduce the likelihood of a foodborne illness outbreak, the meat industry should expand use of advanced food safety technology such as high pressure processing and irradiation. These treatments greatly reduce levels of pathogens that cause illness from accidental cross-contamination or undercooking. Use of these technologies will benefit the meat industry through reduction of meat-related foodborne illnesses and fewer ground beef recalls. Additionally, the public will be protected from pathogens that cause devastating foodborne illness. The food service industry must join the efforts to enhance safety by using products processed for added safety. Similarly, consumers can make safer choices only if supermarkets offer foods processed for added safety. Health educators should continue to advocate safe food handling, coupled with promoting the advantages of safety-enhanced food.

ACKNOWLEDGMENTS

This literature review funded in part by the Cattlemen’s Beef Promotion and Research Board, Beef Checkoff Program.

REFERENCES


42. True, M. 2009. From grilling disaster to grilling master. Sunset Living in the West. July:60.


Author information: Phone: 530.752.2774; Fax: 530.752.4759; Email: cmbruhn@ucdavis.edu.

In Memory

Helene Uhlman
Hobart, Indiana

We extend our deepest sympathy to the family of Helene Uhlman who recently passed away. IAFP will always have sincere gratitude for her contribution to the Association and the profession. An IAFP Member since 1969, it was during that decade that Ms. Uhlman became the first female certified milk inspector in the US Grade “A” Milk Program. She later became the first female Grade “A” Milk Plant Inspector.

Ms. Uhlman’s 40-year career in the industry encompassed appointments as Project Director for the tri-city Northwest Indiana Grade “A” Milk Cooperation, which evolved into a seven-county Indiana State Department of Health (ISDH) contractual agreement; Director of Sanitation and first female Administrator for the City of Gary Health Department; Project Director for a stop-smoking program initiated by ISDH with the American Cancer Society; and as Administrator for the City of Hammond Health Department.

Ms. Uhlman served the IAFP Affiliate Council as Delegate of the Indiana Environmental Health Association since 1969, chairing the council for three different terms. She was active on the Dairy Quality and Safety PDG since 1997, chairing its predecessor groups; served as Food Protection Committee Chairperson; and was active in the former Bridge Committee between IAFP and the National Environmental Health Association, of which she was also a longtime active member.

A devoted advocate and mentor for female industry professionals, Ms. Uhlman was instrumental in encouraging women to become more active in IAFP. By reviewing the Association’s Membership rosters, Annual Meeting attendance and presenter lists, and various leadership roles over the years, the success of her efforts is apparent.

In 1998, she received the IAFP Honorary Life Membership Award.
The International Association for Food Protection welcomes your nominations for our Association Awards. Nominate your colleagues for one of the Awards listed below. You do not have to be an IAFP Member to nominate a deserving professional. Nomination criteria is available at:

www.foodprotection.org

Nominations deadline is February 16, 2010

You may make multiple nominations. All nominations must be received at the IAFP office by February 16, 2010.

- Persons nominated for individual awards must be current IAFP Members. Black Pearl Award nominees must be companies employing current IAFP Members. GMA Food Safety Award and Frozen Food Foundation Research nominees do not have to be IAFP Members.
- Previous award winners are not eligible for the same award.
- Executive Board Members and Awards Selection Committee Members are not eligible for nomination.
- Presentation of awards will be during the Awards Banquet on August 4, at IAFP 2010 in Anaheim, California.

Contact IAFP for questions regarding nominations.
Nominations will be accepted for the following Awards:

**Black Pearl Award**
Award Showcasing the Black Pearl  
Sponsored by Wilbur Feagan and F&H Food Equipment Company
Presented in recognition of a company’s outstanding commitment to, and achievement in, corporate excellence in food safety and quality.

**Fellow Award**
Distinguished Plaque
Presented to Member(s) who have contributed to IAFP and its Affiliates with distinction over an extended period of time.

**Honorary Life Membership Award**
Plaque and Lifetime Membership in IAFP
Presented to Member(s) for their dedication to the high ideals and objectives of IAFP and for their service to the Association.

**Harry Haverland Citation Award**
Plaque and $1,500 Honorarium  
Sponsored by ConAgra Foods, Inc.
Presented to an individual for many years of dedication and devotion to the Association ideals and its objectives.

**Food Safety Innovation Award**
Plaque and $2,500 Honorarium  
Sponsored by Walmart
Presented to a Member or organization for creating a new idea, practice or product that has had a positive impact on food safety, thus, improving public health and the quality of life.

**International Leadership Award**
Plaque, $1,500 Honorarium  
and Reimbursement to attend IAFP 2009  
Sponsored by Cargill, Inc.
Presented to an individual for dedication to the high ideals and objectives of IAFP and for promotion of the mission of the Association in countries outside of the United States and Canada.

**GMA Food Safety Award**
Plaque and $3,000 Honorarium  
Sponsored by Grocery Manufacturers Association
This Award alternates between individuals and groups or organizations. In 2010, the award will be presented to a group or organization in recognition of a long history of outstanding contributions to food safety research and education.

**Frozen Food Foundation Freezing Research Award**
Plaque and $2,000 Honorarium  
Sponsored by the Frozen Food Foundation
Presented to an individual, group or organization for preeminence and outstanding contributions in research that impacts food-safety attributes of freezing.

**Maurice Weber Laboratorian Award**
Plaque and $1,500 Honorarium  
Sponsored by Weber Scientific
Presented to an individual for outstanding contributions in the laboratory, recognizing a commitment to the development of innovative and practical analytical approaches in support of food safety.

**Larry Beuchat Young Researcher Award**
Plaque and $2,000 Honorarium  
Sponsored by bioMérieux, Inc.
Presented to a young researcher who has shown outstanding ability and professional promise in the early years of their career.

**Sanitarian Award**
Plaque and $1,500 Honorarium  
Sponsored by Ecolab Inc.
Presented to an individual for dedicated and exceptional service to the profession of Sanitarian, serving the public and the food industry.

**Elmer Marth Educator Award**
Plaque and $1,500 Honorarium  
Sponsored by Nelson-Jameson, Inc.
Presented to an individual for dedicated and exceptional contributions to the profession of the Educator.

**Harold Barnum Industry Award**
Plaque and $1,500 Honorarium  
Sponsored by Nasco International, Inc.
Presented to an individual for dedication and exceptional service to IAFP, the public, and the food industry.
CALL FOR ABSTRACTS
IAFP 2010
August 1–4, 2010
Anaheim Convention Center
Anaheim, California

General Information
1. Complete the Abstract Submission Form Online.
2. All presenters must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
3. There is no limit on the number of abstracts individuals may submit. However, one of the authors must deliver the presentation.
4. Accepted abstracts will be published in the Program and Abstract Book. Editorial changes may be made to accepted abstracts at the discretion of the Program Committee.
5. Membership in the Association is not required for presenting a paper at IAFP 2010.

Presentation Format
1. Technical — Oral presentations will be scheduled with a maximum of 15 minutes, including a two to four-minute discussion. LCD projectors will be available and computers will be supplied by the convenors.
2. Poster — Freestanding boards will be provided for presenting posters. Poster presentation surface area is 48” high by 96” wide (121.9 cm x 243.8 cm). Handouts may be used, but audiovisual equipment will not be available. The presenter is responsible for bringing pins and velcro. All posters should include the title and author information.
Note: The Program Committee reserves the right to make the final determination on which format will be used for each presentation.

Instructions for Preparing Abstracts
1. All abstracts must be written in clear and correct English.
2. All abstracts must be approved and signed off by all authors before submission. The results should not have been presented/published previously by any one of the authors.
3. Title — The title should be short but descriptive. The title should be in title case.
4. Authors — List all authors using the following style: first name or initials followed by the surname.
5. Presenter Name and Title — List the full name and title of the person who will present the paper.
6. Presenter Address — List the name of the department, institution and full postal address (including zip/postal code and country).
7. Phone Number — List the phone number, including area, country, and city codes of the presenter.
8. Fax Number — List the fax number, including area, country, and city codes of the presenter.
9. E-mail — List the E-mail address for the presenter.
10. Format preferred — Check the box to indicate oral or poster format. The Program Committee reserves the right to make the final determination of presentation format.
11. Category — The categories are used by the Program Committee to organize the posters and technical sessions. Please check 2–3 boxes which best describe the categories for which the abstract is suitable.

Categories used for this years Annual Meeting are:
Pathogens
Microbial Food Spoilage
General Microbiology
Sanitation
Produce
Meat and Poultry
Seafood
Dairy and Other Food Commodities
Beverages and Water
Developing Scientist Awards Competition —
Check the box to indicate if the presenter is a student wishing to be considered in this competition. The student will make the initial submission, and IAFP will E-mail the abstract to the major professor, who will complete the submission process. For more information, see “Call for Entrants in the Developing Scientist Awards Competitions.”

Abstract — Key the abstract into the web-based system. In addition, a double-spaced copy of the abstract, typed in 12-point font in MS Word, should be E-mailed to abstracts@foodprotection.org at the time of submission. Limit the Abstract length to approximately 300 words.

In addition to following these instructions, authors should carefully review the sections on selection criteria and rejection reasons as well as the sample abstract before submitting the abstract. Original research abstracts MUST be in the following format:

Introduction: Provide background, statement of problem, or basis of the study. (2—3 sentences)
Purpose: State the purpose or objectives of the study (1—2 sentences)
Methods: State the methodology used in the study (2—3 sentences). The methods should be specific enough that researchers in the same or similar field would understand the basic experimental design or approach.
Results: Describe the results obtained in the study (2—3 sentences). NOTE: Specific results, with statistical analysis (if appropriate), MUST be provided. A statement of “results pending” or “to be discussed” is not acceptable and will be grounds for abstract rejection. Results should be summarized; do NOT use tables or figures.
Significance: State the significance of the findings to food protection and/or public health (1—2 sentences) NOTE: Do not include reference citations in the Abstract. Please see sample abstracts for further guidance on abstract structure.

Failure to follow the above formatting instructions is reason for rejection.

Abstracts submitted in the Education category MUST present an improvement or innovation on a proven method in order to educate others about a food protection related topic. There should be a way to measure the outcomes and substantiate the improvements and/or outcomes. If measured, the sample size should be sufficiently large to represent the intended population.


Abstract Submission
Abstracts submitted for IAFP 2010 will be evaluated for acceptance by the Program Committee. Please be sure to follow the instructions above carefully; failure to do so may result in rejection. Information in the abstract data must not have been previously published in a copyrighted journal.
Abstracts must be received no later than January 20, 2010. Completed abstract and information must be submitted online. Use the online submission form at www.foodprotection.org. In addition, a double-spaced copy of the abstract, typed in 12-point font in MS Word, should be E-mailed to abstracts@foodprotection.org at the time of submission. You will receive an E-mail confirming receipt of your submission.

Selection Criteria
1. Abstracts should be structured as described above.
2. Abstracts must report the results of original research pertinent to the subject matter. Work should report the results of new, applied studies dealing with: (i) causes (e.g., microorganisms, chemicals, natural toxicants) and control of all forms of foodborne illness; (ii) causes (e.g., microorganisms, chemicals, insects, rodents) and control of food contamination and/or spoilage; (iii) food protection from farm-to-fork (including all sectors of the chain including production, processing, distribution, retail, and consumer phases); (iv) novel approaches for the tracking of foodborne pathogens or the study of pathogenesis and/or microbial ecology; (v) public health significance of foodborne disease, including outbreak investigation; (vi) non-microbiology food protection issues (food toxicology, allergens, chemical contaminants); (vii) advances in sanitation, quality control/assurance, and food protection systems; (viii) advances in laboratory methods; and (ix) food protection risk assessment. Work may also report subject matter of an educational nature.
3. Research must be based on accepted scientific practices.
4. Research should not have been previously presented nor intended for presentation at another scientific meeting. Work should not appear in print prior to the Annual Meeting.

Rejection Reasons

1. Abstract was not prepared according to the "Instructions for Preparing Abstracts." This includes abstracts that are too lengthy.
2. Abstract reports inappropriate or unacceptably subject matter about advancing food safety worldwide.
3. Abstract is not based on accepted scientific or educational practices and/or the quality of the research or scientific/educational approach is inadequate.
4. Potential for the approach to be practically used to enhance food safety is not apparent.
5. Work reported appears to be incomplete and/or data and statistical validity are not presented. Percentages alone are not acceptable unless sample sizes (both numbers of samples and sample weight or volume) are reported. Detection limits should be specified when stating that populations are below these limits. Indicating that data will only appear in the presentation without including them in the abstract is NOT acceptable.
6. Abstract was poorly written or prepared. This includes spelling and grammatical errors or improper English language usage.
7. Results have been presented/published previously by one of the authors.
8. Abstract was received after the deadline for submission.
9. Abstract contains information that is in violation of the International Association for Food Protection Policy on Commercialism.
10. Abstract subject is similar to other(s) submitted by same author. (The committee reserves the right to combine such abstracts.)
11. Abstracts that report research that is confirmatory of previous studies and/or lacks originality will be given low priority for acceptance.

Projected Deadlines/Notification


Contact Information

Questions regarding abstract submission can be directed to Tamara P. Ford, 515.276.3344 or 800.369.6337; E-mail: tford@foodprotection.org

Program Chairperson

Faye J. Feldstein
Deputy Director
Office of Food Defense, Communication and Emergency Response
Center for Food Safety and Applied Nutrition
Food and Drug Administration
5100 Paint Branch Parkway
College Park, MD 20740, USA
Phone: 301.436.1564
Cell: 240.375.3418
Fax: 301.436.2605
E-mail: Faye.Feldstein@fda.hhs.gov
Call for Entrants in the
Developing Scientist Awards Competitions

Supported by the International Association for Food Protection Foundation

The International Association for Food Protection is pleased to announce the continuation of its program to encourage and recognize the work of students and recent graduates in the field of food safety research. Qualified individuals may enter either the oral or poster competition.

Purpose
1. To encourage students and recent graduates to present their original research at the Annual Meeting.
2. To foster professionalism in students and recent graduates through contact with peers and professional Members of the Association.
3. To encourage participation by students and recent graduates in the Association and the Annual Meeting.

Presentation Format
Oral Competition — The Developing Scientist Oral Awards Competition is open to graduate students (enrolled or recent graduates) from M.S. or Ph.D. programs or undergraduate students at accredited universities or colleges. Presentations are limited to 15 minutes, which includes two to four minutes for discussion.

Poster Competition — The Developing Scientist Poster Awards Competition is open to students (enrolled or recent graduates) from undergraduate or graduate programs at accredited universities or colleges. The presenter must be present to answer questions for a specified time (approximately two hours) during the assigned session. Specific requirements for presentations will be provided at a later date.

General Information
1. Competition entrants cannot have graduated more than a year prior to the deadline for submitting abstracts.
2. Accredited universities or colleges must deal with environmental, food or dairy sanitation, protection or safety research.
3. The work must represent original research completed and presented by the entrant.
4. Entrants may enter only one paper in either the oral or poster competition.
5. All entrants must register for the Annual Meeting and assume responsibility for their own transportation, lodging, and registration fees.
6. Acceptance of your abstract for presentation is independent of acceptance as a competition finalist. Competition entrants who are chosen as finalists will be notified of their status by the chairperson by May 3, 2010.

7. Entrants who are full-time students, with accepted abstracts will receive a complimentary, one-year Student Membership with JFP Online.
8. In addition to adhering to the instruction in the “Call for Abstracts,” competition entrants must check the box to indicate if the paper is to be presented by a student in this competition. A copy of the abstract will be E-mailed to the major professor for final approval.
9. You must also specify full-time student or part-time student.

Judging Criteria
A panel of judges will evaluate abstracts and presentations. Selection of up to ten finalists for each competition will be based on evaluations of the abstracts and the scientific quality of the work. All entrants will be advised of the results by May 3, 2010. Only competition finalists will be judged at the Annual Meeting and will be eligible for the awards.

Judging criteria will be based on the following:
1. Abstract — Clarity, comprehensiveness and conciseness.
2. Scientific Quality — Adequacy of experimental design (methodology, replication, controls), extent to which objectives were met, difficulty and thoroughness of research, validity of conclusions based upon data, technical merit and contribution to science.
3. Presentation — Organization (clarity of introduction, objectives, methods, results and conclusions), quality of visuals, quality and poise of presentation, answering questions, and knowledge of subject.

Finalists
Awards will be presented at the International Association for Food Protection Annual Meeting Awards Banquet to the top three presenters (first, second and third places) in both the oral and poster competitions. All finalists are expected to be present at the banquet where the award winners will be announced and recognized.

Awards
First Place — $600 and an engraved plaque
Second Place — $400 and a framed certificate
Third Place — $200 and a framed certificate
Award winners will receive a complimentary, one-year Membership including Food Protection Trends, Journal of Food Protection, and JFP Online.
Policy on Commercialism
for Annual Meeting Presentations

1. INTRODUCTION

No printed media, technical sessions, symposia, posters, seminars, short courses, and/or other related types of forums and discussions offered under the auspices of the International Association for Food Protection (hereafter referred to as Association forums) are to be used as platforms for commercial sales or presentations by authors and/or presenters (hereafter referred to as authors) without the express permission of the staff or Executive Board. The Association enforces this policy in order to restrict commercialism in technical manuscripts, graphics, oral presentations, poster presentations, panel discussions, symposia papers, and all other type submissions and presentations (hereafter referred to as submissions and presentations), so that scientific merit is not diluted by proprietary secrecy.

Excessive use of brand names, product names or logos, failure to substantiate performance claims, and failure to objectively discuss alternative methods, processes, and equipment are indicators of sales pitches. Restricting commercialism benefits both the authors and recipients of submissions and presentations.

This policy has been written to serve as the basis for identifying commercialism in submissions and presentations prepared for the Association forums.

2. TECHNICAL CONTENT OF SUBMISSIONS AND PRESENTATIONS

2.1 Original Work

The presentation of new technical information is to be encouraged. In addition to the commercialism evaluation, all submissions and presentations will be individually evaluated by the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff on the basis of originality before inclusion in the program.

2.2 Substantiating Data

Submissions and presentations should present technical conclusions derived from technical data. If products or services are described, all reported capabilities, features or benefits, and performance parameters must be substantiated by data or by an acceptable explanation as to why the data are unavailable (e.g., incomplete, not collected, etc.) and, if it will become available, when. The explanation for unavailable data will be considered by the Program Committee chairperson and/or technical reviewers selected by the Program Committee chairperson to ascertain if the presentation is acceptable without the data. Serious consideration should be given to withholding submissions and presentations until the data are available, as only those conclusions that might be reasonably drawn from the data may be presented. Claims of benefit and/or technical conclusions not supported by the presented data are prohibited.

2.3 Trade Names

Excessive use of brand names, product names, trade names, and/or trademarks is forbidden. A general guideline is to use proprietary names once and thereafter to use generic descriptors or neutral designations. Where this would make the submission or presentation significantly more difficult to understand, the Program Committee chairperson, technical reviewers selected by the Program Committee chairperson, session convenor, and/or staff, will judge whether the use of trade names, etc., is necessary and acceptable.

2.4 "Industry Practice" Statements

It may be useful to report the extent of application of technologies, products, or services; however, such statements should review the extent of application of all generically similar technologies, products, or services in the field. Specific commercial installations may be cited to the extent that their data are discussed in the submission or presentation.

2.5 Ranking

Although general comparisons of products and services are prohibited, specific generic comparisons that are substantiated by the reported data are allowed.

2.6 Proprietary Information (See also 2.2.)

Some information about products or services may not be publishable because it is proprietary to the author’s agency or company or to the user. However, the scientific principles and validation of performance parameters must be described for such products or services. Conclusions and/or comparisons may be made only on the basis of reported data.

2.7 Capabilities

Discussion of corporate capabilities or experiences are prohibited unless they pertain to the specific presented data.
3. GRAPHICS

3.1 Purpose

Slides, photographs, videos, illustrations, art work, and any other type visual aids appearing with the printed text in submissions or used in presentations (hereafter referred to as graphics) should be included only to clarify technical points. Graphics which primarily promote a product or service will not be allowed. (See also 4.6.)

3.2 Source

Graphics should relate specifically to the technical presentation. General graphics regularly shown in, or intended for, sales presentations cannot be used.

3.3 Company Identification

Names or logos of agencies or companies supplying goods or services must not be the focal point of the slide. Names or logos may be shown on each slide so long as they are not distracting from the overall presentation.

3.4 Copies

Graphics that are not included in the preprint may be shown during the presentation only if they have been reviewed in advance by the Program Committee chairperson, session convenor, and/or staff, and have been determined to comply with this policy. Copies of these additional graphics must be available from the author on request by individual attendees. It is the responsibility of the session convenor to verify that all graphics to be shown have been cleared by Program Committee chairperson, session convenor, staff, or other reviewers designated by the Program Committee chairperson.

4. INTERPRETATION AND ENFORCEMENT

4.1 Distribution

This policy will be sent to all authors of submissions and presentations in the Association forums.

4.2 Assessment Process

Reviewers of submissions and presentations will accept only those that comply with this policy. Drafts of submissions and presentations will be reviewed for commercialism concurrently by both staff and technical reviewers selected by the Program Committee chairperson. All reviewer comments shall be sent to and coordinated by either the Program Committee chairperson or the designated staff. If any submissions are found to violate this policy, authors will be informed and invited to resubmit their materials in revised form before the designated deadline.

4.3 Author Awareness

In addition to receiving a printed copy of this policy, all authors presenting in a forum will be reminded of this policy by the Program Committee chairperson, their session convenor, or the staff, whichever is appropriate.

4.4 Monitoring

Session convenors are responsible for ensuring that presentations comply with this policy. If it is determined by the session convenor that a violation or violations have occurred or are occurring, he or she will publicly request that the author immediately discontinue any and all presentations (oral, visual, audio, etc.) and will notify the Program Committee chairperson and staff of the action taken.

4.5 Enforcement

While technical reviewers, session convenors, and/or staff may all check submissions and presentations for commercialism, ultimately it is the responsibility of the Program Committee chairperson to enforce this policy through the session convenors and staff.

4.6 Penalties

If the author of a submission or presentation violates this policy, the Program Committee chairperson will notify the author and the author’s agency or company of the violation in writing. If an additional violation or violations occur after a written warning has been issued to an author and his agency or company, the Association reserves the right to ban the author and the author’s agency or company from making presentations in the Association forums for a period of up to two (2) years following the violation or violations.
# NEW MEMBERS

## BELGIUM

**Liesbeth Jacxsens**  
Ghent University  
Ghent

## BRUNEI DARUSSALAM

**Tuti Safwati Omar**  
National Standard Centre, Ministry of Industry & Primary Resources  
Tutong

## CANADA

**Nicolas Bachand**  
University of Montreal  
Sherbrooke, Quebec

**Timothy C. Ellis**  
Agriculture and Agri-Food Canada  
Kentville, Nova Scotia

**Marlee Loiseue**  
V.I.H.A.  
Victoria, British Columbia

**Grant L. Penn**  
Glanbia Nutritional (Canada) Inc.  
Angusville, Manitoba

**John Pickles**  
Vancouver Coastal Health  
North Vancouver, British Columbia

**Ting Zhou**  
Agriculture and Agri-Food Canada  
Guelph, Ontario

## CHILE

**Sebastian Gutierrez**  
QTech Ltda.  
Santiago

**Rolf G. Kümmerlin**  
Kümmerlin S.A.  
Concepción

## FRANCE

**Nelly Dumont**  
bioMérieux  
Marcy L’Etoile

## GERMANY

**Geraldine Ramage**  
Chemin De L’Orme  
Marcy L’Etoile

**Ulrich Busch**  
Bavarian Health and Food Safety Authority  
Oberschleisheim

**Jochen Weiss**  
University of Hohenheim  
Garbenstrasse, Stuttgart

## INDIA

**S. Hemawati**  
New Delhi

**Sudarsan Muralidharan**  
Alltech Biotechnology Pvt. Ltd.  
Kodihalli

## IRAN

**Ramin Khaksar**  
Shaheed Beheshti University  
Tehran

## ISRAEL

**Gideon Zipori**  
Institut of Food safety & Quality  
Rosh-HaAyin

## THE NETHERLANDS

**Eelco Heintz**  
Parac Biochem  
Gorinchem

**Peter D. Tips, Sr.**  
Mead Johnson Nutrition  
Jericho

## SERBIA

**Draga Crnobrnja**  
City Center for Public Health  
Belgrade

## SOUTH KOREA

**Hye-Kyung Moon**  
Changwon National University  
Changwon, Kyungnam

## SPAIN

**M. Carmen Vidal-carou**  
University of Barcelona  
Barcelona

## UNITED ARAB EMIRATES

**Muhammad Khalid Saeed**  
Dubai Municipality  
Dubai

**Manju Stephen**  
National Corporation for Tourism & Hotels  
Abu Dhabi

## UNITED KINGDOM

**Jonathan Cloke**  
Oxoid — Thermo Fisher Scientific  
Basingstoke, Hampshire

## UNITED STATES

**Arizona**

**Anna Pfender**  
Arizona Dept. of Agriculture  
Phoenix

**California**

**Bethina Hernandez**  
Heinz San Diego  
San Diego

**Georgia**

**Walid Alali**  
University of Georgia  
Griffin

---

808 FOOD PROTECTION TRENDS | NOVEMBER 2009
NEW MEMBERS

ILLINOIS
Dorothy C.S. David
Peoria City County Health Dept.
Peoria

INDIANA
Richa Vaid
Purdue University
West Lafayette

MARYLAND
Cheryl Burgess
Food & Drug Administration
College Park

MaryAnn Principato
Food & Drug Administration
Laurel

Linda Verrill
US Food and Drug Administration
College Park

MICHIGAN
Joan Bowman
International Food Protection Training Institute
Battle Creek

Alissa M. Wesche
Old Orchard Brands
Rockford

MINNESOTA
Lance Heaton
Provesta
Hutchinson

Mark Wagenius
ConAgra Foods
Minneapolis

MISSOURI
Linda J. Steffens
St. Anthony’s Medical Center
St. Louis

NEW JERSEY
John J. Reynolds, II
Food Sciences Corp.
Mount Laurel

NORTH CAROLINA
Margaret A. Duckson
Virginia Tech
Staley

Jackie R. Glover
US Dept. of Agriculture
Gastonia

NORTH DAKOTA
Michael W. Mahero
North Dakota State University
Fargo

OHIO
Keith Eames
New Philadelphia City Health Dept.
New Philadelphia

TENNESSEE
Steve Calhoun
American Peanut Council
Cleveland

Fur-Chi Chen
Tennessee State University
Nashville

TEXAS
Davonna Koebrick
Texas DSHS
Victoria

Adam W. Tittor
Tittor Consulting
Stephenville

Chitra N. Wendakoon
New Mexico State University
Austin

UTAH
Michelle Cooke
Weber – Morgan Health Dept.
Ogden

WASHINGTON
Raghupathy Ramaswamy
Avure Technologies Inc.
Kent

James M. Wilson
Veratect Corporation
Kirkland
FMI Statement on FDA Launch of Reportable Food Portal and Registry

The Food Marketing Institute (FMI) issued the following statement from Leslie Sarasin, president and chief executive officer, regarding this week's launch by the Food and Drug Administration (FDA) of a Reportable Food Electronic Portal and Registry.

"We commend FDA for launching version 1.0 of the Reportable Food Electronic Portal and Registry to fulfill the congressional directive to track patterns of adulteration in food. We look forward to working with FDA through the implementation process and on additional food safety measures."

"The agency's electronic database should work well with the industry's Rapid Recall Exchange. This online initiative, set to be launched later this month, is designed to expedite supplier notification of food recalls to food retailers and wholesalers with more complete and accurate information."

US EPA Registers PURE Bioscience's SDC-based Food Contact Surface Sanitizer

PURE Bioscience, creator of the patented silver dihydrogen citrate (SDC) antimicrobial, has announced that it has obtained US Environmental Protection Agency (EPA) registration for its SDC-based sanitizer for food contact surfaces. The new sanitizer was registered by PURE's wholly owned subsidiary, ETI-H2O, under the trade name Axen®50 for sanitization of food contact surfaces and equipment in dozens of environments including farms, food processing plants, schools, hospitals and other institutions, restaurants and homes.

Michael L. Krall, President and CEO of PURE Bioscience commented, "This long-awaited registration opens new, major markets for PURE Bioscience. Foodborne illnesses create significant health and economic problems in the US and internationally, and PURE welcomes the opportunity to offer a technology to help stem the spread of these dangerous pathogens that cause millions of illnesses."

Mr. Krall continued, "The EPA's registration of Axen50 as a food contact sanitizer cleared a big hurdle for PURE. Now that we've established a food contact tolerance of 50 parts per million of silver, this registration provides two roads to market for SDC-based food contact surface sanitizers via the EPA. We plan to add the extensive broad-spectrum antimicrobial claims from our existing disinfectant registration to the registration of the new food contact sanitizer, and, also through the EPA, we expect to amend our disinfectant product registration claims to add the new food contact sanitization claims. The EPA regulatory work will include state registrations by distributors and is expected to take at least six months."

"In addition, this registration accelerates our ongoing pursuit, through USDA, of additional direct food contact applications of SDC-based formulations as antimicrobial processing aids."

The CDC estimates that foodborne pathogens cause 76 million illnesses per year in the US resulting in 325,000 hospitalizations and 5,200 deaths. And although Americans have come to expect such risks associated with meat products like raw hamburger, the proportion of outbreaks caused by seemingly innocuous fruits and vegetables is increasing. E. coli alone causes approximately 70,000 infections each year, and 5–10% of those infected develop a potentially fatal kidney complication called hemolytic uremic syndrome.

Foodborne illness creates not only health but also confidence...
issues for consumers. Food recalls can cause a significantly negative economic impact on businesses. For example, salmonellosis is estimated by the CDC to cost more than $1 billion in medical costs and lost wages annually.

Mr. Krall concluded, "This summer’s recall of more than 5 million pounds of beef because of suspected E. coli contamination is just one example of a string of recalls in the US this year including the well-publicized cookie dough recall and the wide-reaching recalls of peanut and dried milk products. SDC-based food contact surface sanitizers will offer the same benefits of efficacy as our disinfectants along with the same remarkable Category IV toxicity for which no warning statements are required. In addition, SDC-based food contact sanitizers are odorless, colorless, non-corrosive, non-flammable and are compatible with other disinfecting and cleaning chemicals.

Covance Receives ISO Accreditation for North America Nutritional Chemistry and Food Safety Laboratory

Covance Inc. has announced that it has received International Organization for Standardization (ISO) 17025 accreditation for its Nutritional Chemistry and Food Safety laboratory in Madison, Wisconsin. Granted by the American Association for Laboratory Accreditation (A2LA), ISO accreditation confirms compliance with the AOAC Guidelines for Laboratories Performing Microbiological and Chemical Analyses of Food and Pharmaceuticals.

"ISO accreditation confirms Covance's commitment to providing our global clients and the food industry with the highest level of quality data," said Marlo Vasquez, vice president and general manager, Nutritional Chemistry and Food Safety, Covance.

ISO standards provide practical tools for generating confidence, reducing uncertainty, and managing risk. ISO 17025 specifies the general competence requirements for testing laboratories to carry out tests and sampling. Competence requirements include testing performed using standard and/or non-standard methods and laboratory-developed methods.

Food manufacturers around the world request ISO 17025 accreditation of laboratory service providers to ensure quality practices. Laboratory customers, regulatory authorities, and accreditation bodies use ISO 17025 to confirm laboratory competence.

ISO 17025 accreditation follows a variety of other awards recognizing the accuracy and proficiency of Covance’s Nutritional Chemistry and Food Safety laboratory, including two 2008 American Association of Cereal Chemists (AACC) Accuracy Awards and several proficiency certificates from both the AACC and the US Department of Agriculture (USDA). Covance’s Singapore laboratory received ISO 17025 accreditation in 2008.

With more than 70 years of experience in nutritional testing, Covance plays a leading role in the design of testing programs required to meet regulatory nutrition facts labeling requirements, regulatory mandates and scientific standards. Covance offers expertise in the complete spectrum of recognized nutrients and an unparalleled range of sample matrices.

Dr. Jimmy Keeton Named Head of the Nutrition and Food Sciences Department at Texas A&M University

Dr. Jimmy Keeton has been named head of the nutrition and food sciences dept. at Texas A&M University College of Agriculture and Life Sciences, according to Dr. Mark Hussey, vice chancellor and dean of agriculture.

Dr. Keeton came to Texas A&M in 1984 as an associate professor in the department of animal science. Since then, he has been promoted to full professor and was interim head of the nutrition and food science department since 2007.

He has studied the safety, nutritional value and quality attributes of meat products. He has also
authored or co-authored more than 70 refereed journal articles and 10 textbook chapters, secured six patents and received more than $4 million in grant/contract funding as principle investigator.

Dr. Keeton earned a bachelor's degree in animal husbandry and agricultural education, and a master's and a doctoral degree in food science, all from the University of Tennessee-Knoxville.

The NPD Group Names Mark East to Head North America Food and Beverage Unit

The NPD Group, Inc., a market research company, announces the appointment of Mark East as president of its North America food and beverage business unit, which provides market information and insights used by food, beverage, pharmaceutical, ingredient manufacturers, and retailers, as well as agencies in the public sector. He replaces Arnie Schwartz, who was recently appointed president of NPD’s US foodservice unit.

Mr. East was formerly vice president of client development for the North America food and beverage unit. In this role, he and his client development team worked closely with a portfolio of clients in the United States and Canada to provide insights on a wide range of critical trends in consumer eating behavior, attitudes, and usage motivators – from diet and nutrition to food safety and brand awareness.

Prior to joining NPD, Mr. East spent four years as US marketing director for Storck, one of the world’s premier confectionery companies. Previous to that, he worked for more than 15 years with Information Resources, Inc., a market research firm, where he started his career in data processing operations before moving into a succession of client service, product management, and marketing roles.

“Mark’s experience on both the client and supplier sides and deep understanding of the consumer goods arena will serve his food and beverage clients well,” says Randall Smith, group president, US Food and Automotive, Canada and Latin America at NPD. “NPD is the only marketing information company that measures everything that consumers actually eat and drink, and armed with this information and insight, Mark and his team are uniquely positioned to help clients understand the entire food and beverage market.”

“The food and beverage industry in the US and Canada is a dynamic, ever-changing market and I look forward to continuing to help NPD clients stay in touch and understand consumers’ behaviors and attitudes,” says Mr. East. “Our job, as I see it, is to help them make informed decisions to drive greater long-term and short-term marketplace success.”
Synbiosis, a manufacturer of automated microbiological systems, has announced that international food ingredients company, Danisco is using an AutoZone, automated zone measurement system to reproducibly predict the efficacy of Nisaplin®, a natural bacteriocide which inhibits growth of pathogenic and food spoilage Gram-positive bacteria in food.

Microbiologists at Danisco’s Food Protection Division in Denmark liquidize different food samples containing Nisaplin®. They plate them out on 35 cm glass plates of Iso-Sensitest Agar seeded with Micrococcus luteus. The Nisaplin® in the food produces 64 zones of inhibition on each plate, which scientists at Danisco can rapidly measure and analyze using the AutoZone system. From the zone size data, they can assess if the correct Nisaplin® levels are present in each food batch.

Malene Svejstrup, application scientist at Danisco explained: “It is important to have the correct dosage of Nisaplin® in the foods we test. If it is too low, it could result in a reduced shelf life of the food. We have been manually measuring inhibition zones with callipers to test Nisaplin® levels for 25 years at Danisco. This method can introduce many variations and results can differ from person to person, which is why we are validating an automated zone sizer to determine if it is a good alternative.”

Mrs. Svejstrup continued, “To date, the system has generated promising results and we can measure the zones in half the time it used to take when we were performing manual measurements.”

Martin Smith of Synbiosis stated, “Ensuring the quality of food is very important and we are excited that one of the food ingredients companies has chosen to use an AutoZone to standardize a critical food test. Danisco’s validation studies with the AutoZone show that microbiologists can save time, while achieving accurate and reproducible results, making the AutoZone an essential tool for testing the activity of bacteriocides in any food manufacturing facility.”

Danisco Uses AutoZone Automated Zone Sizing System to Ensure Foods are Consistently Protected against Pathogenic Bacteria

BAX® System MP Enrichment Media Approved by AOAC for Both E. coli O157:H7 and Salmonella Testing

The AOAC Research Institute has approved the use of BAX® System E. coli O157:H7 MP enrichment media for Salmonella testing. Validated on ground beef, beef trim, spinach and lettuce, the BAX® System performed as well as or better than traditional culture methods for detecting Salmonella, but with quicker time to result.

The MP enrichment media was originally designed for use with the BAX® System assay for detecting E. coli O157:H7 in ground beef and beef trim. Recently, AOAC RI extended certification of that assay to also include lettuce and spinach. This means that the identical MP enrichment protocol has been approved by AOAC RI for both Salmonella and E. coli O157:H7 testing of those foods.

“Customers can now use the same 8-hour enrichment to test certain types of meat and fresh produce for two different pathogens,” said Linda Peng, research microbiologist – DuPont Qualicon. “This will not only save hands-on time, but the single medium will also reduce inventory and storage costs for food companies.”

Food processing companies around the world rely on the BAX® system to detect pathogens or other organisms in raw ingredients, finished products and environmental samples. The automated system uses leading-edge technology,
including polymerase chain reaction (PCR) assays, tableted reagents and optimized media to detect Salmonella, Listeria species, Listeria monocytogenes, E. coli O157:H7, Enterobacter sakazakii, Campylobacter, Staphylococcus aureus, Vibrio, and yeast and mold. With certifications and regulatory approvals in the Americas, Asia and Europe, the BAX® system is recognized globally as one of the most advanced pathogen testing systems available to food companies.

DuPont Qualicon
800.863.6842
Wilmington, DE
www.2.dupont.com

New Smooth, Accurate and Precise Syringe Pump from Harvard Apparatus

Harvard Apparatus has introduced the new PHD ULTRA™ Syringe Pump. The PHD ULTRA sets a new performance standard in syringe pumps for smooth, accurate and precise flow.

Harvard Apparatus introduced the first commercial syringe pump in 1956 and is the global leader in high-performance syringe pumps. The PHD ULTRA™ is designed to meet today’s most demanding standards in fluidics applications.

The new Advanced patent-pending flow control mechanics and electronics provide the smoothest, most accurate, and precise flow across the largest flow range.

The new EZ Pro™ Software functions like a PC and contains an advanced methods architecture for preprogrammed quick-start or advanced methods templates.

A new easy-to-use GUI on an advanced color display allows alpha/ numeric reporting capability and advanced connectivity at the touch of the screen.

This unit also provides maximum versatility of configuration and application. It can handle flow rates from picoliter to 220 ml/min with the highest accuracy, precision and smoothness of flow.

The PHD ULTRA™ can control remote units 30 ft away, accommodates 2 to 10 syringes for multi-channel or larger reservoir capacities, and contains advanced, preprogrammed operational modes. With the push of a button, alternate between auto-fill continuous-flow, pulsatile, bolus, concentration mode, daisy chain, gradients and flow programming modes.

The functional balance of these features makes the PHD ULTRA™ the ultimate problem solver for your lab or work place in MS, drug infusion, nanofluidics, electro-spinning, aerosol generation, reaction chamber dosing and more.

Solve your most demanding fluidics applications with PHD ULTRA™ fluidics from Harvard Apparatus.

Harvard Apparatus
800.272.2775
Holliston, MA
www.harvardapparatus.com

Strategic Diagnostics Awarded Patent for Use of Bacteriophages in Microbiological Assays and Processes

Strategic Diagnostics Inc. (SDI), a provider of biotechnology-based products and services for a broad range of food safety, life science and industrial applications, has announced it has been awarded US Patent No. 7,521,201 B2 for using bacteriophages in microbiological assay tests and processes. The invention is a rapid bacterial detection method that reduces or eliminates the growth of undesirable bacteria, resulting in improved test performance.

The invention addresses the problem of how to detect a harmful pathogen among billions of other bacteria present in a test sample. Reducing the growth of competing bacteria in the sample reduces false negative results, while preventing the growth of cross-reactive bacteria in the sample reduces false positive results. Together, these benefits reduce the time required to obtain test results while improving the accuracy of test methods.

In one application, SDI uses this technology in the enrichment media of its RapidChek® SELECT™ Salmonella and E. coli food pathogen assay test kit to inhibit the growth of cross-reactive and competitive bacteria, providing an optimal environment for Salmonella and E. coli to grow and, therefore, be more easily detected. Enrichment media is a significant component of the $1B global food pathogen testing market. Depending on the detection method used, media can represent more than fifty percent of the cost per test. There are more than 138 million tests conducted globally each
year to test for the presence of pathogens like Salmonella or E. coli in food products. Improving productivity and accuracy of tests is a major goal of the food testing industry.

"The award of this patent and the current application of the technology in our products and services reinforce and confirm the value of the R&D investments we are making," said Fran DiNuzzo, president and CEO of SDI. "Our customers are already seeing this technology reduce the time required to obtain test results while improving accuracy."

Strategic Diagnostics Inc.
800.544.8881
Newark, DE
www.sdix.com

Torrey Pines Scientific, Inc.
announces its new 5-position Model HS15 stirring hot plate with individual stirring control for each vessel.

The large 12" (30.48 cm) square ceramic heater top has a temperature range to 450°C. The unit can heat and stir 5–800 ml beakers. Stirring range is from 100 to 1500 rpm.

The unit measures 19" (43.2 cm) deep by 12.5" (31.75 cm) wide by 5.25" (13.4 cm) tall. It can support more than 50 pounds (22.6 kg) on the plate surface, and the chassis is designed to keep spills out of the interior of the unit.

All controls are mounted well in front of the heater surface to protect against accidental burns.

The HS15 is available in 100VAC/50Hz, 115VAC/60Hz, 220VAC/60Hz and 230VAC/50Hz. It is fused for safety and is supplied with user's manual and detachable line cord for the country of use. It is UL, CSA and CE or equivalent rated.

Torrey Pines Scientific, Inc.
866.573.9104
San Marcos, CA
www.torreypinesscientific.com

KD Scientific New Syringe Pumps Ideal for Lab or IV Applications

KD’s EZFlow 2020 is a durable syringe pump useful in high-rate infusions. It is designed to enhance quick efficient operation while maintaining simplicity.

The EZFlow 2020 system has an automated calculation of delivery based on 4, 8, 12, 16 and 20 minutes, with an infusion accuracy of + 20 seconds.

A wide range of plastic syringes can be used with the unit including 20/30 ml, 50/60 ml and 100 ml. The ergonomic, easy-to-use, horizontal design protects the syringe barrel and allows single-handed loading.

Durable ergonomic waterproof touch control panel provides for efficient and reliable operations.

Flow rates range from 60 ml/h to 1,500 ml/h depending on the syringe size and pump settings.

There are 4 visual and audible alarms, occlusion detection, low battery, near end of dispense and complete.

There are two models available for different power requirements, 115VAC (EZFlow 2020) or 220VAC (EZFlow 2021). Both units have a rechargeable battery, which provides continuous operation of 15 syringes (50 ml) set at 12 minutes.

KD Scientific designs, manufactures and sells a range of quality fluidics equipment used by research laboratory markets worldwide.

KD Scientific syringe pumps are an economical solution to delivering precise and smooth flow in research, pilot plants and production applications. They are recognized worldwide for quality, accuracy and reliability. A broad line of syringe pumps are offered: from a simple one-syringe infuse only, to a programmable multi-syringe infuse/withdrawal pump.

KD Scientific
508.429.6809
Holliston, MA
www.kdscientific.com

Warner Electric Corrosion-Resistant Stainless Steel Permanent Magnet Clutches and Brakes Provide Smooth Torque

Ideal for harsh, washdown environments, these Warner Electric permanent magnet clutches and brakes feature all stainless-steel construction and require no electricity to operate.

Since torque is independent of slip speed, smooth torque is achieved as low as 1 RPM up to 1800 RPM. Perfectly smooth slip torque provides constant torque for tension or torque-limiting applications. Units provide dependable performance, with no friction surfaces to break down or wear out. They also feature 400 Series stainless steel bearings designed for extremely long life.

Warner Electric
800.825.9050
South Beloit, IL
www.warnerelectric.com
COMING EVENTS

DECEMBER
• 4, Turkish Food Safety Association, First Food Safety Congress, Harbiye Military Museum and Cultural Center, Istanbul, Turkey. For more information, go to www.gida.gi.org.
• 7–10, Pasteurization Workshop, Murfreesboro, TN. For more information, call 205.595.6455; E-mail: krisley.clark@raiconsult.com.
• 8–9, BRC Global Food Safety Standard Training Course, San Antonio, TX. For more information, contact Wendy Harmon at 888.525.9788 ext. 262 or go to www.food-safetynet.com.
• 10–11, Food Service Managers HACCP Training Course, Rutgers University, Rutgers, NJ. For more information, go to www.cpe.rutgers.edu.
• 14–15, Advanced HACCP Training Course, Ecolab Inc., Eagan, MN. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.
• 16–17, Implementing SQF 2000 Systems Training Course, Eagan, MN. For more information, contact Tatiana Lorca at tatiana.lorca@ecolab.com.

JANUARY 2010
• 27–29, International Poultry Expo, Atlanta, GA. For more information, call 770.493.9401 or go to www.ipe10.org.

FEBRUARY
• 22–24, Dubai International Food Safety Conference, Dubai Convention and Exhibition Centre, Dubai. For more information, go to www.foodsafetydubai.com.

MARCH
• 4–5, Implementing SQF 2000 Systems, Eagan, MN. For more information, E-mail: foodsafety@ecolab.com.
• 8–9, ASQ Lean Six Sigma Conference, Phoenix, AZ. For more information, go to www.asqa.org.
• 14–17, FMI Asset Protection Conference, Ritz-Carlton Hotel, Dallas, TX. For more information, call Aileen Dullaghan Munster at 202.220.0704 or go to www.fmi.org.

APRIL
• 9–14, Conference for Food Protection 2010 Biennial Meeting, Providence, RI. For more information, call 916.645.2343 or go to www.foodprotect.org.
• 18–21, TAPPI 2010 PLACE Conference, Albuquerque, New Mexico. For more information, call 800.332.8686 or go to www.tappi.org.
• 25–27, ADPI/ABI Annual Conference, Hyatt Regency, Chicago, IL. For more information, go to www.adpi.org.

MAY
• 5, Carolinas Association for Food Protection Annual Meeting, North Carolina Research Campus, Kannapolis, NC. For more information, contact Steve Tracer at smtracey@foodlion.com.
• 5, Florida Association for Food Protection Annual Educational Conference, International Plaza Resort and Spa, Orlando, FL. For more information, contact Zeb Blanton at 407.618.4893 or go to www.fafp.net.
• 6–7, Associated Illinois Milk, Food and Environmental Sanitarians Spring Conference, Eastland Suites, Bloomington, IL. For more information, contact Steve DiVincenzo at Steve.DiVincenzo@illinois.gov.
• 6–7, Metropolitan Association for Food Protection Spring Seminar, Rutgers University, Cook College Campus Center, New Brunswick, NJ. For more information, contact Carol Schwar at 908.475.7960; E-mail: cschwar@co.warren.nj.us.
• 7–8, High-Throughput Methods for Detecting Foodborne Pathogens Workshop, York College, Jamaica, NY. For more information, go to http://york.cuny.edu/conted/fdaworkshops/2008-fda-workshop/preliminary-program.
• 17–21, 3-A SSI 2010 Education Program and Annual Meeting, Wyndham Milwaukee Airport Hotel & Convention Center, Milwaukee, WI. For more information, contact Tim Rugh at trugh@3-a.org or go to www.3-a.org.

IAFP UPCOMING MEETINGS

AUGUST 1–4, 2010
Anaheim, California

JULY 31–AUGUST 1, 2011
Milwaukee, Wisconsin

JULY 22–25, 2012
Providence, Rhode Island
Q: What's the safe minimum cooking temperature for a turkey?

A: HolidayFoodSafety.org

Important tips on how to have a safe and tasty Holiday feast, recipes, and fun activities for kids at HolidayFoodSafety.org

©2009 Partnership for Food Safety Education. All Rights Reserved.
International Food Safety Icons

Available from International Association for Food Protection

Handwashing

Copyright © International Association for Food Protection

Potentially Hazardous Food

Copyright © International Association for Food Protection

Cooking

Copyright © International Association for Food Protection

Do Not Handle if Ill

Copyright © International Association for Food Protection

Cross Contamination

Copyright © International Association for Food Protection

Wash, Rinse, and Sanitize

Copyright © International Association for Food Protection

No Bare Hand Contact

Copyright © International Association for Food Protection

Cooling

Copyright © International Association for Food Protection

Refrigeration/Cold Holding

Copyright © International Association for Food Protection

Hot Holding

Copyright © International Association for Food Protection

Temperature Danger Zone

Copyright © International Association for Food Protection

For additional information, go to our Web site: www.foodprotection.org
or contact the IAFP office at +1 800.369.6337; +1 515.276.3344;
E-mail: info@foodprotection.org

NOVEMBER 2009 | FOOD PROTECTION TRENDS 819
IAFP has agreed with the Dairy Practices Council® to distribute their guidelines. DPC is a non-profit organization of education, industry, and regulatory personnel concerned with milk quality and sanitation. Its membership roster lists individuals and organizations throughout the world. Professionals working through six permanent DPC task forces write DPC guidelines. Prior to distribution, every guideline is peer reviewed and submitted for approval to state regulatory agencies, where exceptions to each state's regulations are noted in the final document. These guidelines represent the state of the knowledge at the time they are written. The guidelines are renowned for their common sense and useful approach to proper and improved sanitation practices. We think they will be a valuable addition to your professional reference library.

Guidelines are available on CD and in printed form.
Complete sets in printed form are bound in 3-ring binders.
Please check which guidelines you are ordering.

- Complete set (over 80 guidelines): CD ($270) □ Printed ($330) □
- Farm Set (58 guidelines): CD ($180) □ Printed ($250) □
- Plant Set (44 guidelines): CD ($135) □ Printed ($160) □
- Small Ruminants (19 guidelines): CD ($61.20) □ Printed ($68) □

Please add $20.00 for each printed set and $4.00 for each CD for shipping and handling. Outside US shipping depends on existing rates. Make checks payable in US dollars on a US bank or pay by credit card.

Name ___________________________ Phone No. ___________________________

Company ___________________________

Street Address ___________________________

City, State ___________________________
Province, Code ___________________________
VISA/MC/AMEX No. ___________________________
Exp. Date ___________________________
Signature ___________________________
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.
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>
</tbody>
</table>

SHIPPING AND HANDLING — $3.00 (US) $5.00 (Outside US)
Each additional booklet $1.50

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>*JFP Memory Stick — September 1952 through December 2000</td>
<td>$295.00</td>
<td>$335.00</td>
<td></td>
</tr>
<tr>
<td></td>
<td>*International Food Safety Icons and International Food Allergen 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</td>
<td>1.50</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

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

☐ Check Enclosed □ 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
WEB SITE www.foodprotection.org
Des Moines, IA 50322-2864, USA

NoVember 2009 | Food Protection Trends 823
MEMBERSHIP APPLICATION

Prefix ( ᴅ  Prof. ᴅ  Dr. ᴅ  Mr. ᴅ  Ms.)
First Name ______________________ M.I. __________________ Last Name ______________________
Company ______________________ Job Title ______________________
Mailing Address ______________________
Please specify: ᴅ  Home ᴅ  Work ______________________
City ______________________ State or Province ______________________
Postal Code/Zip + 4 ______________________ Country ______________________
Telephone # ______________________ Fax # ______________________
E-Mail ______________________

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

MEMBERSHIPS

<table>
<thead>
<tr>
<th></th>
<th>US</th>
<th>Canada/Mexico</th>
<th>International</th>
</tr>
</thead>
<tbody>
<tr>
<td>IAFP Membership</td>
<td>$50.00</td>
<td>$50.00</td>
<td>$50.00</td>
</tr>
</tbody>
</table>

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

Optional Benefits:

- Food Protection Trends: Add $60.00
- Journal of Food Protection: Add $150.00
- Journal of Food Protection Online: Add $36.00
- All Optional Benefits - BEST VALUE! Add $200.00

- Student Membership: $25.00

(Full-time student verification required)

Optional Benefits:

- Student Membership with FPT: Add $30.00
- Student Membership with JFP: Add $75.00
- Student Membership with JFP Online: Add $18.00
- All Optional Benefits - BEST VALUE! Add $100.00

SUSTAINING MEMBERSHIPS

Recognition for your organization and many other benefits.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>GOLD</td>
<td>$5,000.00</td>
<td></td>
</tr>
<tr>
<td>SILVER</td>
<td>$2,500.00</td>
<td></td>
</tr>
<tr>
<td>SUSTAINING</td>
<td>$750.00</td>
<td></td>
</tr>
</tbody>
</table>

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

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

- Check Enclosed  ᴅ  Visa ᴅ  Mastercard ᴅ  American Express ᴅ  Discover

TOTAL MEMBERSHIP PAYMENT $ __________

CREDIT CARD # ______________________  EXP. DATE ______________________

SIGNATURE ______________________

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

All prices include shipping and handling
Prices effective through August 31, 2010

INTERNATIONAL ASSOCIATION FOR FOOD PROTECTION

4 EASY WAYS TO JOIN

PHONE +1 800.369.6337; +1 515.276.8655
FAX +1 515.276.3344
MAIL 6200 Aurora Ave., Suite 200W Des Moines, IA 50322-2864, USA
WEB SITE www.foodprotection.org

824 FOOD PROTECTION TRENDS  NOVEMBER 2009
Advancing Food Safety Worldwide®

Advance your professional potential by joining us for three energizing days of presentations, discussions, and networking with the leading minds in food safety research and technology.

Explore, Learn, Participate!

Program information is available at: www.foodprotection.org
She doesn’t know how technology can make her food safer. But you do.

At DuPont Qualicon, we believe that science—particularly biotechnology—offers the potential to help ensure the safety and quality of our global food supply. Our innovative science can help you perform fast, accurate food quality testing to address a broad range of challenges—so you can get products to market faster and help ensure the safety of the foods people enjoy every day.

1-800-863-6842 Qualicon.com
Technology rules. Results matter.

DuPont Qualicon