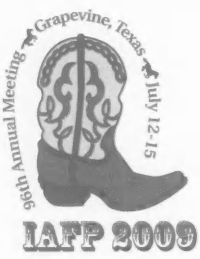
Food Protection Trends



Contribute to the Twelfth Foundation Silent Auction Today!

Proceeds from the Silent Auction Benefit the Foundation

Support the Foundation by donating an item today. A sample of items donated last year included:

- 3M Gift Box
- "Taste of Chicago" Gift Certificates
- Experience Atlanta Gift Basket
- Rosemary's Garden Bath & Body Products
- 2009 Annual Meeting Registration
- Jimmy Buffet Autographed Album
- Cultured Freshwater Pearl Necklace w/Sapphire and Silver Clasp
- *JFP* On-A-Stick (Back Issues)
- *Y'all Come Eat*–Signed by Paula Deen
- Author Signed Scientific Text Books
- 10 lb. Nestle Crunch Bar

To donate an item go to our Web site at www.foodprotection.org and complete the Silent Auction Donation Form or contact Donna Gronstal at dgronstal@foodprotection.org 515.276.3344; 800.369.6337.

IAFP FOUNDATION

ABOUT THE COVER...
Photo courtesy of Photo Researchers, Inc.
Use of the photo does not imply endorsement of any product by the International Association for Food Protection

International Association for Food Protection

FOOD PROTECTION TRENDS

VOLUME 29, NO. 3

ARTICLES

148 **Microbiological Safety of Farmstead Cheeses Made in the United States and Purchased via Online Shopping**
Lisa P. Ramsey and Julie A. Funk

155 **Antibacterial Activity of a Crude Chive Extract against *Salmonella* in Culture Medium, Beef Broth and Chicken Broth**
Salam Ibrahim, Tom Tse, Hong Yang and Angela Fraser

ASSOCIATION NEWS

141 Sustaining Members
144 Perspectives from Your President
146 Commentary from the Executive Director
164 New Members

DEPARTMENTS

166 What's Happening in Food Safety
172 Industry Products
183 Coming Events
185 Advertising Index

EXTRAS

162 2009–2010 Secretary Election

IAFP 2009

176 Ivan Parkin and John H. Silliker Lectures
177 Proposed Symposia Topics and Roundtables
178 Event Information
180 Networking Opportunities
181 General Information
182 Registration Form

186 *Journal of Food Protection* Table of Contents
187 Booklet Order Form
188 Membership Application

Microbiology Media Solutions for Food Safety

BD

Helping all people live healthy lives

New! BBL™ Campy-Cefex Agar

BBL Campy-Cefex Agar* is a prepared plated medium for the isolation, enumeration and detection of *Campylobacter* species directly from poultry.

- Campy-Cefex Agar formulation was adopted by the National Advisory Committee on Microbiological Criteria for Foods for the isolation of *Campylobacter* species from chicken carcasses[1]
- The proven experience of BBL in prepared media manufacturing provides consistency in quality and performance

Microbiology – it's what we do.

Find out what we can do for you. Visit us on the web at www.bd.com/ds

* U.S. Patent No. 5,891,709 licensed to Becton Dickinson & Company

[1] NACMCF Executive Secretariat. 2007. Analytical utility of *Campylobacter* methodologies. U.S. Department of Agriculture, Food Safety and Inspection Service, Washington, D.C. Journal Food Protect. 70:241-251.

BD Diagnostics
800.638.8663
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

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

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

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

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

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

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

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

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

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

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

Subscription Rates: ***Food Protection Trends*** is available by subscription for $255.00 US, $270.00 Canada/Mexico, and $285.00 International. Single issues are available for $31.00 US and $40.00 all other countries. All rates include shipping and handling. No cancellations accepted. For more information contact Julie A. Cattanach, Membership Services, International Association for Food Protection.

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

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

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

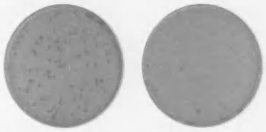
THEY BOTH LOOK CLEAN, FRESH AND DELICIOUS.

WHICH ONE CONTAINS DANGEROUS PATHOGENS?*

You can't afford to guess at how clean your vegetables are. The standards for fresh-cut fruits and vegetables are becoming more stringent due to the recent rise of industry outbreaks, and you need a proven product to consistently meet those standards. ***You need Tsunami® 100.***

*Tsunami 100 is the ONLY EPA-registered antimicrobial water additive product on the market that reduces pathogens in process water. It reduces 99.9% of *Escherichia coli* O157:H7; *Listeria monocytogenes* and *Salmonella enterica* in fruit and vegetable processing waters. It also provides control of spoilage and decay causing non-public health organisms present on the surface of post-harvest, fresh-cut, and processed fruits and vegetables.

***E. coli* O157:H7 in process water**



Typical results without Tsunami 100 treatment.

Typical results with Tsunami 100 treatment.

Be confident you've got the most effective process in place for proven food quality with Tsunami 100. Find out more about how Tsunami and Ecolab can help you by calling **1-800-392-3392.**

tsunami

Ecolab Inc.
370 Wabasha Street N.
St. Paul, Minnesota 55102-1390 U.S.A.
www.ecolab.com 1-800-392-3392

ECOLAB®

FUTURE ANNUAL MEETINGS

IAFP 2009

JULY 12–15

Gaylord Texan Resort
Grapevine, Texas

IAFP 2010

AUGUST 1–4

Anaheim Convention Center
Anaheim, California

International Association for Food Protection

FOOD PROTECTION TRENDS

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

Associations Make A Better World

FPT EDITORIAL BOARD

SUSTAINING MEMBERS

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

GOLD

3M Microbiology Products
St. Paul, MN
www.3m.com

Applied Biosystems
Foster City, CA
www.appliedbiosystems.com

BD Diagnostics
Sparks, MD
www.bd.com

bioMérieux, Inc.
Hazelwood, MO
www.biomerieux.com

Bio-Rad Laboratories
Hercules, CA
www.biorad.com

BPI Technology, Inc.
Dakota Dunes, SD
www.beefproducts.com

Cargill
Minneapolis, MN
www.cargill.com

The Coca-Cola Company
Atlanta, GA
www.thecoca-colacompany.com

ConAgra Foods, Inc.
Omaha, NE
www.conagrafoods.com

DuPont Qualicon
Wilmington, DE
www.dupont.com

Ecolab Inc.
St. Paul, MN
www.ecolab.com

JohnsonDiversey
Sharonville, OH
www.johnsondiversey.com

Kellogg Company
Battle Creek, MI
www.kellogg.com

Kraft Foods
Glenview, IL
www.kraftfoods.com

PepsiCo
Chicago, IL
www.pepsico.com

SGS North America
Fairfield, NJ
www.us.sgs.com

Silliker Inc.
Homewood, IL
www.silliker.com

(Continued on next page)

SUSTAINING MEMBERS

SILVER (Continued)

AIV Microbiology & Food Safety Consultants, LLC
Hawthorn Woods, IL
www.aivfoodsafety.com

Chemstar Corporation
Lithia Springs, GA
www.chemstarcorp.com

Dubai Municipality
Dubai, United Arab Emirates
www.dm.gov.ae

F & H Food Equipment Co.
Springfield, MO
www.fhfoodequipment.com

Food Safety Net Services, Ltd.
San Antonio, TX
www.food-safetynet.com

MATRIX MicroScience, Inc.
Golden, CO
www.matrixmsci.com

Orkin Commercial Services
Atlanta, GA
www.OrkinCommercial.com

Quality Flow Inc.
Northbrook, IL
www.qualityflow.com

Weber Scientific
Hamilton, NJ
www.weberscientific.com

SUSTAINING

1 Priority Biocidal, LLC, Fort Worth, TX; www.go1biomist.com

3-A Sanitary Standards, Inc., McLean, VA; www.3-a.org

Abbott Nutrition, Columbus, OH; www.abbottnutrition.com

ABC Research Corporation, Gainesville, FL; www.abcr.com

Advanced Instruments, Inc., Norwood, MA; www.aicompanies.com

AEMTEK, Inc., Fremont, CA; www.aemtek.com

ASI Food Safety Consultants, Inc., St. Louis, MO; www.asifood.com

Bentley Instruments, Inc., Chaska, MN; www.bentleyinstruments.com

BioControl Systems, Inc., Bellevue, WA; www.biocontrolsys.com

Biolog, Inc., Hayward, CA; www.biolog.com

Burger King Corp., Miami, FL; www.burgerking.com

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

Chemir Analytical Services, Maryland Heights, MO; www.chemir.com

Chestnut Labs, Springfield, MO; www.chestnutlabs.com

DARDEN Restaurants, Inc., Orlando, FL; www.darden.com

Decagon Devices, Inc., Pullman, WA; www.decagon.com

Deibel Laboratories, Inc., Lincolnwood, IL; www.deibellabs.com

DeLaval Cleaning Solutions, Kansas City, MO; www.delaval.com

Diversified Laboratory Testing, LLC, Mounds View, MN; www.dqci.com

DonLevy Laboratories, Crown Point, IN; www.donlevylab.com

DSM Food Specialties USA, Inc. Parsippany, NJ; www.dsm.com

Electrol Specialties Co., South Beloit, IL; www.esc4cip.com

Elena's, Auburn, Hills, MI; www.elenas.com

SUSTAINING MEMBERS

SUSTAINING

Fisher Scientific, Pittsburgh, PA; www.thermofisher.com

Food Directorate, Health Canada, Ottawa, Ontario, Canada; www.hc-sc.gc.ca

FoodHandler Inc., Mesa, AZ; www.foodhandler.com

Food Lion, LLC, Salisbury, NC; www.foodlion.com

GOJO Industries, Akron, OH; www.gojo.com

Grocery Manufacturers Association, Washington, D.C.; www.gmabrands.com

HiMedia Laboratories Pvt. Limited, Mumbai, Maharashtra, India; www.himedialabs.com

IBA Inc., Millbury, MA; 508.865.6911

Idaho Technology, Inc., Salt Lake City, UT; www.idahotech.com

Institute for Environmental Health, Lake Forest Park, WA; www.iehinc.com

International Dairy Foods Association, Washington, D.C.; www.idfa.org

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

Lester Schwab Katz & Dwyer, LLP; Short Hills, NJ; www.lskdnylaw.com

The Kroger Co., Cincinnati, OH; www.kroger.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

MicroBioLogics, Inc., St. Cloud, MN; www.microbiologics.com

Micro-Smedt, Herentals, Belgium; www.micro-smedt.be

Microbial-Vac Systems, Inc., Bluffdale, UT; www.m-vac.com

Mol Industries, Grand Rapids, MI; www.molindustries.com

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

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

The Procter & Gamble Co., Cincinnati, OH; www.proctergamble.com

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

rtech™ laboratories, St. Paul, MN; www.rtechlabs.com

Rochester Midland Corporation, Rochester, NY; www.rochestermidland.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.sodexousa.com

The Steritech Group, Inc., San Diego, CA; www.steritech.com

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

Texas Agricultural Experiment Station, College Station, TX; www.tamu.edu

United Fresh Produce Association, Washington, D.C.; www.unitedfresh.org

Wal-Mart Stores, Inc., 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

"PERSPECTIVES" FROM YOUR PRESIDENT

By STAN BAILEY
PRESIDENT

"In an ideal world we would never have any foodborne illnesses or outbreaks, but in the world we live in today, we will likely continue to see outbreaks"

As I write this column, state and federal public health authorities have identified peanut butter as the source for *Salmonella* in another widespread food poisoning outbreak. In the last two years, in North America, there have been numerous outbreaks including large ones involving leafy greens (several times), peanut butter (twice), peppers/tomatoes, frozen potpies, and deli meats. Consumer groups and individual consumers are asking the question, is our food supply less safe today than in the past?

It is my belief that our food supply is as safe or safer today than in previous years. The meat industry has made tremendous strides in controlling *Listeria* and *E. coli* O157:H7, and the poultry industry has reduced the prevalence of *Salmonella* by at least 50%. As a result of the large produce outbreaks in 2006 and 2007, the produce industry has implemented many changes that are reducing contamination of leafy greens and other produce. Are we where we want and need to be? Not yet, but progress is being made.

If the food industry is really reducing the level of contamination, why does it seem that there are so many large scale outbreaks? I believe that the development of PulseNet by Dr. Bala Swaminathan and his colleagues at the Centers for Disease Control (CDC) in 1998 and the introduction of this technology and network to the individual local and state departments' of health have, for the first time, given us the ability to identify outbreaks that in earlier years would have gone undetected.

The CDC Web site defines PulseNet as a national network of public health and food regulatory agency laboratories coordinated by the CDC. The network consists of: state health departments, local health departments and federal agencies (CDC, USDA/FSIS, FDA).

PulseNet participants perform standardized molecular subtyping (or "fingerprinting") of foodborne disease-causing bacteria by pulsed-field gel electrophoresis (PFGE). PFGE can be used to distinguish strains of organisms such as *Escherichia coli* O157:H7, *Salmonella*, *Shigella*, *Listeria*, or *Campylobacter* at the DNA level. DNA "fingerprints," or patterns, are submitted electronically to a dynamic database at the CDC. These databases are available on-demand to participants, thus, allowing for rapid comparison of the patterns.

The objectives of PulseNet are to detect foodborne disease clusters by PFGE, allow for real-time communication among state, local health departments, and international partners, facilitate early identification of common source outbreaks, and help food regulatory agencies identify areas where implementation of new measures are likely to increase the safety of our food supply. Specifically, PulseNet assists epidemiologists in investigating outbreaks by helping to separate outbreak-associated cases from other sporadic cases.

In addition to the numerous benefits, the CDC lists a number of limitations for the PFGE method including that the method is time consuming, requires a high degree of skill, does not work for everything, bands are bands not sequences, and some strains are untypable by PFGE and caution that "relatedness" should be used as a guide, not true phylogenic measure. One limitation of the PulseNet is the lack of epidemiological resources at the local, state and federal level.

Despite these limitations, most foodborne outbreaks in recent years have been initially identified through the PulseNet. Without PusleNet it is probable that many smaller outbreaks would never be identified. Does finding more outbreaks mean our food supply is less safe? I would argue the opposite. With a better ability to identify outbreaks, we have a better opportunity to prevent individual cases of foodborne disease.

Data from the CDC shows that in the time since PulseNet was introduced there are approximately 30 to 50% less cases of food poisoning caused by *E. coli* O157:H7, *Listeria*, and *Campylobacter* and 10 to 20% fewer cases from *Salmonella* than in the years

before PulseNet was established. Clearly, the respective food industries can take credit for much of this improvement, but the better epidemiology that PulseNet has allowed should also be acknowledged.

Although epidemiology is a valuable tool that has clearly contributed to the identification of foodborne outbreaks and improved safety, care must be taken to ensure that epidemiology surveys are carefully conducted and responsibly reported. The pressure CDC and other public health agencies are under to rapidly identify the source of outbreaks can lead to unintended consequences. Identification of potential foods that are the cause of outbreaks has immediate significant financial implications to the company or industry identified as the potential cause of the outbreak. The erroneous identification of tomatoes as the cause of the widespread *Salmonella* outbreak in the summer of 2008 cost the US tomato industry in excess of 200 million dollars. The CDC based their initial warning that tomatoes were the likely cause of the outbreak on the data that their epidemiological studies produced.

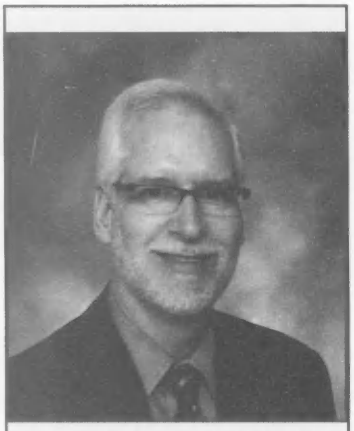
An evaluation of how this decision was made, when peppers were the true source, revealed that the right questions were not asked by the epidemiologist conducting the investigation. Because tomatoes had been associated with *Salmonella* in recent years, the questionnaires had questions about tomatoes, but not about peppers because *Salmonella* had not previously been associated with peppers. When salsa made with tomatoes and peppers were identified as the likely cause of the outbreak, then the assumption was that the *Salmonella* was coming from the tomatoes. An honest oversight and mistake on the part of CDC and state health departments, but one that was very costly to the tomato industry.

Over the last 10 years, PulseNet has contributed significantly to a reduction in the number of illnesses from foods. The success of PulseNet in the United States has led to an expansion of the network to many different countries. With the increased movement of foods from one country to another, the ability to identify outbreak-associated cases globally is becoming increasingly important.

In an ideal world we would never have any foodborne illnesses or outbreaks, but in the world we live in today, we will likely continue to see outbreaks. When we inevitably see the next outbreak, I would encourage you to consider the identification of that outbreak as a success rather than a failure of our public health and regulatory agencies.

As I close my Perspective for this month, I want to encourage each of you to make your reservations for this year's annual meeting in Grapevine, Texas, July 12–15. The Program Committee has organized another outstanding program. I welcome your comments or feedback. Please E-mail me at stan.bailey@na.biomerieux.com.

"COMMENTARY" FROM THE EXECUTIVE DIRECTOR



By DAVID W. THARP, CAE
EXECUTIVE DIRECTOR

"Food safety in a time of shrinking budgets"

Many times we are asked about the financial health of the Association. How has the economy affected Membership? Sponsorship? Exhibitor participation? Attendance at symposia and meetings? Well, this provides a couple of topics that can be discussed in this month's column.

First, let's just say that the financial health of the Association is really very good generally. There are a number of factors that can be investigated further, but to begin with, when we look at the budget for the current year and compare how we measure up we are tracking in really good shape. Our fiscal year begins September 1, and ends August 31 so we have four months of financial statements to review at the time I'm writing.

We all know what happened to investment portfolios has hurt everyone's (and every business') financial picture. IAFP is no different here. Our investments for the calendar year 2008 show an overall decrease in valuation of 34%, probably about the same as your average loss of value. So when looking at our financial statements and comparing to budget, if you remove the affects of the investment portfolio, the organization (IAFP) is actually performing ahead of what was budgeted!

If we look deeper, Membership is actually growing – that is really wonderful news! We are exceeding our revenue budget for Membership. Sponsorship for IAFP 2009 is just about to reach last year's total and we still have six months until the meeting. Our expectation is that we will obtain last year's position and even be able to exceed that record level of sponsorship funding. Exhibitor sign up for the next Annual Meeting is tracking very well when compared to last year. Exhibitors seem very excited about IAFP 2009 and the publicity effort is just now ready to begin.

Attendance for IAFP 2009 is surely an unknown factor at this point in time. Registration just opened in February and promotion will begin more in earnest in March. One comparison that can be used to show IAFP's success is that of our European Symposium held in Lisbon last November. We experienced a 50% increase in attendance over the prior year in Rome. Of course we don't expect that percentage increase for IAFP 2009, but it seems that food safety is still a major concern even in times of shrinking budgets.

Food safety in a time of shrinking budgets calls for particularly strong management. Not only in an association like IAFP, but in the many food product companies and our government inspection agencies. A shrinking economy leads to layoffs which can lead to reduced efforts by those left to carry the remaining workload. This can lead to implementing short cuts that can leave out major safety steps that should never be bypassed. All-in-all, you can see where this is going. Don't let the shrinking economy affect your company, your agency, or your responsibilities in a way that will reduce the safety of your product (or your service to the food industry). The public's health depends on your ability to make the right decisions when it comes to product safety. No short cuts allowed!

So, how do you think the shrinking economy has affected IAFP? Has it weakened us? Or, has it strengthened the organization? We feel that IAFP is as strong as or even stronger than it was prior to the world economic problems. We are very concerned for the people suffering from layoffs or reduced income and we know this has affected many IAFP Members and supporters. We are also concerned for the safety of the food supply during these turbulent times. With all the eco-

nomic pressures, it may be appealing to take the easy way and short-cut standard practices – but we must resist this temptation. For the good of the public's health, we must continue to perform the testing and analysis to ensure a safe product.

One last note on this issue. If you have found yourself without a job or position, this is a time when it is of the utmost importance to continue your IAFP Membership. Think of the colleagues and contacts you have made through IAFP; call on them to let them know of your situation, your expertise and the type of position you are searching for. Also, if your Membership is due for renewal and you are unemployed, call the IAFP office and we will arrange for an extension of your Membership. Now is not the time to be without your IAFP Membership!

ARTICLES

Food Protection Trends, Vol. 29, No. 3, Pages 148–154

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

International Association for Food Protection

Microbiological Safety of Farmstead Cheeses Made in the United States and Purchased via Online Shopping

LISA P. RAMSEY[1]* and JULIE A. FUNK[2]

[1]Virginia Dept. of Agriculture and Consumer Services, Lynchburg Regional Animal Health Laboratory, 4832 Tyreeanna Road, Lynchburg, VA 24504, USA; [2]Dept. of Large Animal Clinical Sciences, 165 Food Safety and Toxicology Building, Michigan State University, East Lansing, MI 48824, USA

SUMMARY

Farmstead cheeses, made right on the farm from the milk of the cheesemakers' own animals, are rapidly growing in popularity in the United States. Many of these cheeses are available for purchase via online shopping, and thus can be obtained by consumers far removed from where the cheeses are produced. The objective of this study was to evaluate the microbiological safety of farmstead cheeses purchased online. A total of 61 samples of farmstead cheeses purchased from 39 different cheesemakers in 24 different states within the United States were tested for the presence of *Salmonella*, *Listeria monocytogenes*, *Escherichia coli* O157:H7, *Staphylococcus aureus*, and coliform bacteria. Of the 61 cheeses tested, only seven were found to be unacceptable. One sample was found to be contaminated with Group B *Salmonella*, three samples had high *S. aureus* counts, and three samples had high coliform counts. Most of the cheeses, which are perishable products, were cold or cool upon arrival, but the product labeling of many of the cheeses was inadequate, which would make it difficult or impossible to trace it back to the maker should this be necessary because of an epidemiological investigation.

INTRODUCTION

Cheese has been made and consumed by people worldwide for thousands of years *(16)*. Prior to modern technology and the ability to mass produce, cheese was made by hand in small batches. Cheesemaking was a labor intensive process, but it was a way to produce a nutritious food item with a much better shelf life than the milk from which it was made. Modern high-tech food processing methods provided a way to make cheese efficiently and produced a convenient, affordable, and consistent product that many consumers enjoyed. With the availability of manufactured cheese, fewer people bothered to make cheese the old-fashioned way. In recent times, there has been a renewed interest in cheeses made the old way, and the number of "artisanal" cheesemakers has increased substantially in just a few years *(2)*. Many of these artisanal cheesemakers make their cheeses right on the farm where the milk-producing animals are raised and maintained. Artisanal cheeses made on the farm from the milk of the farmer's own animals are called "farmstead" cheeses *(2)*. In early 2006, the Vermont Farmstead Cheese Marketing Study determined that Vermont farmstead cheesemakers made over

A peer-reviewed article

*Author for correspondence: Phone: 434.947.2518; Fax: 434.947.2577
E-mail: Lisa.Ramsey@vdacs.virginia.gov

650,000 pounds of artisanal cheeses, and that approximately 10% of these cheeses reached consumers by way of mail order *(34)*. This means that many consumers of farmstead cheeses are located in cities, states, or even countries other than where the cheeses are made. The Internet makes it easier for businesses of all types, including producers of perishable products such as cheese, to sell their products to the world in the global marketplace.

While dairy products collectively have been identified by the Centers for Disease Control and Prevention (CDC) as causing less than 1.5% of all foodborne disease outbreaks *(33)*, cheeses are perishable products that can potentially harbor bacterial pathogens that can cause severe illness or even death. Some types of cheese, in particular soft cheeses made from raw milk have been implicated in outbreaks more often than others *(21)*. The bacterial pathogens most often found in contaminated cheeses implicated in outbreaks of illness include *Listeria monocytogenes*, *Salmonella*, *Escherichia coli* O157:H7, and *Staphylococcus aureus (1)*. Farmstead cheesemakers, compared to other cheesemakers, must take additional precautions to prevent the contamination of their product with these pathogens, which are commonly found in the animal farming environment. Because of the seriousness of illness these pathogens can cause, regulations (federal and state) are in place to help assure the safety of these products for the consumer. One of the federal regulations that applies to cheeses produced in all states, in place since 1949, addresses the safety of cheeses made from raw milk by requiring that these cheeses be aged for a minimum of 60 days prior to their release for sale to consumers *(35)*. State regulations related to making and selling these cheeses vary from state to state.

The objective of this study was to evaluate the microbiological safety, relative to standards of Virginia state regulations, of farmstead cheeses made in various places across the United States, by testing cheeses available for purchase via online shopping.

MATERIALS AND METHODS

Sampling of cheeses

Determining the various sources of farmstead cheeses for this project was done by performing Internet searches using the following terms, or a combination of these terms: farmstead, small farm, cheese, artisanal, gourmet, raw, unpasteurized, and pasteurized. The cheeses for this project were purchased via the Internet, either directly from the cheese maker or through a retail distributor of gourmet food products. All of the cheeses selected for purchase were described by the cheese maker as being made on the farm where the animals producing the milk are maintained. These farmstead cheeses were purchased entirely by electronic means (Web site "shopping carts"). All cheeses were delivered to a single address in Virginia, evaluated for condition upon arrival, and placed in refrigeration at 0–4.4°C until microbiological analyses were performed.

Procedure for detection of *E. coli* O157:H7

The VIDAS, *E. coli* O157 (ECO) test kit (bioMérieux, Inc., Durham, NC), an enzyme-linked fluorescent assay (ELFA) designed to detect the presence of *E. coli* O157 antigens, was used with a mini VIDAS instrument (bioMérieux) to evaluate the cheese samples qualitatively for contamination with *E. coli* O157. A 25-g portion of each cheese sample was incubated in the appropriate enrichment broths according to the ECO test kit instructions, and prepared for analysis. The prepared sample broths were analyzed for *E. coli* O157 antigens, following test kit instructions. Sample broths testing positive by the VIDAS ECO test were subjected to a confirmation procedure using the VIDAS Immuno-Concentration *E. coli* O157 (ICE) test kit (bioMérieux) according to the kit instructions, followed by plating on Rainbow Agar O157 (Biolog, Inc., Hayward, CA), Chromagar O157 (Hardy Diagnostics, Santa Maria, CA), Sorbitol MacConkey Agar (SMAC), and Cefixime Tellurite supplemented SMAC agar (CT-SMac). Absence on these selective/differential media of colonies typical of *E. coli* O157 (as described by the technical information for Rainbow O157 agar, FDA's Bacteriological Analytical Manual [BAM] for SMAC and CT-SMac agars, and the technical information for Chromagar O157) was considered a negative confirmation result *(4, 5, 13)*.

Procedure for detection of *Salmonella* spp.

To determine the presence or absence of *Salmonella* in the cheese samples, the VIDAS Immuno-Concentration *Salmonella* (ICS) (bioMérieux) and the VIDAS *Salmonella* (SLM) (bioMérieux) were used in combination. The ICS kit, which uses *Salmonella* specific antibodies (O and H antigens) to capture and concentrate any *Salmonella* present, was used first to increase the sensitivity of the SLM test, which, like the ECO test, uses the ELFA technique to detect the target organism. A 25-g portion of each cheese was incubated in enrichment broth according to instructions included with the ICS and SLM kits and prepared for analysis. The prepared sample broths were analyzed on the mini VIDAS instrument for *Salmonella* antigens, and broths testing positive by the VIDAS SLM test were subjected to a confirmation procedure. To confirm the presence of *Salmonella*, Xylose Lysine Deoxycholate (XLD) agar (Remel, Inc., Lenexa, KS) and Brilliant Green (BG) agar (Remel) were used. After incubation, the plates were examined for colonies typical of *Salmonella* (for BG agar, pink, opaque colonies with red zones in the surrounding media; for XLD agar, black, red with black center, or red colonies) *(3, 6)*. Colonies typical of *Salmonella* were inoculated in Triple Sugar Iron Agar slants (Remel) and Lysine Iron Agar slants (Remel), incubated, and examined for reactions consistent with *Salmonella*. Isolates determined to be *Salmonella* were serogrouped using the Wellcolex Colour *Salmonella* test (Remel).

Procedure for detection of *Listeria monocytogenes*

Another ELFA test, the VIDAS *Listeria* (LIS) (bioMérieux), was used, according to AOAC Official Method 999.06, with a mini VIDAS instrument to qualitatively detect *Listeria* spp. antigens in a 25-g portion of each cheese sample. Sample broths testing positive by the VIDAS LIS assay were subjected to a confirmation procedure according to methods described in BAM, using both Palcam agar (Hardy) and Oxford agar (Remel) *(18)*.

TABLE 1. Summary of farmstead cheese test results

No. of Samples	Cheese Type	Acceptable Yes/No	*Salmonella* Result	*E. coli* O157 Result	*L. mono.* Result	Coliform Count (CFU/g)	*S. aureus* Count (CFU/g)
1	Pasteurized, Cow	No	ND[a]	ND	ND	>15,000	<100
1	Pasteurized, Cow	No	Positive	ND	ND	<10	<100
1	Pasteurized, Goat	No	ND	ND	ND	>15,000	<100
1	Raw, Cow	No	ND	ND	ND	410	3,900
1	Raw, Cow	No	ND	ND	ND	<10	1,300
1	Raw, Cow	No	ND	ND	ND	30	17,000
1	Raw, Cow	No	ND	ND	ND	4,600	<100
2	Pasteurized, Cow	Yes	ND	ND	ND	10	<100
1	Pasteurized, Cow	Yes	ND	ND	ND	60	<100
10	Pasteurized, Cow	Yes	ND	ND	ND	<10	<100
12	Pasteurized, Goat	Yes	ND	ND	ND	<10	<100
1	Pasteurized, Sheep	Yes	ND	ND	ND	<10	100
1	Raw, Cow	Yes	ND	ND	ND	10	<100
1	Raw, Cow	Yes	ND	ND	ND	50	<100
1	Raw, Cow	Yes	ND	ND	ND	<10	100
1	Raw, Cow	Yes	ND	ND	ND	<10	700
22	Raw, Cow	Yes	ND	ND	ND	<10	<100
2	Raw, Goat	Yes	ND	ND	ND	<10	<100
Summaries:	Total samples tested: 61	88.5% Acceptable	1.6% *Salmonella* Positive	0% *EC* O157 Positive	0% *L. mono.* Positive	4.9% High Coli Count	4.9% High *Staph* Count

[a]ND, not detected in 25 g

Procedure for detection and enumeration of coliform bacteria

AOAC Official Method 989.10, with modifications, was used. A 25-g portion of cheese was thoroughly mixed with 225 ml of Butterfield's buffer (Weber Scientific, Hamilton, NJ) to make a 1:10 dilution of the test sample. Two dilutions of the sample, 1:10 and 1:100, were plated on Petrifilm Coliform Count Plates (3M Microbiology, St. Paul, MN) and incubated for 24 ± 2 h at 32 ± 1°C. After incubation, gas-producing coliform colonies were enumerated and counts were recorded.

Procedure for detection and enumeration of *Staphylococcus aureus*

AOAC Official Method 2003.08 was used, with modifications. A 25-g portion of cheese was thoroughly mixed with 225 ml of Butterfield's buffer (Weber) to make a 1:10 dilution of the test sample. Two dilutions of the sample, 1:100 and 1:1000, were plated on Petrifilm Staph Express Count Plates (3M Microbiology) and incubated for 24 ± 2 h at 35 ± 1°C. After incubation, the petrifilms were examined for growth consistent with *S. aureus* according to Staph Express Count System instructions, using Petrifilm Staph Express disks (3M Microbiology) to confirm suspect colonies when appropriate.

Criteria used to determine if the cheeses were microbiologically safe

The criteria used to determine if the cheeses were microbiologically safe (acceptable), which are part of the state of Virginia's regulation 2VAC 5-531-70 (Regulations Governing Milk for Milk Manufacturing Purposes — Standards for milk and dairy products) found in the Virginia Register of Regulations, included the following: no detectable level of *Salmonella*, *L. monocytogenes*, or *E. coli* O157:H7; a coliform count in pasteurized milk cheeses not exceeding 100 CFU/g; a coliform count in raw milk cheeses not exceeding 500 CFU/g; a *S. aureus* count in pasteurized milk cheeses not exceed-

ing 100 CFU/g; and a *S. aureus* count in raw milk cheeses not exceeding 1000 CFU/g *(39)*.

RESULTS

A total of 61 cheeses were ordered via online shopping, and were delivered to the Virginia Dept. of Agriculture Lynchburg Regional Animal Health Laboratory (VDACS Lynchburg RAHL) in Lynchburg, VA. The 61 cheeses tested came from 39 different farmstead dairies in 24 different states within the United States. Of the 61 cheeses tested, 30 from raw cow's milk, 15 from pasteurized cow's milk, 2 from raw goat's milk, 13 from pasteurized goat's milk, and 1 from pasteurized sheep's milk. Some of the cheeses were ordered directly from the farm that produced them, and the others were ordered from third party gourmet food companies. Most of the samples (86.9%) arrived in insulated coolers with frozen or partially frozen ice packs. Two samples (3.3%) arrived in insulated coolers with completely thawed ice packs, and 6 samples (9.8%) arrived in non-insulated boxes with no ice packs. Most samples (68.9%) were in transit (from the point of shipment to the delivery destination) for two days. Some samples (21.3%) were in transit for only one day, and a few (9.8%) for four days. Standard delivery (as defined by the seller) was requested for all orders. Packaging and labeling of received cheeses was noted.

A summary of the test results on the 61 samples tested, grouped by the type of cheese tested (pasteurized or raw milk, and species of animal) and results obtained, can be found in Table 1. Of the 61 samples tested, 54 (88.5%) were found to be acceptable with regard to microbiological safety. Of the 30 cheeses made from raw cow's milk, 4 (13.3%) were found to be unacceptable with regard to microbiological safety. Of the 15 cheeses made from pasteurized cow's milk, 2 (13.3%) were found to be unacceptable. Only one of the 13 pasteurized goat's milk samples (7.7%) was found to be unacceptable. The two raw goat's milk cheeses were found to be microbiologically safe, as was the one pasteurized sheep's milk cheese. Only one sample, a pasteurized cow's milk cheese, was found to be contaminated with *Salmonella*. None of the 61 samples tested were found to be contaminated with *L. monocytogenes* or *E. coli* O157:H7. Three samples (one raw cow's milk cheese, one pasteurized cow's milk cheese, and one pasteurized goat's milk cheese) had coliform counts that exceeded Virginia's legal limit. Three samples (all raw cows' milk cheeses) exceeded the legal limit for *S. aureus* organisms.

DISCUSSION

This brief study was conducted to evaluate the microbiological safety of farmstead cheeses selected from those that are produced in the United States, and that are available for purchase via online shopping to consumers in other states. Internet searches for farmstead cheeses revealed that there are hundreds of farmstead cheese producers across the US, and many of these producers offer their cheeses for sale over the Internet. Dairy products, including cheeses, are perishable products known to be potential carriers of pathogenic bacteria when care is not taken to prevent contamination with such bacteria. The farmstead dairy environment, where the animals that produce the milk used in production are raised in close proximity to the site where the dairy products are made, presents additional challenges to the prevention of contamination, compared with non-farmstead dairies, because the animals and their immediate environment are natural reservoirs of the foodborne pathogens associated with dairy products *(33)*. Often, the same individuals who care for the animals also make the cheeses, so in the absence of adequate attention to sanitation, contamination of the cheeses could easily occur. Additionally, many of these farmstead cheeses are made from raw milk rather than from pasteurized milk, which calls for an even greater need to be certain of the microbiological safety of the milk being used. This last point can be a challenge even to the most attentive producer, because it is known that animals can be asymptomatic or subclinical carriers of *Salmonella*, *L. monocytogenes*, *E. coli* O157:H7, and *S. aureus*. The results of this brief and limited study indicate that the majority of the farmstead cheeses produced in the United States and available for purchase online are microbiologically safe for consumers.

With such a small number of unacceptable samples in this study, it is difficult to make substantive speculations based on the results, but for the sake of discussion, some comments can be made. The seven unacceptable samples were from six different states, so no correlation between unsafe farmstead cheeses and the state in which they were produced could be found. Interestingly, none of the seven unacceptable samples were found to exceed the limits for more than one type of bacteria. This was an unexpected result, especially with regard to coliform counts, since coliform counts are very commonly used as an indicator of the sanitary quality of foods *(14)*. Three of the seven unacceptable samples, including the one sample positive for *Salmonella*, were made from pasteurized milk (according to the cheese maker's description of the product), so based on these results, it cannot be said that cheeses made from pasteurized milk are safer that those made from raw milk. One of the limitations of this study should be considered with this last comment: A phosphatase test was not done to detect the presence of alkaline phosphatase, the presence of which indicates the presence of some level of raw milk, since proper pasteurization temperatures inactivate phosphatase.

The recovery of *Salmonella* (determined to be Group B) from one of the cheese samples, regardless of whether or not the sample was made from properly pasteurized milk (as the label indicated), was a significant finding. The symptoms of salmonellosis, one of the most common foodborne illnesses worldwide, can include abdominal pain, nausea, vomiting, diarrhea, and fever, and the illness can become life-threatening in very young, very old, or immunocompromised individuals *(15)*. Cheeses can become contaminated with *Salmonella* in a number of different ways and at a number of different points in the cheese-making process. Both raw milk cheeses and pasteurized milk cheeses have been associated with outbreaks of salmonellosis *(11)*, and it has been shown that under some circumstances, cheeses made from pasteurized milk contaminated with *Salmonella* post-pasteurization can still have viable *Salmonella* organisms after several months of storage *(10)*. Some studies have shown that *Salmonella* can develop adaptive responses to unfavorable factors in their environments, including increased acidity, increased salinity, and unfavorable temperatures *(27)*. This

ability to develop adaptive responses that allow the organisms to survive in cheeses, together with the emergence of multidrug-resistant strains of *Salmonella* *(15)*, makes it important for the farmstead cheesemaker to remain vigilant for the presence of *Salmonella* on the farm.

The presence of *E. coli* O157:H7 was not detected in any of the samples from this study. The incidence of this pathogen in cheeses is very low, although a number of other studies have attempted to detect it in dairy products *(1)*. Even though *E. coli* O157:H7 is not often found in cheeses, taking steps to prevent contamination of products with this foodborne pathogen remains important, because it is infectious at very low doses *(37)* and causes severe illness, with symptoms of bloody diarrhea and acute renal failure sometimes resulting in death, especially in children *(39)*. Ruminants, especially cattle, can be carriers of *E. coli* O157:H7 *(20)*, so the organism can be present on the farm with no obvious signs that it is there, as it is not pathogenic in ruminants as it is in humans. Because of its extreme pathogenicity, the ability of *E. coli* O157:H7 to survive in cheeses and cheese brines has been investigated *(12, 20, 25, 26, 35, 37)*. The results of these studies showed that *E. coli* O157:H7 can often tolerate the cheese production process *(12, 26)*, the salinity of brines used in cheese making *(20)*, and the acidity of some cheeses *(25, 37)*, as well as surviving the mandatory 60-day aging period in some raw milk cheeses *(35)*.

L. monocytogenes is commonly found in the dairy farm environment *(19, 22, 23)*, but none of the farmstead cheese samples from this study were positive for this important foodborne pathogen. Human infection with *L. monocytogenes* is relatively rare, with about 3 or 4 cases per million people annually in the United States *(36)* and between 3 and 7 cases per million annually in Europe *(8)*. But the symptoms of invasive disease caused by *L. monocytogenes* (listeriosis) — encephalitis, meningitis, and miscarriage in pregnant women — are severe, and results in death in about 20% of those infected *(8, 22, 28, 29)*. A *L. monocytogenes* risk assessment conducted in the United States in 2003 concluded that cheeses have a moderate to low relative per-serving risk of causing foodborne listeriosis, with soft unripened cheese being classified as moderate risk and other types of cheeses classified as low risk *(36)*. For the sake of comparison, it will be mentioned that the high relative risk ready-to-eat foods include deli meats, frankfurters (not reheated), and unpasteurized fluid milk, and that pasteurized fluid milk is in the same moderate-risk category with soft unripened cheese *(36)*. Studies have shown that *L. monocytogenes* can still be viable in some types of cheeses made from raw milk after 42 days of ripening and storage *(31)*, and even after the federally required 60-day aging period *(7)*. Other studies have shown that *L. monocytogenes* can develop a tolerance to acidic environments *(17)* and can survive in the high salinity of cheese brines, where many other species of bacteria perish *(23)*. It would appear that with the high incidence of *L. monocytogenes* in the dairy farm environment, and the ability of this pathogen to adapt to acidic environments and to tolerate salinity, the very low incidence of listeriosis attributed to contaminated cheeses, indicates that United States cheesemakers are working successfully to control the contamination of their products, perhaps as the result of effective regulations and a zero tolerance for the presence of *L. monocytogenes* in foods.

Staphylococcal food poisoning, caused by enterotoxins produced by some strains of *S. aureus*, is a very common and relatively mild foodborne illness, causing nausea, vomiting and diarrhea that normally subside within one to three days *(9)*. *S. aureus* survives quite well in milk, and dairy products (including cheeses) have been implicated in cases of illness caused by enterotoxins produced by these bacteria *(30)*. Another reason to be concerned about the presence of *S. aureus* in foods is the increasing presence of methicillin-resistant *S. aureus* (MRSA) in settings other than hospitals. The presence of MRSA in food producing animals has been demonstrated by others, with about 3-4% of *S. aureus* isolates from two studies possessing the *mecA* gene characteristic of MRSA *(24, 32)*. Because *S. aureus* can be shed in the milk of animals infected with this organism, and because *S. aureus* is destroyed by pasteurization, raw milk and cheeses made from raw milk are more likely than products made from pasteurized milk to be contaminated with *S. aureus* that could be MRSA. Consistent with this statement, the three cheese samples from the present study that were unacceptable because of high *S. aureus* counts were made from raw milk (isolates were not tested to determine if they were MRSA). However, pasteurized products can become contaminated with *S. aureus* through post-pasteurization contamination. Because MRSA is resistant to most commonly used antibiotics and infections with MRSA can consequently be difficult to treat, cheese makers should take steps to control the presence in their products of *S. aureus*, some of which could be MRSA.

Lastly, the packaging, shipping, and labeling of the farmstead cheeses tested in this study must be considered. Most of the samples were received cold or cool, having been shipped in insulated coolers, as perishable products should be, but six samples were shipped in plain boxes with no ice packs and they were in transit for four days before they were received. Interestingly, two of these six samples were among the total of seven that were found to be microbiologically unsafe (one was positive for presence of *Salmonella*, and the other had a high *S. aureus* count). Proper packaging and shipping of perishable products such as cheeses are necessary to help minimize the potential risk to consumers of microbial food safety hazards. Also, of the 61 samples in this study, only 22 included some sort of date or lot information that could be useful in a traceback, and 2 samples were received with no label at all. Virginia regulations require that all packages containing a finished dairy product (a product ready for sale) be labeled with the name of the product (a name that does not mislead the consumer), the name and address of the processor, and a "sell by date" *(38)*. The proper labeling of these products appears to be an area where much improvement could be made.

With the desire of some individuals to go back in time to produce farmstead cheeses in the way of the artisan, and the desire of others to consume these highly flavorful cheeses full of character, it is likely that the trend of farmstead cheese production and consumption will continue. The results of this study indicate that most farmstead cheesemakers are successfully preventing contamination of their cheeses with *Salmonella*, *L. monocytogenes*, *E. coli* O157:H7, and *S. aureus*, but a wealth of scientific data shows that these harmful pathogens are in the dairy

environment and can easily find their way into the finished product if great care is not taken. Modern day cheesemakers producing artisan cheeses must take advantage of some modern tools (e.g., effective sanitizers) and concepts (e.g., Hazard Analysis Critical Control Points, or HACCP) to help assure the safety to consumers of their artisan cheeses.

ACKNOWLEDGMENTS

This project was undertaken by the primary author to fulfill the requirement for an "Applied Project" to complete a Professional Master of Science in Food Safety degree program through Michigan State University, in East Lansing, MI. The staff of the VDACS Lynchburg RAHL is thanked for their assistance and support. The primary author also thanks her family for their patience and understanding. This project was funded in its entirety by the primary author.

REFERENCES

1. Almeida, G., A. Figueiredo, M. Rôla, R. M. Barros, P. Gibbs, T. Hogg, and P. Teixeira. 2007. Microbiological characterization of randomly selected Portuguese raw milk cheeses with reference to food safety. J. Food Prot. 70:1710–1716.
2. American Cheese Society. 2007. American cheese styles. Available at: http://www.cheesesociety.org/displaycommoncfm?an=1&subarticlenbr=8. Accessed 24 November 2007.
3. Andrews, W. H. and T. S. Hammack. 2006. Bacteriological Analytical Manual — *Salmonella*. Available at: http://www.cfsan.fda.gov/~ebam/bam-5.html .Accessed 25 November 2007.
4. Anonymous. 2003. Rainbow agar O157 technical information. Available at: http://www.biolog.com/pdf/RBO157Tech00P037A.pdf. Accessed 25 November 2007.
5. Anonymous. 2005. BD BBL CHROMagar O157. Available at: http://www.bd.com/ds/productCenter/214984.asp. Accessed 25 November 2007.
6. Anonymous. Brilliant green agar. Available at: http://www.bd.com/ds/technicalCenter/inserts/Brilliant_Green_Agar.pdf. Accessed 25 November 2007.
7. Bauzzi, M. M., M. E. Johnson, and E. H. Marth. 1992. Survival of *Listeria monocytogenes* during the manufacture and ripening of Swiss cheese. J. Dairy Sci. 75:380–386.
8. Bille, J., D. S. Blanc, H. Schmid, K. Boubaker, A. Baumgartner, H. H. Siegrist, M. L. Tritten, R. Lienhard, D. Berner, R. Anderau, M. Treboux, J. M. Ducommun, R. Malinverni, D. Genné, P. Erard, and U. Waespi. 2006. Outbreak of human listeriosis associated with Tomme cheese in northwest Switzerland, 2005. Euro Surveill. 11:91–93.
9. Centers for Disease Control and Prevention. 2006. Staphylococcal food poisoning. Available at: http://www.cdc.gov/NCIDOD/dbmd/diseaseinfo/staphylococcus_food_g.htm. Accessed 25 November 2007.
10. De Lamo-Castellví, S., A. X. Roig-Sagués, T. López-Pedemone, M. M. Hernández-Herrero, B. Guamis, and M. Capellas. 2007. Response of two *Salmonella enterica* strains inoculated in model cheese treated with high hydrostatic pressure. J. Dairy Sci. 90:99–109.
11. De Valk, H., E. Delarocque-Astagneau, G. Colomb, S. Ple, E. Godard, V. Vaillant, S. Haighebaert, P. Bouver, F. Grimont, P. Grimont, and J. C. Desenclos. 2000. A community-wide outbreak of *Salmonella enterica* serotype Typhimurium infection associated with eating a raw milk soft cheese in France. Epidemiol. Infect. 124:1–7.
12. Ercolini, D., V. Fusco, G. Blaiotta, F. Sarghini, and S. Coppola. 2005. Response of *Escherichia coli* O157:H7, *Listeria monocytogenes*, *Salmonella* Typhimurium, and *Staphylococcus aureus* to the thermal stress occurring in model manufactures of Grana Padano cheese. J. Dairy Sci. 88:3818–3825.
13. Feng, P., and S. D. Weagant. 2002. Bacteriological Analytical Manual — Diarrheagenic *Escherichia coli*. Available at: http://www.cfsan.fda.gov/~ebam/bam-4a.html. Accessed on 25 November 2007.
14. Feng, P., S. D. Weagant, and M. A. Grant. 2002. Bacteriological Analytical Manual – Enumeration of *Escherichia coli* and the coliform bacteria. Available at: http://www.cfsan.fda.gov/~ebam/bam-4.html. Accessed 24 November 2007.
15. Food Safety Department, World Health Organization. 2005. Available at: http://www.who.int/mediacentre/factsheets/fs139/en/. Accessed 24 November 2007.
16. Fox, P. F., P. McSweeney, T. M. Cogan, and T. P. Guinee. 2000. Fundamentals of Cheese Science. Aspen Publishers, Gaithersburg, MD.
17. Gahan, C. G. M., B. O'Driscoll, and C. Hill. 1996. Acid adaptation of *Listeria monocytogenes* can enhance survival in acidic foods and during milk fermentation. Appl. Environ. Microbiol. 62:3128–3132.
18. Hitchins, A. D. 2003. Detection and enumeration of *Listeria monocytogenes* in foods. Available in the FDA's Bacteriological Analytical Manual online at: http://www.cfsan.fda.gov/~ebam/bam-10.html. Accessed 25 November 2007.
19. Ho, A. J., V. R. Lappi, and M. Wiedmann. 2007. Longitudinal monitoring of *Listeria monocytogenes* contamination patterns in a farmstead dairy processing facility. J. Dairy Sci. 90:2517–2524.
20. Ingham, S. C., Y. Su, and D. S. Spangenberg. 2000. Survival of *Salmonella* Typhimurium and *Escherichia coli* O157:H7 in cheese brines. Int. J. Food Microbiol. 61:73–79.
21. Kinde, H., A. Mikolon, A. Rodriguez-Lainz, C. Adams, R. L. Walker, S. Cernek-Hoskins, S. Treviso, M. Ginsberg, R. Rast, B. Harris, J. B. Payer, S. Waterman, and A. Ardans. 2007. Recovery of *Salmonella*, *Listeria monocytogenes*, and *Mycobacterium bovis* from cheese entering the United States through a noncommercial land port of entry. J. Food Prot. 70:47–52.
22. Kongo, J. M., F. X. Malcata, A. J. Ho, and M. Wiedmann. 2006. Detection and characterization of *Listeria monocytogenes* in São Jorge (Portugal) cheese production. J. Dairy Sci. 89:4456–4461.
23. Larson, A. E., E. A. Johnson, and J. H. Nelson. 1999. Survival of *Listeria monocytogenes* in commercial cheese brines. J. Dairy Sci. 82:1860–1868.
24. Lee, J. H. 2003. Methicillin (oxacillin)-resistant *Staphylococcus aureus* strains isolated from major food animals and their potential transmission to humans. Appl. Environ. Microbiol. 69:6489–6494.

25. Lekkas, C., A. Kakouri, E. Paleologos, L. p. Voutsinas, M. G. Kontominas, and J. Samelis. 2006. Survival of *Escherichia coli* O157:H7 in Galotyre cheese stored at 4 and 12°C. Food Microbiol. 23:268–276.
26. Leuschner, R. G. K., and M. P. Boughtflower. 2002. Laboratory-scale preparation of soft cheese artificially contaminated with low levels of *Escherichia coli* O157, *Listeria monocytogenes*, and *Salmonella enterica* serovars Typhimurium, Enteritidis, and Dublin. J. Food Prot. 65:508–514.
27. Leyer, G. J., and E. A. Johnson. 1992. Acid adaptation promotes survival of *Salmonella* spp. in cheese. Appl. Environ. Microbiol. 58:2075–2080.
28. McDonald, P. D. M., R. E. Whitwam, J. D. Boggs, J. N. MacCormack, K. L. Anderson, J. W. Reardon, J. R. Saah, L. M. Graves, S. B. Hunter, and J. Sobel. 2005. Outbreak of listeriosis among Mexican immigrants as a result of consumption of illicitly produced Mexican-style cheese. Clin. Infect. Dis. 40:677–682.
29. Mead, P. S., L. Slutsker, V. Dietz, L. F. McCaig, J. S, Bresee, C. Shapiro, P. M. Griffin, and R. V. Tauxe. 1999. Food-related illness and death in the United States. Emerg. Infect. Dis. 5:607–625
30. Morandi, S., M. Brasca, R. Lodi, P. Cremonesi, and B. Castiglioni. 2007. Detection of classical enterotoxins and identification of enterotoxin genes in *Staphylococcus aureus* from milk and dairy products. Vet. Microbiol. 124:66–72.
31. Morgan, F., V. Bonnin, M-P. Mallereau, and G. Perrin. 2001. Survival of *Listeria monocytogenes* during manufacture, ripening and storage of soft lactic cheese made from raw goat milk. Int. J. Food Microbiol. 62:217–221.
32. Normanno, G., M. Corrente, G. La Salandra, A. Dambrosio, N. C. Quaglia, P. Parisi, G. Greco, A. L. Bellacicco, S. Virgilio, and G. V. Celano. 2007. Methicillin-resistant *Staphylococcus aureus* (MRSA) in foods of animal origin product in Italy. Int. J. Food Microbiol. 117:219–222.
33. Ruegg, P. L. 2003. Practical food safety interventions for dairy production. J. Dairy Sci. 86:E1-E9.
34. Sakovitch-Dale, J., 2006. Vermont Farmstead Cheese Marketing Study. Available at: http://www.vhcb.org/pdfs/farmsteadcheesereport.pdf. Accessed 24 November 2007.
35. Schlesser, J. E., R. Gerdes, S. Ravishankar, K. Madsen, J. Mowbray, and A. Y.-L. Teo. 2006. Survival of a five-strain cocktail of *Escherichia coli* O157:H7 during the 60-day aging period of cheddar cheese made from unpasteurized milk. J. Food Prot. 69:990–998.
36. United States Food and Drug Administration, Center for Food Safety and Applied Nutrition, USDA, Food Safety and Inspection Service, and the Centers for Disease Control and Prevention. 2003. Quantitative assessment of relative risk to public health from foodborne *Listeria monocytogenes* among selected categories of ready-to-eat foods. Available at: http://www.foodsafety.gov/~dms/lmr2-toc.html. Accessed on 24 November 2007.
37. Vernozy-Rozand, C., C. Mazuy-Cruchaudet, C. Bavai, M. P. Montet, V. Bonin, A. Dernburg, and Y. Richard. 2005. Growth and survival of *Escherichia coli* O157:H7 during the manufacture and ripening of raw goat milk lactic cheeses. Int. J. Food Microbiol. 105:83–88.
38. Virginia State Board of Agriculture and Consumer Services. 2005. 2VAC 5-531-70 regulations governing milk for milk manufacturing purposes – Standards for milk and dairy products. Available at: http://legis.state.va.us/codecomm/register/vol21/iss08/f2v5530.doc. Accessed 24 November 2007.
39. World Health Organization. 2002. Foodborne diseases, emerging. Available at: http://www.who.int/mediacentre/factsheets/fs124/en/index.html. Accessed 24 November 2007.

Food Protection Trends, Vol. 29, No. 3, Pages 155–160

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

Antibacterial Activity of a Crude Chive Extract against *Salmonella* in Culture Medium, Beef Broth and Chicken Broth

SALAM IBRAHIM,[1†] TOM TSE,[1] HONG YANG[2] and ANGELA FRASER[3]

[1]North Carolina Agricultural and Technical State University, Greensboro, NC 27411-1064, USA;

[2]Agricultural Research Station, Virginia State University, P.O. Box 9061, Petersburg, VA 23806, USA;

[3]Dept. of Food Science and Human Nutrition, Clemson University, Clemson, SC 29634, USA

SUMMARY

The objective of this study was to examine the antibacterial activity of Chinese chives against 38 strains of *Salmonella*. Antibacterial activity was tested in a culture medium (BHI) and in two food models (beef and chicken broth). Results showed that the chive extract had strong antibacterial activity against all 38 strains in culture media. The average minimum inhibitory volume (MIV) was 235 µl/ml and the average minimum lethal inhibition volume (MLV) was 747 µl/ml. A trial of inhibition over time showed that a minimum of 500 µl of chive extract was required for total growth inhibition over 24 h. When chive extract was added to food samples, *Salmonella* populations were reduced to 1.78 ± 0.24 log CFU/ml in chicken broth and to 2.10 ± 0.22 CFU/ml in beef broth. In the control samples, *Salmonella* populations reached 7.40 ± 0.17 CFU/ml in chicken broth and 8.67 ± 0.34 CFU/ml in beef broth. The findings show that crude chive extract can be effective against the growth of *Salmonella* and could be used in food products to prevent the growth of this pathogen.

INTRODUCTION

Foodborne disease caused by microorganisms is the number one food safety concern among consumers and regulatory agencies. Illnesses attributed to foodborne microorganisms can cause severe debilitating symptoms and, in some cases, death. In the United States, *Salmonella* is the second most common cause of foodborne illness, with estimates as high as 2–4 million cases per year and an associated cost of over $2 billion *(4)*.

Strategies have been developed to prevent outbreaks as well as to meet consumer demands for better quality food products. These strategies include modifications of existing food processing techniques and development of novel processing technologies. High heat treatment for longer times and the use of synthetic preservatives are the most common modifications. The use of nonthermal processes, such as high pressure and ultrasound, are also being considered as new processing technologies.

As consumer demand for naturally and minimally processed foods continues to grow, the food industry is looking toward naturally occuring antimicrobial agents to control the presence and growth of foodborne pathogens. Many of these

A peer-reviewed article

*Author for correspondence: Phone: 336.334.7328; Fax: 336.334.7239
E-mail: ibrah001@ncat.edu

natually occuring compounds have been successfully shown to inhibit the growth of foodborne pathogens *(1–3, 8,11–12, 16, 18, 19)*.

A number of studies have found that Chinese chives possess antibacterial properties due to the presence of sulfur-containing compounds *(5–7, 10, 13–14)*. As a result, Chinese chives have been used to control microbial spoilage. However, their antibacterial effect against foodborne pathogens such as *Salmonella* has not been determined. Therefore, the objective of this study was to examine the antibacterial activity of a crude chive extract against 38 strains of *Salmonella* in culture media and in both beef and chicken broth as food models. To our knowledge, this is the first study to determine the antibacterial activity of a chive extract against a wide range of *Salmonella* strains associated with foodborne illnesses in the United States.

MATERIALS AND METHODS

Bacterial strains

The thirty-eight (38) strains of *Salmonella* were obtained from the North Carolina A&T State University food microbiology laboratory culture collection. All strains were initially obtained from a private clinical laboratory that confirmed the identification of each strain by use of several biochemical and serological methods. The identification for each strain was confirmed with API 20E and the APILAB plus the identification program 3.3/4.0 (bioMérieux, Inc., Hazelwood, MO). In addition, triple sugar iron and urea agar (Difco, Becton Dickinson) was used as a quality control test to confirm the biochemical characteristics of *Salmonella* isolates. Strains were kept in −80°C stock cultures in Tryptic Soy Broth with 20% glycerol. A working culture was prepared by inoculating a loopful of culture into 10 ml of TSB (TSB; Difco, Sparks, MD) with 0.8% yeast extract (Difco). The cultures were subjected to at least three successive 14 h transfers before use.

Preparation of crude chive extract

To prepare the crude chive extract, fresh chives were obtained from a local international market in Greensboro, NC. The chives were washed under running tap water, blotted with a single-use paper towel, then chopped into pieces with a sterilized table knife. Chive pieces (100-g) were blended in a sterilized kitchen blender for 2–3 minutes to obtain a homogenous blend. This blend was placed in 50 ml tubes and centrifuged at 5500 × g for 45 min at 4°C. The supernatant was collected and filtered, using a 0.45 µm filter (Nagle, Rochester, NY USA), then stored overnight at 4°C.

Antimicrobial assay

A diffusion assay with some modifications was used to determine the antibacterial activity of crude chive extract. Batches of 100 ml BHI agar with 0.2% Tween 80 were prepared and sterilized at 121°C for 15 min. The agar was placed in a water bath at 49°C and allowed to cool, and each extract sample was then inoculated individually with a single strain of *Salmonella* to achive an inoculum level of ~5-6 log CFU/ml. The BHI agar (~45 ml) was poured into Petri dishes (100 × 15 mm) and allowed to solidify (agar thickness 12 mm). One well (7 mm in diameter) was made in the center of the agar using a sterile test tube. Chive extract (0.5 ml) was transferred into each well. Plates were incubated for 10–12 h at 35°C and then examined for a clear inhibition zone around the well. The assay was carried out in duplicate for all 38 *Salmonella* strains.

An agar diffusion assay was also used to determine the MIV of the chive extract against all 38 strains of *Salmonella*. BHI agar was inoculated with a single strain of *Salmonella* (~5–6 log CFU/ml). Wells were made and filled with chive extracts at different concentrations (0–1000 µl/ml with 10 µl/ml, unit concentration increase for each plate). To avoid spillage and ensure complete containment of the extract in the agar, the wells were filled gradually for complete deposit of the extract into the well cavity. Plates were incubated at 35°C and the developed clear zones were recorded. The size of the zone of inhibition was calaculated as the diameter of the zone minus the diameter of the bored test well. The MIV was defined as the lowest volume that inhibited growth. The minimum lethal volume (MLV) was defined as the lowest volume at which no growth was observed after three days of incubation. Each set of experiments was conducted three times.

Growth over time

Ten *Salmonella* strains were used to determine bacterial growth over time. Overnight individual strains of *Salmonella* (randomly selected: ED404, ED405, ED104, ED165, ED429, ED204, ED379, DT104, ED181, ED203) were serially diluted to 3 log CFU/ml, and 1 ml of each diluted strain was well mixed in a sterilized tube. This mixture was used to inoculate 10 ml batches of sterile BHI containing chive extract at eight concentrations (100 to 800 µl/ml, at 100 µl/ml intervals). Samples without chive extract were used as control. Samples were then incubated at 37°C for 24 h, and bacterial growth was monitored by measuring optical density at 610 nm, using a spectrophotometer 21 (Thermo Electron Scientific Co., Madison, WI).

Antibacterial activity of chives in food models

The antibacterial activity of chives in two food models was measured in commercially canned chicken broth and beef broth samples purchased from a local store (Greensboro, NC). Each sample (beef and chicken broth) was split into two 95-ml portions. Chive extract was added at 5% (5 ml) to one portion of each food sample. Food samples without chive extract served as control samples. Samples were then incoulated with a mixture of *Salmonella* strains to achive a final inoculum level of 3.00 log CFU/ml. The samples were stored at 37°C for 48 h. A 0.1 ml aliquot of each sample was removed at the end of the incubation period, serially diluted in 0.1% peptone water (Bacto peptone, Becton Dickinson, Sparks, MD, USA) and spread plated, in duplicate, on prepared BHI agar. The inoculated plates were then incubated at 35°C for 24 h. The colonies were counted to determine the bacterial population in each sample. The experiments were conducted three times to determine whether addition of chive extract significantly affected bacterial growth.

Statistical analysis

The Statistical Analysis System (SAS) version 6.0 computer statistical package (SAS Institute, Cary, NC) was used for

TABLE 1. MIV, MLV, and zone of growth inhibition for 38 strains of *Salmonella* exposed to crude chive extract at different concentrations in a culture medium[1]

Serovar	Strain	MIV[2] (µl/ml)	MLV[3] (µl/ml)	Zone of inhibition[4] (mm)
Enterica	ED113	200	720	4.68
Muenster	ED419	200	680	4.46
Newport	ED424	220	700	4.46
Typhimurium	ED404	180	700	4.68
Newport	ED381	240	740	4.91
Muenster	ED419	200	680	4.46
Typhimurium	ED405	240	750	4.01
Mbandaka	ED426	220	740	4.91
Kentucky	ED430	200	650	4.46
Kunzendorf	ED379	220	680	4.91
Heidelberg	ED428	200	700	4.68
Typhimurium	ED099	220	720	4.91
Heidelberg	ED377	240	900	4.24
Typhimurium	ED104	220	800	4.68
Heidelberg	ED181	200	680	4.91
Hadar	ED182	250	840	4.46
Newport	ED184	250	750	4.91
Enteritidis	ED210	200	680	4.68
Gaminara	ED207	200	750	4.91
Urbana	ED165	250	850	4.46
Anatum	ED71	220	800	5.13
Enteritidis	ED429	250	740	4.91
Salmonella sp.	ED204	200	750	4.91
Arizonae	ED11	240	750	5.35
Enteritidis	ED376	250	700	4.46
Salmonella sp.	ED202	250	750	4.91
Salmonella sp.	ED091	200	650	5.35
Abony	ED374	220	750	4.91
Typhimurium	DT104	240	750	4.68
Salmonella sp.	43845	280	900	4.91
Worthington	ED181	250	800	4.68
Salmonella sp.	ED090	240	750	4.91
Thompson	ED180	250	700	4.91
Tennessee	ED178	280	800	5.35
Salmonella sp.	ED203	240	700	4.46
Schwarzengrund	ED177	250	750	4.68
Montevideo	ED238	300	900	4.91
Salmonella sp.	ED 242	220	750	4.91
Average		235	747	4.77

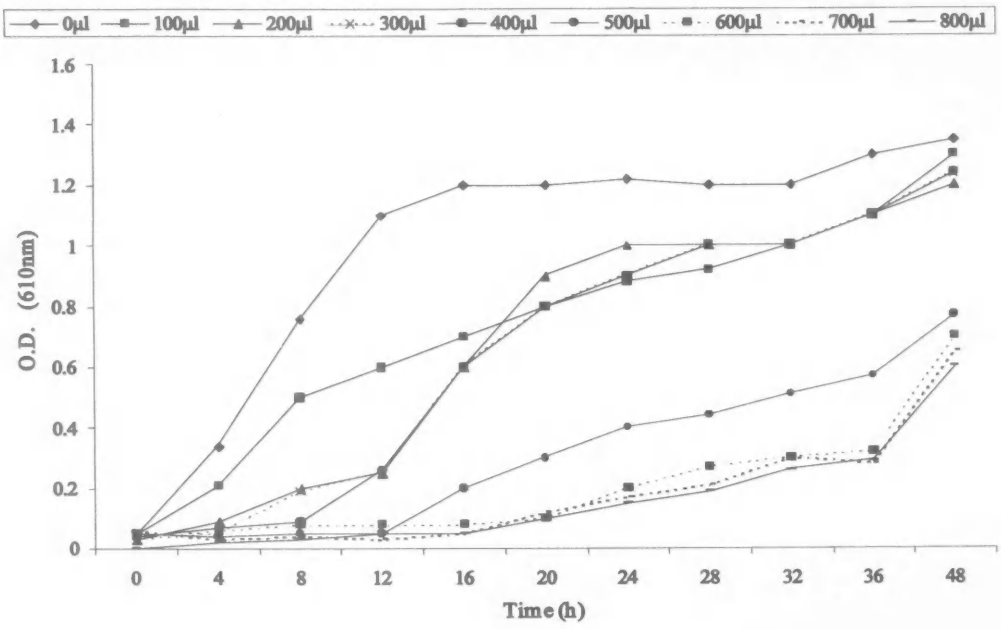
[1]Average of three replications

[2]MIV: minimum inhibitory volume

[3]MLV: minimum lethal volume

[4]Zone of inhibition = (Diameter of the zone) – (diameter of the bored test well)

FIGURE 1. Survival and growth of *Salmonella* in BHI broth at 37°C for 24 h with different concentrations of chive extract (readings are average of three replications).



the analysis of data, with use of Duncan's multiple range to determine significant differences ($P < 0.05$). At least three replications of each experiment were conducted, with two samples per treatment at each sampling time.

RESULTS AND DISCUSSION

Table 1 shows the MIV, MLV and zone of inhibition for each strain. The average MIV and MLC were 235 µl/ml and 747 µl/ml, respectively. The minimum MIV was 180 µl/ml for *Salmonella* Tyhimurium ED404, and the maximum was 300 µl/ml for *Salmonella* Montevideo ED238. The lowest MLV concentration was 650 µl/l, found for both *Salmonella* ED430 and *Salmonella* sp. The highest MLV, 900 µl/ l, was associated with *Salmonella* Heidelberg ED377 and *Salmonella* Montevideo ED238. The largest zone of inhibition (5.35 mm) was observed with *Salmonella* Arizonae ED11, *Salmonella* sp., and *Salmonella* Tennessee ED178. The smallest zone, 4.01 mm, occurred with *Salmonella* Typhimurium ED405.

Figure 1 shows the survival and growth of the *Salmonella* mixture strains in the presence of different concentrations of chive extract in BHI broth over 48 h at 37°C. When *Salmonella* strains were grown in BHI broth samples without chive extract, populations reached the stationary phase within 12 h. Turbidity readings reached absorbance of 1.0–1.2 (610 nm). Addition of chive extract to BHI broth caused significant growth inhibition within 12 h ($P < 0.05$). Growth inhibition ranged from 50 to 100% within 8 h of incubation at 37°C. After 24 h, the growth of *Salmonella* continued, but at a significantly lower rate than for the control samples ($P < 0.05$). The addition of 500 µl/10ml (5%) caused a significant inhibition of *Salmonella* growth during the incubation period (48 h). Higher concentrations of chive extract (>5%) enhanced growth inhibition, but not to values significantly greater than those associated with 5% chive extract. These findings clearly showed that the chive extract had strong antibacterial activity against all 38 strains of *Salmonella*. Evidence of this activity is indicated by the achieved inhibition levels; the average MIV was 235 µl and the average MLV was 747 µl. Assessment of inhibition over time showed that a minimum of 500 µl was required to cause total growth inhibition within 24 h.

Table 1 shows the survival and growth of *Salmonella* in chicken and beef broth samples during incubation at 37°C for 48 h. In chicken broth, the population of *Salmonella* increased from 3.11 log CFU/ml to 7.4 log CFU/ml ($P < 0.05$) for the control sample and decreased from 3.10 log CFU/ml to 1.78 log CFU/ml for the sample treated with chive extract. This indicates that chive extract caused significant growth inhibition of *Salmonella* ($P < 0.001$). Similar results were obtained with beef broth samples, in which the population of *Salmonella* increased from 3.19 log CFU/ml to 8.67 log CFU/ml ($P < 0.05$) for the control sample and decreased from 3.21 log CFU/ml to 2.10 log CFU/ml for the sample treated with chive extract. This shows that all treatments reduced populations of *Salmonella* compared to the control.

Chicken and beef broth were selected as food models because both products are high in nutrients required for the growth of bacteria, including *Salmonella*. However, we observed a higher population of *Salmonella* in beef broth samples than in chicken broth samples ($P < 0.05$). This could be due to the presence of extra nutrients in the beef extract that support

TABLE 2. Population of *Salmonella* in beef and chicken broth samples treated with 5% chive extract after incubation at 37°C for 48 h

Food sample	Bacterial population (log CFU/ml)	
	Initial	Final (48 h)[1,2]
Chicken broth without chive extract	3.11 ± 0.31	7.40 ± 0.17[b]
Chicken broth with chive extract	3.10 ± 0.19	1.78 ± 0.24[a]
Beef broth without chive extract	3.19 ± 0.21	8.67 ± 0.34[c]
Beef broth with chive extract	3.21 ± 0.19	2.10 ± 0.22[a]

[1]Average of three replications

[2]Mean values in the same column followed by different letters are significantly different ($P < 0.05$)

the growth of *Salmonella* or to the high buffering capacity of ingredients present in the beef extract that maintain neutral pH value during growth of *Salmonella*.

We believe this study represents the first published work to demonstrate the antimicrobial capacity of chive extract against *Salmonella* in a food model. Although our results demonstrate that chive extract has great potential for use as an antibacterial compound, we believe that chive extract could be more effective if combined with other natural ingredients or nonthermal processes. To date, several combinations of natural ingredients have been shown to inhibit the growth of disease-causing microorganisms *(3, 10–12)*. For example, lactic acid in combination with caffeine or copper could be used as an antimicrobial agent to inhibit growth of *Escherichia coli* O157:H7 *(11, 15)*. The combination of copper and lactic acid also has a synergistic effect against *Salmonella* in BHI broth and carrot juice *(12)*. The use of copper ion in combination with sodium hydrochloride (100 ppm) followed by sonication (44 to 48 kHz) caused a 5-log reduction of *E. coli* O157:H7 and *Listeria monocytogenes* is in apple cider *(17)*. A combination of ultrasound and vanilla prevented the growth of *L. monocytogenes* is in orange juice *(9)*. Extensive further studies on applications of combined treatments should be conducted to determine the inhibitory effects of different chive mixtures on other strains of *Salmonella*.

Chives can be used as seasoning and can be incorporated into a variety of fresh and cooked foods in which a natural antimicrobial agent is needed. Its use is likely to be appealing to consumers because chives are natural and can be added to fresh food mixtures, especially those typically prepared with onion, without significantly altering the flavor. Results of this study suggest that further research should explore the potential antimicrobial effect of chives in other food systems, particularly fresh greens. Sensory analysis studies of foods are also needed to determine if concentrations sufficient to inhibit growth effectively or eliminate foodborne pathogens would change the taste characteristics of the original food.

ACKNOWLEDGMENTS

The research work was funded, in part, through the Cooperative State Research, Education and Extension Service of the United States Department of Agriculture, in the Agricultural Research Program, North Carolina Agricultural and Technical State University. We express our gratitude to Dr. C. S. Turner, Associate Dean for Research, for her support and to Dr. K. J. Gruber for his review and comments on this manuscript.

REFERENCES

1. Abbas, S. M., and A. K. Halkman. 2004. Antimicrobial effect of water extract of sumac (*Rhus coriaria L.*) on the growth of some food borne bacteria including pathogens. Int. J. Food Microbiol. 97:63–69.
2. Aktug, S. E., and M. Karapinar. 1986. Sensitivity of some common food poisoning bacteria to thyme, mint and bay leaves. Int. J. Food Microbiol. 3: 349–354.
3. Alzoreky, N. S., and K. Nakahara. 2003. Antibacterial activity of extracts from some edible plants commonly consumed in Asia. Int. J. Food Microbiol. 80:223–230.
4. Anonymous. Economics of foodborne disease: estimating the benefits of reducing foodborne disease. US Department of Agriculture, Economic Research Service. Available at http://www.ers.usda.gov/briefing/foodborneDisease/features.htm Accessed 20 November 2006.
5. Block, E., S. Naganathan, D. Putman, and S. H. Zhao. 1992. Allium chemistry: HPLC analysis of thiosulfinates from onion, garlic, wild garlic (ramsons), leek, scallion, shallot, elephant (great-headed) garlic, chive, and Chinese chive. Uniquely high allyl to methyl ratios in some garlic samples. J. Agric. Food Chem. 40:2418–2430.
6. Cavallito, C. J., J. S. Buck, and C. M. Suter. 1944a. Allicin, the antibacterial principle of *Allium sativum*, I. Isolation, physical properties and antibacterial action. J. Am. Chem. Soc. 66:1950–1951.
7. Cavallito, C. J., J. S. Buck, and C. M. Suter. 1944b. Allicin, the antibacterial principle of *Allium sativum*, II. Determination of the structure. J. Am. Chem. Soc. 66:1952–1955.
8. Chitsiri, T., P. M. Davidson, W. Mahakarnchanakul, and P. Vibulsresth. 2005. Antimicrobial effect of Thai spices against *Listeria monocytogenes* and *Salmonella* Typhimurium DT104. J. Food Prot. 68:2054–2058.
9. Ferrante, S., S. Guerrero, and S. M. Alzamora. 2007. Combined use of ultrasound and natural antimicrobi-

als to inactivate *Listeria monocytogenes* in orange juice. J. Food Prot. 70:1850–1856.
10. Hsieh, P. C., J. L. Mau, and S. H. Huang. 2001. Antimicrobial effect of various combinations of plant extracts. Food Microbiol. 18:35–43.
11. Ibrahim, S.A., M. M. Salameh, S. Phetsomphou, H. Yang, and C. W. Seo. 2006. Application of caffeine, 1,3,7-Trimethylxanthine, to control *Escherichia coli* O157:H7. Food Chem. 99:645–650.
12. Ibrahim, S. A., H. Yang, and C. W. Seo. 2008. Effect of lactic acid alone or in combination with copper on the survival and growth of *E. coli* O157:H7 and *Salmonella* in carrot juice. Food Chem. 101:137–144.
13. Jain, M. K., and R. Apitz-Castro. 1987. Garlic: molecular basis of the putative "vampire-repellant" action and other matters related to heart and blood. Trend Biochem. Sci. 12: 252–254.
14. Mau, J. L., C. P. Chen and P. C. Hsieh. 2001. Antimicrobial effect of extracts from Chinese chive, cinnamon, and corni fructus. J. Agric. Food Chem. 49:183–188.
15. Mutamba, O. Z., S. A. Ibrahim, C. W. Seo, M. M. Salameh, and H. Yang. 2007. Antimicrobial effect of lactic acid alone or in combination with caffeine and copper on growth of *Escherichia coli* O157: H7 in laboratory media. IFT Annual Meetings and Food Expo. Abstract No. 89D-11.
16. Puglisi, M. P., S. Engel, and P. A. Jensen. 2007. Antimicrobial activity of extracts from Indo-Pacific marine plants against marine pathogens and saprophytes. Mar. Biol. 150: 531–540.
17. Rodgers, S. L., and E. Ryser. 2004. E. Reduction of microbial pathogens during apple cider production using sodium hypochlorite, copper ion, and sonication. J. Food Prot. 67: 766–771.
18. Thongson, C., P. M. Davidson, W. Mahakarnchanakul, and J. Weiss. 2004. Antimicrobial activity of ultrasound-assisted solvent-extracted spices. Lett. Appl. Microbiol. 39:401–406.
19. Zaika, L.L. 1988. Spices and herbs: their antimicrobial activity and its determination. J. Food Safety 9: 97–118.

3-A Sanitary Standards, Inc.
Regulatory Sanitarian Travel Assistance

In FY 2009, 3-A SSI will create a new fund for Regulatory Sanitarian Travel Assistance. The purpose of the fund will be to provide financial assistance for regulatory sanitarians to attend the annual 3-A SSI education program and to participate in the related Working Group meetings.*

The total amount of travel assistance support for FY 2009 is $5,000. Any unexpended funds in 2009 cannot be carried over to a successive year.

Administration and Disbursement of Travel Assistance

- 3-A SSI will announce the availability of the Travel Assistance to the regulatory sanitarians by communication with the Chair of the CSP, voting members of the sanitarians on the 3-A SSI Board of Directors, and other representatives.
  - The CSP, or representatives designated by the regulatory sanitarians, will be responsible for promotion of the travel assistance support to members of the regulatory sanitarian community.
- The Chair of the CSP, Don Wilding (State of Illinois) will receive requests for Travel Assistance and will convey requests for Travel Assistance to 3-A SSI. Requests should be sent to: Don.Wilding@Illinois.gov. The purpose for this requirement is to help assure that the requests of all eligible applicants are properly evaluated and supported by peers in the regulatory sanitarian interest group. 3-A SSI will not provide Travel Assistance for a regulatory sanitarian unless specified in writing by the representative so designated by the regulatory sanitarian interest group.

Guidelines on Recommendation of Candidate for Travel Assistance

- The applicant for Travel Assistance is solely responsible for determining whether such assistance may be accepted in accordance with all pertinent rules and regulations of the organization in which they are employed.
- The amount of travel assistance per individual shall not exceed $1,000.00. The travel assistance shall be used for transportation and hotel lodging expenses only (not food or other meeting expenses).
- Travel assistance will be limited to one regulatory representative per state. The applicant should be a member of IAFP (or be allowed to join at time of application).
- The body responsible for the recommendation of candidates for travel assistance should promote participation in 3-A SSI by those who would not otherwise be able to participate in the annual education program and Working Group meetings except through this travel support.

*The 3-A SSI 2009 Education Program and Annual Meeting will be held May 18–22 at the Wyndham Milwaukee Airport Hotel & Convention Center in Milwaukee, Wisconsin. For general program information, see the 3-A SSI Web site www.3-a.org under News & Events, or go to http://www.3-a.org/news/releases/10-1-08_edu_annual_meeting2009.html.

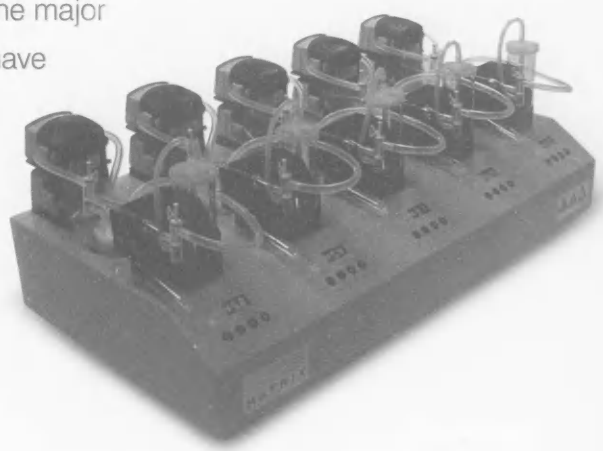
CURRENT PCR USER?
OR WANT TO BE A PCR USER?
YOU CAN SAVE 60% OF COSTS IMMEDIATELY!

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

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

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

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



MATRIX
MICROSCIENCE

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

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

International Association for Food Protection®

2009–2010 Secretary Election

The following page contains biographical information for the 2009–2010 Secretary Candidates. This information is provided to help you make your selection of the next IAFP Secretary.

Members with valid E-mail addresses will receive election notices and a unique personal identification number via E-mail from IAFP's election service provider. Members without E-mail addresses, or invalid E-mail addresses, will be sent their unique personal identification number via postal service. Voting will take place on a Web site hosted by Survey & Ballot Systems (SBS), an independent, external organization who is conducting the IAFP election. Safeguards are in place to insure each Member votes only once.

The election Web site will be open from January 28 to March 17. Election results will be reported directly from SBS to the IAFP Teller who will report directly to President Stan Bailey. Watch for the election results on the IAFP Web site in April and also in the April *IAFP Report* and the May issue of *Food Protection Trends*.

If you have questions about the election process, contact David W. Tharp, CAE, Executive Director at 800.369.6337; 515.276.3344 or E-mail dtharp@foodprotection.org.

MARK A. MOORMAN

KATHERINE M.J. SWANSON

DR. MARK A. MOORMAN

Battle Creek, Michigan

Dr. Mark A. Moorman is the Senior Director of Food Safety and Food Chemistry for Kellogg Company located in Battle Creek, Michigan, with responsibilities for the safety of the global portfolio of Kellogg products. His responsibilities involve leading teams developing food safety and chemistry programs and providing technical expertise.

Dr. Moorman has 20 years of industry experience in microbiology and food safety. Beginning his career as a chemistry supervisor at Silliker Laboratories in Illinois, he was responsible for developing a microbial metabolites laboratory that analyzed food and ingredient samples for the presence of bacterial or fungal metabolites and/or toxins. Subsequent positions as laboratory director in California and then technical director in Illinois afforded many opportunities to investigate microbiological quality and safety of foods in a wide range of industries. In these positions, Dr. Moorman learned the importance of laboratory quality programs and the science of analytical testing. Through investigative and auditing work as technical director, he learned the breadth of quality and safety programs needed to assure safe and wholesome foods. After nearly 10 years at Silliker Laboratories, Dr. Moorman had the privilege to join Kellogg Company as a manager of microbiology.

Throughout his career, Dr. Moorman has provided scientific leadership by developing programs that prevent hazards in foods including allergens and pathogenic microorganisms. Dr. Moorman has been active serving in leadership roles in technical associations serving the food industry and their consumers. Dr. Moorman is a member of the Board of Directors for Food Allergy Research and Resource Program (FARRP) and is a frequent speaker at their food industry workshops, serves on the International Life Sciences (ILSI) Food Microbiology Committee and serves as Chairman of the Grocery Manufacturers Association (GMA) Microbiological Safety Committee. He is also past Chairman of the American Frozen Foods Institute (AFFI) Microbiology Committee.

Since 1994, Dr. Moorman has been a proud and active member of IAFP and has served as Chairman of the Food Hygiene and Sanitation Professional Development Group (PDG) and worked to form and ultimately serve as Chairman of the Food Chemical Hazards and Food Allergy PDG.

Dr. Moorman earned his undergraduate degree in Microbiology and his M.S. and Ph.D. degrees in Food Science from Michigan State University. He had the honor of receiving the 2006 Outstanding Alumni Award from the Department of Food Science and Human Nutrition at Michigan State University.

Rarely does a career materialize without the gift of wise counsel, support and friendship of individuals willing to turn back and lend a hand to the next generation. For the past 15 years, Dr. Moorman has had the honor of being mentored by Dr. John Silliker, a pioneer in the field of food microbiology. The IAFP Board provides the venue for Dr. Moorman to support the association, its membership and offer a hand to the next generation of food safety professionals.

DR. KATHERINE M.J. SWANSON

St. Paul, Minnesota

Dr. Katherine M.J. Swanson is Vice President of Food Safety at Ecolab Inc., where she identifies control strategies for emerging food safety concerns and assists customers with high level food safety issues. Prior to joining Ecolab in 2004, Dr. Swanson was Director of Global Product Safety at General Mills, responsible for microbiology, thermal process, toxicology, food allergen, and non-food premium support worldwide. As Director of Microbiology & Food Safety for The Pillsbury Company, Dr. Swanson restaged their world-class HACCP program to meet regulatory requirements around the world. She also developed food allergen training for R&D and operations, managed electronic specification systems, oversaw food quality audits, and developed corporate product quality management systems. Earlier in her Pillsbury career, Dr. Swanson conducted microbiological research on fresh and frozen vegetables, bakery products, canned foods, fish, and pizza. Prior to joining Pillsbury, Dr. Swanson was a senior microbiologist at 3M, where she developed food applications for innovative microbiological test methods. She was also an Assistant Professor of Food Microbiology at Cornell University.

With a long history of appointments on influential committees, Dr. Swanson has made significant contributions to food safety. She is a member of the International Commission on Microbiological Specifications for Foods (ICMSF), and chairs their editorial committee. As a seven-year member of the National Advisory Committee on Microbiological Criteria for Foods (NACMCF), Dr. Swanson contributed to reports on HACCP principles, Redefinition of Pasteurization, Safety-Based Shelf-Life Labeling, Fresh Produce, Sprouted Seeds, Evaluation of NSF Standard 75, Codex Pasteurized Milk Products, and others. Dr. Swanson is a Fellow of the Institute of Food Technologists (IFT) and completed a three-year term on the IFT Board of Directors in 2008. She served on the IFT Panel that addressed redefinition of Potentially Hazardous Foods, which shaped changes in the Food Code. Dr. Swanson also served on the Food and Drug Administration's Science Advisory Board, the Conference for Food Protection's Council III, and currently serves on the National Academy of Science's Standing Committee for the Review of Food Safety and Defense Risk Assessments, Analyses, and Data. Dr. Swanson has published and presented on food safety management, microbial ecology of vegetable and cereal products, norovirus, *Bacillus cereus,* and *Listeria monocytogenes*, and in the last five years alone has delivered over 50 invited presentations around the world.

Since joining in 1980, Dr. Swanson has enthusiastically served IAFP. She was on the *Journal of Food Protection* Editorial Board for eleven years (1988-99) and the *Food Protection Trends* Editorial Board for three years (2005–07). She was also an active member of the Organizing Committee for the very successful 2008 IAFP Latin America Symposium on Food Safety held in Campinas, Brazil. Dr. Swanson was a past jury member for the Black Pearl Award and has presented numerous papers at IAFP Annual Meetings.

Dr. Swanson received her B.S. degree in Dietetics from the University of Delaware, and her M.S. and Ph.D. degrees in Food Science from the University of Minnesota. She has received numerous awards, including the 2003 NFPA (now GMA) Food Safety Award and the 2008 National Center for Food Safety and Technology Food Safety Award.

NEW MEMBERS

BRAZIL

Karen S. Pereira
Universidade Federal Do Rio De Janeiro
Rio De Janeiro

Anderson Santana
University of São Paulo
São Paulo

Gabriela N. Vicosa
Universidade Federal De Vicosa
Vicosa, Minas Gerais

CANADA

Alysson H. Blaine
CanBiocin, Inc.
Edmonton, Alberta

Janet Eng
Eleven Foodgroup
Richmond, British Columbia

Angel Mehta
Toronto, Ontario

Blaise Ouattara
Canadian Meat Council
Ottawa, Ontario

Oscar Rodriguez Gonzalez
Canadian Research Institute for Food Safety
Guelph, Ontario

Heidi Schraft
Lakehead University
Thunder Bay, Ontario

Joseph J. Yun
Parmalat
Toronto, Ontario

CYPRUS

Christoforos A. Christoforou
Castconsult
Strovolos

GERMANY

Helmut Steinkamp
German Institute of Food Technologies
Quakenbruck

JAPAN

Tomomi Hata
Asama Chemical Co., Ltd.
Tokyo

MEXICO

Helena F. Morales
The Hershey Co.
General Escobedo, Nuevo Leon

NEW ZEALAND

Cristina Cruz
Plant and Food Research
Sandringham, Auckland

PHILLIPINES

Gabriel M. Salazar
Sterix Incorporated
Muntinlupa, Metro Manila

PORTUGAL

Luis Patarata
UTAD
Vila Real

SPAIN

Antonio Galvez
University of Jaen
Jaen

Lluis Palou
IVIA
Montcada, Valencia

THAILAND

Aumnart Thongchai
Chiengmai University
Chiang Mai

UNITED STATES

ALABAMA

Traci Robinson
Jefferson Co. Dept. of Health
Birmingham

CALIFORNIA

Carrie M.H. Ferstl
Food Safety Net Services
Fresno

COLORADO

Jessica L. Corron
Colorado State University
Fort Collins

DISTRICT OF COLUMBIA

Patty A. Bennett
FSIS–USDA
Washington

IDAHO

Tiffani L. Zemmer
University of Idaho
Moscow

ILLINOIS

Carl Caneva
Evanston Health Dept.
Evanston

Mindi R. Manes
University of Illinois at Chicago
Chicago

Ravinder Reddy
US FDA
Summit-Argo

Steven A. Roach
Food Animal Concerns Trust
Chicago

LOUISIANA

Fei Wang
Louisiana State University
Baton Rouge

NEW MEMBERS

MARYLAND

Rebecca Buckner
US Food and Drug Administration
Silver Spring

MINNESOTA

Sandra R. Zinn
Silliker, Inc.
Minnetonka

NEBRASKA

Maria E. Perez-Munoz
University of Nebraska–Lincoln
Lincoln

Tara K. Stiles
University of Nebraska–Lincoln
Lincoln

NORTH CAROLINA

Jeffrey A. Knight
Union Co. Environmental Health
Monroe

OHIO

Donald L. Barrett
Giant Eagle, Inc.
Canal Winchester

OKLAHOMA

William Quimby
Lopez Foods, Inc.
Oklahoma City

PENNSYLVANIA

Susan A. Landis
Dietrich's Milk Products
Reading

Ed J. Lucko
H.J. Heinz
Gibsonia

TEXAS

Jia-Ching Li
J.O.Y. Foods, Inc.
Dallas

Rudy M. Mendoza
Compass Group NAD
Sachse

WASHINGTON

Sid N. Jhaveri
Starbucks Coffee Co.
Seattle

WISCONSIN

Lori Healey
Andes Candies
Delaven

Daniel Pelgrin
Danisco Inc.
Verona

VIETNAM

Luu Tuan Ngoc
Hanoi

WHAT'S HAPPENING IN FOOD SAFETY

Recall of Products Containing Peanut Butter: *Salmonella* Typhimurium

A combination of epidemiological analysis and laboratory testing by state officials in Minnesota and Connecticut, the Food and Drug Administration (FDA), and the Centers for Disease Control and Prevention (CDC) have enabled FDA to confirm that the sources of the outbreak of illnesses caused by *Salmonella* Typhimurium are peanut butter and peanut paste produced by the Peanut Corporation of America (PCA) at its Blakely, Georgia processing plant.

Peanut butter is sold by PCA in bulk containers ranging in size from five (5) to 1,700 pounds. The peanut paste is sold in sizes ranging from 35-pound containers to product sold by the tanker container. Neither of these products is sold directly to consumers.

However, through its investigation, FDA has determined that PCA distributed potentially contaminated product to more than 70 consignee firms, for use as an ingredient in hundreds of different products, such as cookies, crackers, cereal, candy and ice cream. Companies all over the country that received product from PCA have issued voluntary recalls of their products. FDA has created a searchable database for these products, which can be found at http://www.accessdata.fda.gov/scripts/peanutbutterrecall/index.cfm. Identification of products subject to recall is continuing and this list is updated frequently.

Product recalls now include some pet food products that contain peanut paste that was made by PCA. While the risk of animals contracting salmonellosis is minimal, there is risk to humans from handling these products. It is important for people to wash their hands, and make sure children wash their hands, before and, especially, after feeding treats to pets. Further information for consumers is located in the Frequently Asked Questions section of the FDA Web site. The pet food products are also included in the searchable data base of recalled products.

Major national brands of jarred peanut butter found in grocery stores are not affected by the PCA recall.

FDA and CDC recommendations for consumers include:

- Do not eat products that have been recalled and throw them away in a manner that prevents others from eating them.
- To determine if commercially-prepared or manufactured peanut butter/peanut paste-containing products (such as cookies, crackers, cereal, candy and ice cream) are subject to recall, consumers are urged first to visit FDA's Web site and check the searchable database of recalled products.
- For information on products containing peanut butter from companies not reporting recalls, consumers may wish to consult the company's Web site or call the toll-free number listed on most packaging. Information consumers may receive from the companies has not been verified by the FDA.
- If consumers cannot determine if their peanut butter, peanut butter/peanut paste-containing products or institutionally-served peanut butter contains PCA peanut butter/peanut paste, FDA recommends that they do not consume those products.
- Persons who think they may have become ill from eating peanut butter are advised to consult their health care providers.

Expert Panel Announced for NSF's 2009 Food Safety Leadership Awards Program

NSF International has announced the expert panel of jurors for its 2009 Food Safety Leadership Awards (FSLA) Program, which will be held at the 2009 Food Safety Summit in Washington, D.C. This awards program recognizes individuals and organizations that demonstrate exceptional leadership in foodservice safety.

The Food Safety Summit will be held April 27–29, 2009, with the award winners to be announced during the opening reception at the Washington, D.C. Convention Center on April 27.

"For over six decades, NSF International has strived to be a leader in the food safety industry. The Food Safety Leadership Awards, now in its sixth year, is our opportunity to recognize those individuals and organizations that have joined us in our efforts to protect and improve public health and food safety," said Anna Schmitt-Reichert, NSF director of corporate communications.

The expert juror panel that will select the winners includes other industry leaders:

Mary Adolf, former president and chief operating officer, National Restaurant Association Education Foundation.

John Farquharson, founder and president of the International Food Safety Council, executive emeritus for ARAMARK Corporation, 2004 FSLA Lifetime Achievement Award Winner.

Ernest Julian, Ph.D., chief of the Office of Food Protection for the Rhode Island Department of Health, past chair of the Council of Public Health Consultants for NSF International.

Ellen Laymon, staff supervisor for the Oregon Department of Agriculture Food Safety Division and member of the AFDO board. Ms. Layman has also served on the Western Association of Food and Drug Officials Board of Directors as liaison to the AFDO Board of Directors.

Vickie Lewandowski, President Elect, International Association for Food Protection (IAFP), associate principal microbiologist for Kraft Foods Global Inc.

Jim Mann, founder of the Handwashing Leadership Forum® and creator of Handwashing for Life,® winner of the 2005 FSLA Lifetime Achievement Award for Service.

Donald Schaffner, Ph.D., extension specialist in Food Science and professor at Rutgers University, Member of the International Association for Food Protection (IAFP), the Institute of Food Technologists, the Society for Risk Analysis and the American Society for Microbiology.

David M. Theno, Ph.D., CEO of Gray Dog Partners, Inc. Foods Consulting Business, former senior vice president of quality and logistics for Jack-in-the-Box and member of the US Department of Agriculture (USDA) National Advisory Committee on microbiological criteria for foods. Jack-in-the-Box was awarded the 2005 FSLA Award for Systems Improvement.

Ewen C.D. Todd, Ph.D., director of the Food Safety Policy Center at Michigan State University, professor at MSU's National Food Safety Toxicology Center, former director of the National Food Safety and Toxicology Center, chair of the Committee on Control of Foodborne Illness of the International Association for Food Protection (IAFP).

Frank Yiannas, MPH, vice president of food safety, Wal-Mart Stores, Inc.; former director of Safety Health, Walt Disney World Co.; former president, International Association for Food Protection (IAFP), recipient of the 2007 FSLA Lifetime Achievement Award.

For additional information about the awards program, please visit http://www.nsf.org/business/newsroom/fs_awards.asp.

3-A SSI Announces New Public List of 3-A Symbol Holders

3-A Sanitary Standards, Inc. (3-A SSI) announces new public information on current 3-A Symbol holders to assist regulatory sanitarians, processors, equipment fabricators, and other interested parties. The list of current 3-A Symbol licensees, now available on the 3-A SSI web site, is important public information because it shows all equipment that conforms to 3-A Sanitary Standards for dairy and food processing equipment and meets provisions of the 3-A Symbol program.

"This information is more valuable today than ever for inspection authorities, equipment fabricators and users," according to 3-A SSI Executive Director Tim Rugh. "Concern about food safety extends to every part of the chain, including the sanitary design of processing equipment. The 3-A Symbol is a respected and reliable means to help assure everyone concerned that the equipment conforms to the appropriate 3-A Sanitary Standards," he said.

The value of the 3-A Symbol in the marketplace was enhanced by the Third Party Verification (TPV) inspection requirement instituted in 2003 as a requirement for 3-A Symbol authorization. The TPV requirement moved 3-A Symbol authorization away from an era of self-certification. Between 2003 and the end of 2007, approximately 520 TPV inspections were completed for equipment fabricated in the US and 22 other countries around the world, according to 3-A SSI. The inspections must be renewed every five years to maintain a 3-A Symbol authorization, whenever equipment nonconformance is found, or if there is a significant change in materials or manufacturing processes.

Since 1956, the 3-A Symbol has been used to identify equipment that meets 3-A Sanitary Standards for design and fabrication. Voluntary use of the 3-A Symbol on dairy and food equipment assures processors that equipment meets sanitary standards, provides accepted criteria to equipment manufacturers for sanitary design, and establishes guidelines for uniform evaluation and compliance by sanitarians.

3-A SSI maintains the list of current 3-A Symbol licensees and a separate list of discontinued 3-A Symbol holders. The lists of current and discontinued 3-A Symbol holders are available on the 3-A SSI Web site at http://www.3-a.org/symbol/holders_list.html. The discontinued symbol holders list shows the reason for discontinuation, such as the equipment is no longer in production, the equipment was consolidated in another 3-A Symbol authorization resulting from

a change in company ownership, or the failure of the holder to maintain the authorization in accordance with the terms and conditions for use of the 3-A Symbol.

Tom Vilsack Confirmed as USDA Secretary

On January 20, the Senate quickly approved six members of President Barack Obama's Cabinet, including Tom Vilsack as Secretary of Agriculture,

President Obama's nomination of former Iowa Governor Tom Vilsack to be the 30th Secretary of Agriculture has been applauded by many industry leaders including the current US Secretary of Agriculture, Ed Schafer. Mr. Schafer cited the former governor's experience in agricultural issues and he expressed confidence in Mr. Vilsack's ability to effectively continue USDA's success in expanding America's agricultural economy.

"USDA plays an integral role in supporting our agricultural economy and working on behalf of America's farmers and ranchers," Mr. Schafer said. "I am confident that Tom Vilsack's background and experience will help him continue the progress we have made here."

J. Patrick Boyle, president and CEO of the American Meat Institute, told MEATPOULTRY.COM: "As a former governor of Iowa, Tom Vilsack knows first-hand the many issues facing the agriculture sector. As the new Secretary of Agriculture, he will be at the helm during a period of unequaled challenges and opportunities for the meat and poultry industry and we look forward to working with him on those issues."

Joel Brandenberger, president of The National Turkey Federation, congratulated Mr. Vilsack on behalf of all N.T.F. members. "Governor Vilsack led one of the most important agricultural states in the nation, and a state that has significant turkey production and processing," he said. "His background should give him a solid understanding of the dynamics of the turkey industry, which will be significant given the challenges facing our industry and all of animal agriculture."

"Governor Vilsack has a distinguished record of public service in his home state, and we look forward to working with him as Secretary of Agriculture," George Watts, president of National Chicken Council, relayed to MEATPOULTRY.COM.

The National Pork Producers Council, based in Mr. Vilsack's home state of Iowa, also congratulated Mr. Vilsack on his nomination.

"Tom Vilsack knows production agriculture and the pork industry and will make a good secretary of agriculture," said N.P.P.C. President Bryan Black, a pork producer from Canal Winchester, Ohio. "US pork producers look forward to working with him as he tackles issues of importance to the US hog industry, including trade agreements, animal identification, energy and environmental issues and livestock production matters."

US Meat Export Federation President and CEO Phil Seng, an Iowa native, relayed to MEATPOULTRY.COM, "Governor Vilsack's experience leading a state that is such a large producer of grain and livestock should give him an excellent perspective on the critical importance of agricultural exports. U.S.M.E.F. looks forward to working with him to expand market access and continue the momentum of US exports."

A spokesman from the National Cattlemen's Beef Association said: "We appreciate that President-elect Obama chose to nominate a Secretary of Agriculture who has worked closely with agricultural producers during his time as governor of Iowa."

"Governor Vilsack understands that America's farmers and ranchers feed our nation and provide significant contributions to our economy," he added. "We've been consistently assured that decisions in the Obama Administration will be made based on sound science with a view of the economic impacts of the policy in question. We appreciate that commitment and look forward to sharing the facts about beef and beef production with Mr. Vilsack and other agriculture policy advisors to the President."

Mr. Vilsack was of counsel in the Des Moines, Iowa office of the Minneapolis-based law firm Dorsey & Whitney.

Jennifer J. Quinlan Named Fulbright Scholar for 2008–2009

Jennifer J. Quinlan's Fulbright is hosted by Corvinus University, Faculty of Food Science in the Department of microbiolgy, in Budapest, Hungary. There she will teach food microbiology and nutrition courses, as well as work with faculty at Corvinus as they start new MSc programs as part of their structural reorganization. In addition to teaching, she will be an active member of the department of microbiology and biotechnology, serving as a member of student research committees in order to become familiar with ongoing research at Corvinus.

Ms. Quinlan's current research at Drexel focuses on the differing risks of foodborne illness experienced by demographically-distinct populations, which vary in how they access and use the food supply. She anticipates that the Fulbright experience will "expand my horizons and provide avenues for further work as I continue to develop my research program."

Dr. Quinlan received her Ph.D. in food science from North Carolina State University and her B.S. and

M.S. from Rutgers University. She served as chief microbiologist for the NC Dept. of Agriculture prior to coming to Drexel in 2003.

Dr. Quinlan has been a member of IAFP since 1994.

3-A SSI Opens Nominations for 2009 Volunteer Service Awards

3-A Sanitary Standards, Inc. (3-A SSI) announces the opening of nominations for its 2009 Volunteer Service Awards program to recognize the extraordinary dedication and commitment of individuals who contribute to the development of voluntary standards and the mission of 3-A SSI. The three annual awards constitute a highly visible and significant form of recognition for the outstanding service of individuals to the advancement of 3-A SSI.

The 3-A SSI awards include the following:

- The Leadership Service Award is presented to an individual or group who demonstrates a record of significant contribution to 3-A SSI voluntary standards development and who has demonstrated outstanding service in enabling 3-A SSI to attain its objectives. Accomplishments may include leading a major new activity, reducing the cycle time of development, revitalizing a 'dormant' activity or other outstanding service.
- The 3-A SSI Advancement Award honors outstanding accomplishments performed by any individual or group on behalf of 3-A SSI, such as advancing the use or industry recognition of 3-A Sanitary Standards or 3-A Accepted Practices.
- The Next Generation Award honors an individual who has been engaged in 3-A SSI standards development activities for less than five years and has demonstrated leadership, dedication and significant contributions to the development of 3-A Sanitary Standards or 3-A Accepted Practices.

According to 3-A SSI Executive Director Tim Rugh, "3-A SSI relies on a network of engaged and committed volunteers to forge consensus on the voluntary standards and practices and we should all recognize the immense contribution they make to this organization and to the goal of advancing public health."

More details on the new program and a Nomination Form are available on the 3-A SSI Web site at www.3-a.org under News & Events or go directly to http://www.3-a.org/news/index.html. The deadline for 2009 nominations is April 10, 2009. Awards will be presented at the 3-A SSI Annual Meeting on May 20, 2009 in Milwaukee, WI.

ASQ Receives Award for Education and Training System

The American Society for Quality (ASQ) has been recognized by the Learning Resources Network (LERN) for work on its new education and training system. The winning entry was included in a showcase of internationally exemplary programs at the LERN Annual Convention in San Francisco, CA, November 16–18.

Honored for excellence in the Management Practice category, the entry highlighted the education and training system's revolutionary design. Deputy Regional Director Neal Kuhn and ASQ Past President Jerry Mairani accepted the award on behalf of ASQ at a luncheon at the Hyatt Regency in San Francisco on November 17.

"This award is a testament to the hard work and dedication of the project teams involved with creating this extraordinary new system," said Roberto Saco, ASQ president. "With this system we will change the way quality professionals and practitioners seek their education needs."

Julie Coates, vice president of information services for LERN, said that this year's award nominees were among the highest quality ever submitted. The primary criterion judges used was the quality of being at the leading edge of the field of lifelong learning, as evidenced by their nomination. In addition, judges also applied the following criteria: originality, innovation, appropriateness as a model for other programs, replicability and measurable outcomes. "The awards selection process is very competitive, and it is truly an honor to be selected," Ms. Coates said.

Quantas Analytics Accredited According to ISO 17025

Quantas, a test laboratory located at the Technopol Tulln in Lower Austria, was accredited for the analytics of fungal toxins in grains and grain products.

The analytical procedures at Quantas Analytics meet highest quality standards. This was confirmed within an accreditation process conducted by the Federal Ministry of Economics and Labour of the Republic of Austria.

Quantas was granted the certificate after an extensive accreditation process according to ISO 17025. In the course of a preceding audit evaluators reviewed on site laboratory processes, interviewed employees and checked documenta-

tion. Accreditation was received for analysis of the most relevant fungal toxins (mycotoxins) in grains and grain products.

Quantas Analytics was founded in 2005 as a spin-off of the IFA Tulln, a Department of the University for Life Sciences in Vienna, and Romer Labs, an international food safety company. Quantas is located at the Technopol Tulln and staffed with six employees providing analytical services. In addition to mycotoxin analysis, determination of undesirable contaminants like genetically modified organisms (GMO) and allergens in food and feed is offered. Most recently the analysis of melamine was established, the substance that caused one of the largest food scandals in China several months ago, when baby and infant formula were supplemented with this highly toxic chemical. The accreditation certifies that quality management at Quantas Analytics meets highest reliability and safety standards.

Within the international comparability and consistent traceability have become relevant in many areas, particularly in analytical services. The main standard used in testing and calibration laboratories is ISO/IEC 17025, which was issued by the International Organization for Standardization in 2000 and covers two main sections: management requirements and technical requirement. While management requirements are primarily related to the operation and effectiveness of the quality management system within a laboratory, technical requirements address methodologies used, test equipment and the competence of staff. Accreditation according to ISO/IEC 17025 is the formal recognition of fulfillment of these requirements by an official accreditation body, which is the Federal Ministry of Economics and Labour in Austria. This accreditation is internationally recognized.

One to two kg of a representative food or feed sample is required for analysis. Turnaround time at Quantas is usually six days from receiving a sample until a test certificate is provided. Upon request express service can be offered.

Q Laboratories, Inc. Names Meghan McDonough to Microbiology Group Leader Position

Meghan McDonough has been promoted to Microbiology group leader Q Laboratories, Inc.

Ms. McDonough has worked as a microbiologist at Q Laboratories, Inc. since February 2007. As microbiology group leader, Ms. McDonough will be responsible for organizing and scheduling the work load of the section, and assuring that projects are accomplished in a timely and scientifically sound manner. Other responsibilities will be to monitor quality control records, assure that proper records are maintained and studies are conducted in compliance with established standard operating procedures.

Walmart's Jack Sinclair Elected to FMI Board

Food Marketing Institute (FMI) has announced the election of Jack Sinclair, executive vice president of the grocery division for Walmart Stores Division, to the FMI Board of Directors.

Walmart Stores, Inc., operates Walmart discount stores, supercenters, Neighborhood Markets and Sam's Club locations in the United States and around the world.

Mr. Sinclair joined Walmart in January 2008 and works to integrate planning, category management, store experience and private brand development into the grocery business unit.

He began his career as a trainee at Shoppers' Paradise in the United Kingdom (UK). He also worked for Tesco and Safeway, PLC. He served on the Board of Directors at Safeway, PLC, during its merger with Morrisons, creating the UK's fourth largest supermarket group. He served as the European development director for SB Capital. Sinclair joined Walmart from McCurrach, a UK-based field merchandising business.

Mr. Sinclair earned a bachelor's degree in economics and marketing from the University of Strathclyde, Glasgow, Scotland.

Aquionics Appoints New Vice President

UV disinfection specialist Aquionics has appointed Oliver Lawal as its new vice president. Having worked in the US, UK and Germany, Oliver has over ten years global knowledge of UV products and applications. In this new role he will work with existing product lines from Aquionics and its two sister companies, Berson UV-techniek in the Netherlands and Hanovia Limited in the United Kingdom, as well as overseeing the development of new product lines and applications.

He joins Aquionics from ITT-WEDECO, where he most recently served as director of engineering, responsible for new development. During his time with WEDECO he was responsible for project managing many large UV installations, including a UV wastewater treatment installation, in Manukau, New Zealand.

Oliver holds a bachelor's degree in integrated engineering systems from Manchester University

in the United Kingdom, is a chartered engineer and member of the Institution of mechanical engineers (UK). He also actively serves on a number of industry committees, including the International Ultraviolet Association, where he chairs the Manufacturers' Council, the American Water Works Association UV Standards Committee, and the Water Environment Federation's Disinfection Committee.

Accugenix Announces New CEO and President, Retains Former as R&D Vice President

Former COO Roger Nalepa has taken the reins and former CEO Doug Smith refocuses on R&D. Accugenix, Inc. has publicly announced the promotion of Roger Nalepa, to the position of CEO and president, and the reassignment of Doug Smith to vice president of research and development. Specializing in genetic microbial identification, the Delaware-based DNA sequencing lab described the recent reorganization as rejuvenation for both its strategic leadership and its exemplary cutting-edge technology.

"Doug and I have changed roles to command positions that capitalize on our strengths to further drive the business," said Mr. Nalepa, whose extensive 30-year history of management experience includes executive-level positions at Hewlett Packard and Agilent Technologies.

"Doug's entrepreneurship and technical expertise have made him a leader in cutting-edge technology, whereas my management and international leadership experience have prepared me to coordinate our people to deliver our objectives and strategic vision."

As CEO, Mr. Naiepa will provide strategic leadership for the company, working with the Board of Directors (presided over by chairman Mark Martin) and the executive management team to establish long-range goals, strategies and policies. He will assume fiduciary responsibility for protecting shareholder interests, and publicly represent Accugenix in the community. As R&D VP, Mr. Smith will direct all activities related to building the research and development function and its strategic direction. He will establish R&D initiatives for improving DNA sequencing assays, bacterial and fungal identification libraries, cost, and on-time delivery, continually innovating solutions to customer problems.

American Frozen Food Institute Names Kraig R. Naasz as New President and CEO

The American Frozen Food Institute has announced the selection of Kraig R. Naasz as its new president and CEO. Mr. Naasz took leadership of the organization February 1, 2009.

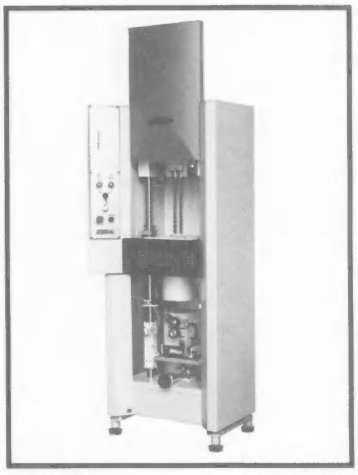
Mr. Naasz currently serves as senior advisor to Washington Advocates, a government affairs, communications and strategic consulting company with offices in Washington, D.C. and Bellevue, WA. Mr. Naasz previously served as president and CEO of the National Mining Association, where he secured enactment of the first major reform of the nation's mine safety laws in over 30 years and aided the mining industry in achieving its safest year ever in 2008.

Mr. Naasz's prior experience also includes service as president of The Fertilizer Institute, where he directed the industry's efforts to address security concerns stemming from the Oklahoma City bombing; and as president and CEO of the US Apple Association, where he garnered over $550 million in federal assistance for financially-strapped apple growers and processors. Earlier in his career, he also worked as vice president of the Northwest Horticultural Council and as an aid to former US Senators Slade Gorton and Daniel J. Evans, as well as Congressmen Sid Morrison and Rod Chandler and the House Committee on Agriculture.

An active member of several key groups that advocate for business in the nation's capital, Mr. Naasz is a member of the US Chamber of Commerce Association Committee of 100 and the Business-Industry Political Action Committee (BIPAC). He also belongs to the American Society of Association Executive's Key Industry Associations Committee, chairs the National Energy Foundation and is a director of the US Energy Association.

Mr. Naasz is an honors graduate of Washington State University, with a bachelor of arts degree in history, and serves as a trustee of the WSU Foundation.

INDUSTRY PRODUCTS



ATS RheoSystems

New Capillary Rheometer from ATS RheoSystems

RHEOLOGIC and Smart RHEO are technically advanced laboratory capillary rheometers on the market for the determination of the flow behavior of a wide range of materials. Both floor and bench top models are available with single and dual bore capabilities.

The computer controlled instruments offer testing abilities to measure shear viscosity, extensional viscosity, wall slip, melt fracture and rupture with a variety of dies and accessories.

The capillary rheometer system features a two level software interface which offers standard test control functionality as well as scientific evaluation capabilities for a better understanding of the data.

Also featured are Extensional Viscosity Measurement by convergent flow, hyperbolic die or precision melt strength system with optional extrudate profile measurement. In addition, high temperature uniformity is maintained across the entire sample.

The ergonomic design of this unit allows easy access and experimentation.

ATS RheoSystems
609.298.2522
Bordentown, NJ
www.atsrheosystems.com

DuPont Qualicon BAX® System *Salmonella* Assay Now Certified by AOAC for Environmental Testing

Food processors who already rely on the BAX® system from DuPont Qualicon as a certified method for detecting *Salmonella* in their end products and ingredients can now use the same polymerase chain reaction (PCR) assay to monitor their production environments.

Validation studies comparing the BAX® system to traditional culture methods for detecting *Salmonella* on stainless steel, concrete and other surfaces found that the BAX® system demonstrated the same level of accuracy but shaved days off the time to result. Based on those studies, AOAC Research Institute (Gaithersburg, MD) has extended their certification of the BAX® system *Salmonella* assay as a Performance Tested℠ method for use on environmental samples.

"The good news for customers, especially those who require certified methods, is that they can improve operational efficiencies while saving time and money by using a single, highly reliable test — the BAX® system *Salmonella* assay — for all sample types," said Kevin Huttman, president – DuPont Qualicon.

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 PCR assays, tableted reagents and optimized media to also detect *Salmonella*, *Listeria monocytogenes*, *E. coli* O157:H7, *Campylobacter*, and more. With certifications and regulatory approvals in the Americas, Asia and Europe, the BAX® system is recognized globally as the most advanced pathogen testing system available to food companies. DuPont Qualicon also markets the RiboPrinter® system, an automated method for identifying bacteria and pinpointing the contamination source.

DuPont Qualicon
800.863.6842
Wilmington, DE
www.qualicon.com

Thermo Fisher Scientific Solutions Successfully Identify Dioxins in Pork Products

Thermo Fisher Scientific Inc. has announced that its high-resolution gas chromatography mass spectrometry (GC/MS) solutions are suitable for dioxin analysis in foods. In light of public concern over the safety of food, particularly as a result of the Irish pork contamination, government agencies and food processors are selecting instruments that can accurately identify and contain the spread of dioxins in the global food supply.

On December 6, 2008, the Irish Government recalled all pork products made in the Republic of Ireland after the discovery of dioxins in slaughtered pigs. This was followed by an announcement from the Chinese government on

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

The publishers do not warrant, either expressly or by implication, the factual accuracy of the products or descriptions herein, nor do they so warrant any views or opinions offered by the manufacturer of said articles and products.

December 9 banning all imports of pork from Ireland after some of the meat was found to be contaminated with elevated levels of the chemicals. Dioxins are a group of chemicals formed during combustion processes, such as waste incineration and are known to increase the likelihood of cancer with long-term exposure.

The European Commission and the US EPA have set maximum levels for dioxins in food. Tests on some of the Irish pork products showed that they contained up to 200 times more dioxins than the recognized safety limit. The directives require limits of quantitation (LOQ) to be 80% lower than the lowest reported level in the US EPA Method 1613 Rev.B [3-7]. This requires more demanding detection limits, selectivity and sensitivity to confirm their presence along with tools that manage data and can detect problems earlier in the process.

The Thermo Scientific DFS High Resolution GC/MS (HRGC/HRMS system) achieves these lower levels of detection required with dioxins. Even difficult sample types with heavy matrix effects can be successfully analyzed. In addition, the Thermo Scientific TSQ Quantum GC can be employed to screen for dioxins. By identifying foods that do not contain dioxins, the number of samples that must be analyzed using HRGC/HRMS is reduced, significantly lowering the cost for laboratories to conduct these analyses.

Thermo Fisher Scientific Inc. capabilities in dioxin analysis and detection exemplify the technological capabilities of Thermo Fisher Scientific, while our commitment to food safety in terms of support and consulting will enable scientists to address these contamination issues as they occur.

The comprehensive Thermo Scientific offering includes a wide range of sample collection, sample preparation, instrumentation and data management products focused on the needs of food safety. In addition, a broad portfolio of chemicals, consumables and equipment and supply chain services are available through the Fisher Scientific brand.

Thermo Fisher Scientific Inc.
781.622.1000
Waltham, MA
www.thermofisher.com

Sun Chemical and Keating Specialist Cylinders Develop New Brand Enhancement Effects

Sun Chemical and Keating Specialist Cylinders have developed a concept which will enable brand owners to apply effects with sensory appeal to packaging cost-effectively without altering the standard design.

The concept, which is the result of several years of research and development, sees the application of Sun Chemical's specially developed inks utilizing a unique engraved gravure cylinder, produced by Keating Specialist Cylinders, printed onto a polypropylene film, which for the purposes of the development process has been supplied by Innovia. The resulting effect can be used in place of a standard filmic overwrap for carton boxes, containing products such as cosmetics, tobacco or confectionery, to add value to the product and increase shelf standout. This approach also gives brand owners more flexibility to run short-term promotions or seasonal themes using standard packaging, while saving costs on redesigns and wastage.

A key element of the solution is the development of a new technique to engrave cells which are considerably deeper than those found on traditional gravure cylinders, while maintaining a shallow gradient. This technology allows an image to be applied using a heavier ink weight than could be delivered using standard gravure cylinders. This in turn can give the printed film an embossed effect using the specially formulated inks, without the cost or technological challenges of physical embossing. The new ink and cylinder can be used with traditional gravure presses.

Tony Palmer, business director of Sun Chemical's packaging division, said: "Traditionally, if a brand owner wanted to launch a limited edition or seasonal design on their packaging, they would need to brief designers and print a new batch of packaging, which can be a time-consuming process. At the end of the range, there is often a substantial amount of waste packaging which can no longer be used. Using the innovative solution we have developed with Keating Special Cylinders, brand owners can add the limited edition or seasonal design to the film, which allows them to continue using their standard packaging."

"Taking the concept one step further, security taggants could also be added to the ink to provide a security and authentication solution, helping protect the product against counterfeiters. At this stage, there are a number of options for the direction we can take in order to develop this concept further and we are keen to work with printers, designers and brand owners to convert the concept into a commercial reality."

John Simms, technical sales director, Keating Specialist Cylinders, added, "Gravure printing has been the primary printing process in the packaging sector over the last 30 years. However, as brand owners and product manufacturers demand more shelf standout for their products, and other printing processes, such as flexo and digital become

more established in the packaging sector, it is necessary to look for new ways in which gravure can add value. Using this breakthrough technology, we are confident printers can offer their customers the 'X factor', as well as a cost-effective solution."

Sun Chemical Corporation
866.786.7276
Parsippany, NJ
www.sunchemical.com

Nilfisk GWD 120/220 Stainless Steel, Wet/Dry Vac is an Affordable, Durable Solution

Do you throw money away? Every year, food manufacturers waste money on inefficient short-lived wet/dry vacuums that aren't fit for the food industry. The Nilfisk GWD 120 and 220 wet/dry industrial vacuums with stainless steel tank is an affordable and durable vacuum that promises to last and last. Specifically designed for food manufacturers, plant workers can easily collect both wet and dry materials without having to stop to change out filters, helping save time and money.

Designed for heavy-duty use, the GWD 120 comes equipped with a single motor, while the GWD 220 has two for extra power. The high-powered bypass motors provide excellent performance, while maintaining low noise levels. An ergonomic "tip and pour" tank system also allows users to easily dispose of collected liquids. Other features and benefits include:

- Innovative float valve shuts off airflow when container is full
- Easy access to float basket and filters for cleaning and maintenance
- Adjustable handle for easy storage and
- Use 50-foot yellow safety cord

The GWD 120 and 220 industrial vacuum packages come standard with a set of 38 mm accessories. An upstream HEPA filter is also available for hazardous material pick-up (for wet collection, additional accessories are required).

Nilfisk CFM
800.645.3475
Malvern, PA
www.nilfiskcfm.com

Chemstar Corporation

Chemstar Concentrated Chemical Cartridges: Less Waste, Lighter Shipping, Big Savings

The old adage is true: good things come in small packages. In this case, it's a revolutionary new line of highly concentrated and powerful cleaning products that also happen to be better for the environment. Appropriately named, the Just Insert, Mix and Spray™ (J.I.M.S.™) system of concentrated chemical cartridges is an economical, convenient, and safe solution for the most challenging cleaning jobs.

The J.I.M.S.™ cartridge system features a safe and efficient three-step design: (1) water is added to a specially-designed quart-sized spray bottle; (2) a cartridge of chemical concentrate is inserted; and (3) the trigger sprayer is attached. Once the sprayer is connected to the bottle, the bottom of the cartridge opens, releasing the chemical concentrate into the water. After a few shakes, the product is mixed with the water and is ready to use.

When comparing a package of Just Insert, Mix, and Spray™ concentrated cartridges to 24 quart-sized bottles of ready-to-use cleaning products, the J.I.M.S.™ system provides tremendous savings:

The package volume is 98% smaller, freeing up valuable storage space.

The shipping weight is 97% lighter because water is added at the point of use.

There is a 81% decrease in plastic waste because the spray bottle can be refilled multiple times.

Far more puncture and moisture resistant and much less fragile than concentrated drop-in gel pouches, J.I.M.S.™ cartridges are available in five different formulations: bathroom cleaner, glass cleaner, degreaser, sanitizer, and disinfectant. Three of the formulations are Green Seal certified and all offer a lower cost-per-use over traditional ready-to-use cleaning products.

The Just Insert, Mix, and Spray™ system is a simple and effective system for just about any commercial cleaning environment, including retail supermarkets, convenience stores, quick-service restaurants, and the hospitality industry.

The new product line is part of Chemstar's GREENSTAR Commitment™ to promote sustainability in all parts of our operations, from products and production to packaging and equipment. Not only do we care about the environment, we are also dedicated to helping our clients incorporate environmentally friendly

and sustainable solutions into their business models.

Chemstar Corporation
800.327.0777
Lithia Springs, GA
www.chemstarcorp.com

Key Technology Introduces New Online Training Program

Key Technology launches its new Online Training Program, an interactive multimedia curriculum covering Key's optical inspection systems and vibratory conveyors. The flexible, web-based program offers a wide variety of self-paced training modules designed for operators, maintenance personnel, sanitation crews, supervisors, and others working with Key's sorters and shakers. By providing effective and consistent training, the new Online Training Program improves operating efficiencies while reducing training costs.

Online Training Program modules are available immediately in English covering the many software-related G6 user interface topics that are common to all current Key sorters including Optyx®, Tegra®, Manta®, and ADR® systems, and G6-upgraded legacy sorters, as well as the many hardware-related topics specific to Optyx. Within the coming months, training modules will be added, covering hardware topics specific to all other current Key and Symetix sorters as well as Iso-Flo® vibratory shakers. These training modules will be available in Spanish, French, German, Dutch, and Chinese later in 2009.

With as many as 50 training modules covering the various topics related to each sorter, customers can pick and choose the most suitable combination for each job position, tailoring the training program to focus only on the subjects of interest to those in that position. Each self-paced module is designed to take less than 20 minutes to complete and is followed by a test to verify the material is understood. To facilitate record keeping and proof of compliance with industry regulations and company policies, full reporting, via the Learning Management System (LMS), is delivered.

Compared to traditional in-person, on-site training, Key's Online Training Program is affordable, self-paced, and available anytime, on-demand. This new program enables companies to easily train personnel as needed, just in time – before equipment is installed or when certification or re-certification is essential. Consistency is improved because all employees across the company, regardless of plant location, receive the same training. Training time is reduced and retention is enhanced since the program can be tailored to focus only on the topics suitable for each position.

By expanding the knowledgeability of employees to better operate, maintain, and clean sorting equipment and vibratory shakers, processors are better able to optimize product quality and improve operating efficiencies.

In addition to training modules covering Key's sorters and vibratory conveyors, training modules are available on a variety of industry compliance topics including occupational safety and health, HACCP, human resources compliance, DOT HAZMAT, and environmental management.

In addition to the new Online Training Program, Key offers training via instructor-led web conferencing and in-person, on-site, as needed.

Key Technology, Inc.
509.529.2161
Walla Walla, WA
www.key.net

Mettler-Toledo Safeline X-ray Inspection for Detection of Contaminants in Cans

Mettler-Toledo Safeline introduces its CanChek x-ray inspection system, set to revolutionize contaminant detection in the food processing industry.

With innovative multi-beam technology and new adaptive filtering software, the CanChek system offers superior detection sensitivity and is able to identify a wide range of foreign bodies. For manufacturers in sectors such as baby food, canned fruit and vegetables, processed meat and fish, ready meals, soups, snacks and canned desserts, the CanChek system assures complete brand protection.

Using a typical traditional vertical beam inspection system, the densest areas of the can – the top, base and sidewalls – appear on the operator screen as dark, elongated edges. Contaminants lying next to the sidewalls or flat on the bottom of the can are extremely difficult to identify because they are also shown as dark, elongated shapes. This compromises product safety and quality. Using a horizontal multi-beam system, the CanChek inspects the cross section of the can. Due to the angle of the beams, contaminants are pulled away from the sidewalls, increasing visibility in at least one of the x-ray images. This dramatically increases sensitivity and the probability of detection.

Despite its high accuracy and sensitivity, CanChek can inspect 1,200 cans per minute. Variable speed detection capability allows changes in line speed without interrupting inspection, thereby increasing productivity.

Mettler-Toledo Safeline
800.447.4439
Tampa, FL
www.mt.com/safelineus

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

IAFP 2009
FEATURED PRESENTERS

IVAN PARKIN LECTURE

SUNDAY, JULY 12
6:00 P.M. - 7:30 P.M.

PRESENTED BY

DR. PAUL A. HALL

AIV Microbiology & Food Safety Consultants, LLC

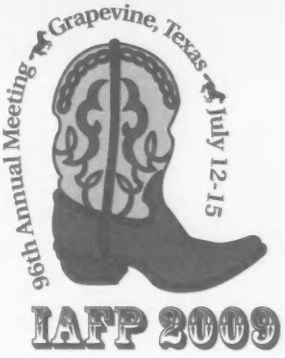
JOHN H. SILLIKER LECTURE

WEDNESDAY, JULY 15
4:00 P.M. - 4:45 P.M.

PRESENTED BY

DR. PATRICK WALL

University College Dublin's School
of Public Health and Population Sciences



PROPOSED SYMPOSIA TOPICS AND ROUNDTABLES

SYMPOSIA:

A Systems Approach to Minimize *Escherichia coli* O157:H7 Food Safety Hazards Associated with Fresh and Fresh Cut Leafy Greens

International Food Protection Issues: Overview and Global Commodity Trade

Food Safety in Global Food Trade

Integrating Epidemiology and Microbiology to Solve Complex Food Safety Problems

Food Safety Programs Across an Integrated Poultry Industry

Epidemiological Trends of Noroviruses

Food Safety Challenges for Unrefrigerated Display of Ready-to-Eat Foods

Facing a Persistent Challenge: *Salmonella* Control in Low-moisture Foods

Environmental Reservoirs of Major and Emerging Foodborne Pathogens

Foodborne Disease Outbreak Update: *Campylobacter* in Fresh Peas, *Salmonella* Schwarzengrund in Pet Food, *Salmonella* Saintpaul in Tomatoes/Peppers

Listeria monocytogenes Controls from Local to Global – Are They Working?

Best Practices for Cleaning and Validation

Less Recognized and Underappreciated Foodborne Pathogens – No Crystal Ball for the Next Big Bug

Enhancing Oyster Safety through *Vibrio* Control Plans

Looking for Thresholds: A Multi-disciplinary "Key Events" Approach

Measuring and Interpreting Food Handling Behavior and Its Impact on Policy

Emerging Chemical Hazards in Food

Pathogen and Spoilage Persistence in the Processing Environment and Food Products: Where, Why and How We Know

Shigatoxin *E. coli*: The Bad, the Worse, and the Pathogenic

ICMSF Symposium on International Developments in Food Safety

Sterilant Gas Decontamination of Food and Environments and Emerging Technologies

Attribution of Foodborne Illness/Disease

The Effect of Climate Change on Food Availability and Safety

Harnessing Irradiation for the Marketplace Today

Round Up Your Pathogen Plan: Enrichment, Sample Preparation and the Legal and Social Perspectives

Third Party Certification Systems: Can It Make Our Food Safer?

Tracking and Tracing Technologies – Do You Know Where Your Steak and Tomatoes Come From?

DEBATE:

Pros and Cons of Zero-tolerance Policy for Pathogens in Food and Mandatory HACCP

ROUNDTABLES:

Selling Food Safety to Employees: Creating a Fully Functioning Food Safety Culture in Retail Grocery and Foodservice Operations

Public Health Decision Making – A Character Building Exercise

IAFP 2009 EVENT INFORMATION

GOLF TOURNAMENT

Saturday, July 11

Golf Tournament at Tour 18 — 6:00 a.m. – 2:00 p.m.

Have you ever dreamed of playing Amen Corner at Augusta National? How about a round of golf at Murifield Village, Firestone Country Club, or Southern Hills? Oakmont? Sawgrass? Crooked Stick? Doral? Each of these famed golf courses and more are represented in this unique golfing experience at "Tour 18" Golf Course, the site of IAFP's 2009 Golf Tournament. "Tour 18" has duplicated legendary holes from the most celebrated golf courses for your enjoyment.

Imagine yourself playing on carefully simulated holes from some of the greatest golf holes in America. This collaboration of incredible replicas offers one fantastic challenge after another, creating a uniquely memorable experience.

This will be an opportunity you won't want to miss! Sign up now to join your friends and colleagues in this best-ball, pre-meeting tournament to start IAFP 2009 off with some fun!!! Price includes transportation, greens fees with a cart, range balls, breakfast, lunch and prizes.

DAYTIME EVENTS

Saturday, July 11

JFK and Dallas City Tour — 9:00 a.m. – 3:00 p.m.

Do you remember where you were on November 22, 1963? On this day, John F. Kennedy, the 35th President of the United States of America was assassinated in downtown Dallas. Visit the Sixth Floor Museum to learn more about this historic day. Continue to explore the heart of Dallas including the Historic West End District, Pioneer Plaza, the renowned Dallas Farmer's Market and more.

Sunday, July 12

Grapevine Historical Tour — 10:00 a.m. – 3:00 p.m.
(Lunch included)

After a scrumptious brunch at Willhoittes on Main Street you will visit Nash Farm and witness the life and times of the early farmers and settlers who established Grapevine. Your journey will continue to the Grapevine Vintage Railroad, the Grapevine Heritage Museum and the Vetro Glass Studio, where you can watch the glass blowing artisans. A memorable wine tasting experience at Cross Timbers will complete your day.

Monday, July 13

Fort Worth Stockyards Tour — 12:00 p.m. – 5:00 p.m.
(Lunch included)

Begin your day with lunch at Risky's Barbeque before you are transported back in time to the Wild West, visiting the Fort Worth Historic Stockyards, the largest horse and mule market in the world during WWII. Explore the Texas Cowboy Hall of Fame and then see an actual boot making demonstration at the Ponder Boot Company. End your day with the Fort Worth Herd Cattle Drive, the only true cattle drive left in the US.

Tuesday, July 14

Fort Worth Arts Tour 10:00 a.m. – 3:00 p.m.
(Lunch included)

The Kimbell Art Museum's holdings range in period from antiquity to the 20th century and includes masterpieces by Duccio, El Greco, Rembrandt, Monet and Picasso to name a few. Next you will have lunch at the famed Joe T. Garcia's Mexican Cuisine, one of the most popular restaurants in the area. Then it's on to the Sid Richardson Museum to see the finest and most focused collections of Western art in America.

EVENING EVENTS

Sunday, July 12

Opening Session 6:00 p.m. – 7:30 p.m.

Cheese and Wine Reception 7:30 p.m. – 9:30 p.m.
Sponsored by Kraft Foods

Monday, July 13

Exhibit Hall Reception 5:00 p.m. – 6:00 p.m.
Sponsored by DuPont Qualicon

Monday Night Social

Texas Fun on the Ranch 6:30 p.m. – 10:00 p.m.

Howdy, partner! Pull on your boots and get ready to kick up your heels at Circle R Ranch. Hop aboard a horse-drawn hay wagon for a leisurely ride, try your hand in a quick-draw "shoot-out," learn to rope and work up a Texas-sized appetite for an all-you-can-eat barbecue. Enjoy the country-western band and join the fun as you are taught a Texas line dance. Don't miss this Wild West experience!

Tuesday, July 14

Exhibit Hall Reception 5:00 p.m. – 6:00 p.m.

IAFP Foundation Fundraiser 6:30 p.m. – 9:30 p.m.

Wednesday, July 15

Awards Banquet Reception 6:00 p.m. – 7:00 p.m.

Awards Banquet 7:00 p.m. – 9:30 p.m.

SPECIAL EVENTS

Saturday, July 11

NIFSI Project Directors Meeting 11:00 a.m. – 5:00 p.m.

The National Integrated Food Safety Initiative (NIFSI) is hosting its bi-annual Project Directors Meeting in conjunction with the International Association for Food Protection's Annual Meeting. This meeting will help to: (1) Facilitate regional and national coordination of efforts to avoid duplication and create synergy in productivity; (2) Foster alignment of program activities with national and international priorities in food safety research, education, and extension; and (3) Showcase the impacts of different NIFSI grants in food safety. This meeting will also provide a mechanism for gathering stakeholder input on emerging issues and priority areas impacting the safety of America's food supply.

Registration fee includes lunch and breaks.

Tuesday, July 14

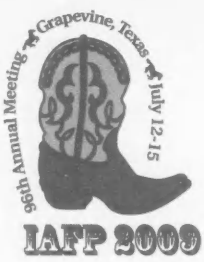
Texas A&M Breakfast 7:00 a.m. – 8:30 a.m.

Current and Former Students of Texas A&M University, get your "Gig 'em" going by joining fellow Aggies for breakfast before heading off to the symposia. Catch up on all the news and meet new members of the Aggie Network

Tuesday, July 14

NFPA Alumni and Friends Reception 6:00 p.m. – 8:00 p.m.

National Canners Association has evolved to today's major food association GMA, and IAFP's Annual Meeting draws many of its alumni and friends. The Gaylord's shuttle bus will take us on the short ride to a local watering hole for this casual, strictly social event featuring drinks, snacks, billiards, and friends from GMA today and yesterday. All are welcome.



IAFP 2009 NETWORKING OPPORTUNITIES

IAFP FUNCTIONS

WELCOME RECEPTION
Saturday, July 11 • 5:00 p.m. – 6:30 p.m.
Sponsored by Quality Auditing Institute

Reunite with colleagues from around the world as you socialize and prepare for the leading food safety conference. Everyone is invited!

COMMITTEE MEETINGS
Saturday, July 11 • 3:00 p.m. – 4:30 p.m.
Sunday, July 12 • 7:00 a.m. – 5:00 p.m.

Committees and Professional Development Groups (PDGs) plan, develop and institute many of the Association's projects, including workshops, publications, and educational sessions. Share your expertise by volunteering to serve on committees or PDGs. Everyone is invited to attend.

STUDENT LUNCHEON
Sunday, July 12 • 12:00 p.m. – 1:30 p.m.
Sponsored by Unilever

The mission of the Student PDG is to provide students of food safety with a platform to enrich their experience as Members of IAFP. Sign up for the luncheon to help start building your professional network.

EDITORIAL BOARD RECEPTION
Sunday, July 12 • 4:30 p.m. – 5:30 p.m.

Editorial Board Members are invited to this reception to be recognized for their service during the year.

OPENING SESSION AND IVAN PARKIN LECTURE
Sunday, July 12 • 6:00 p.m. – 7:30 p.m.

Join us to kick off IAFP 2009 at the Opening Session. Listen to the prestigous Ivan Parkin Lecture delivered by Dr. Paul A. Hall.

CHEESE AND WINE RECEPTION
Sunday, July 12 • 7:30 p.m. – 9:30 p.m.
Sponsored by Kraft Foods

An IAFP tradition for attendees and guests. The reception begins in the Exhibit Hall immediately following the Ivan Parkin Lecture on Sunday evening.

IAFP JOB FAIR
Sunday, July 12 through Wednesday, July 15

Employers, take advantage of the opportunity to recruit the top food scientists in the world! Post your job announcements and interview candidates.

COMMITTEE AND PDG CHAIRPERSON BREAKFAST
Monday, July 13 • 7:00 a.m. – 9:00 a.m.

Chairpersons and Vice Chairpersons are invited to attend this breakfast to report on the activities of your committee.

EXHIBIT HALL LUNCH
Monday, July 13 • 12:00 p.m. – 1:00 p.m.
Sponsored by JohnsonDiversey

Tuesday, July 14 • 12:00 p.m. – 1:00 p.m.

Stop in the Exhibit Hall for lunch and networking on Monday and Tuesday.

EXHIBIT HALL RECEPTIONS
Monday, July 13 • 5:00 p.m. – 6:00 p.m.
Sponsored by DuPont Qualicon

Tuesday, July 14 • 5:00 p.m. – 6:00 p.m.
Partially sponsored by Quality Assurance and Food Safety Magazine

Join your colleagues in the Exhibit Hall to see the most up-to-date trends in food safety techniques and equipment. Take advantage of these great networking opportunities.

PRESIDENT'S RECEPTION
Tuesday, July 13 • 6:00 p.m. – 7:00 p.m.
Sponsored by Fisher Scientific

This by-invitation event is held each year to honor those who have contributed to the Association during the year.

BUSINESS MEETING
Tuesday, July 14 • 12:15 p.m. – 1:00 p.m.

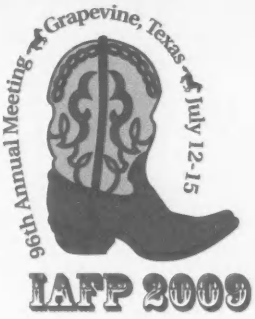
You are encouraged to attend the Business Meeting to keep informed of the actions of YOUR Association.

JOHN H. SILLIKER LECTURE
Wednesday, July 15 • 4:00 p.m. – 4:45 p.m.

The John H. Silliker Lecture will be delivered by Dr. Patrick Wall.

AWARDS RECEPTION AND BANQUET
Wednesday, July 15 • 6:00 p.m. – 9:30 p.m.

Bring IAFP 2009 to a close at the Awards Banquet. Award recipients will be recognized for their outstanding achievements and the gavel will be passed from Dr. Stan Bailey to Incoming President Vickie Lewandowski.



IAFP 2009 GENERAL INFORMATION

REGISTRATION INCLUDES

Register to attend the world's leading food safety conference.

Full Registration includes:

- Program and Abstract Book
- Welcome Reception
- Ivan Parkin Lecture
- Cheese and Wine Reception
- Technical Sessions
- Poster Presentations
- Symposia
- Exhibit Hall Admittance
- Exhibit Hall Lunch (Mon. & Tues.)
- Exhibit Hall Reception (Mon. & Tues.)
- John H. Silliker Lecture
- Awards Banquet

PRESENTATION HOURS

Sunday, July 12	
Opening Session	6:00 p.m. – 7:30 p.m.
Monday, July 13	
Symposia & Technical Sessions	8:30 a.m. – 5:00 p.m.
Tuesday, July 14	
Symposia & Technical Sessions	8:30 a.m. – 5:00 p.m.
Wednesday, July 15	
Symposia & Technical Sessions	8:30 a.m. – 3:30 p.m.
Closing Session	4:00 p.m. – 4:45 p.m.

GOLF TOURNAMENT

Saturday, July 11	
Golf Tournament at Tour 18	6:00 a.m. – 2:00 p.m.

Join your friends and colleagues for an exciting round of golf before IAFP 2009.

DAYTIME EVENTS

Saturday, July 11	
JFK and Dallas City Tour	9:00 a.m. – 3:00 p.m.
Sunday, July 12	
Grapevine Historical Tour (Lunch included)	10:00 a.m. – 3:00 p.m.
Monday, July 13	
Fort Worth Stockyards Tour (Lunch included)	12:00 p.m. – 5:00 p.m.
Tuesday, July 14	
Fort Worth Arts Tour (Lunch included)	10:00 a.m. – 3:00 p.m.

EVENING EVENTS

Sunday, July 12	
Opening Session	6:00 p.m. – 7:30 p.m.
Cheese and Wine Reception *Sponsored by Kraft Foods*	7:30 p.m. – 9:30 p.m.
Monday, July 13	
Exhibit Hall Reception *Sponsored by DuPont Qualicon*	5:00 p.m. – 6:00 p.m.
Monday Night Social	
Texas Fun on the Ranch	6:30 p.m. – 10:00 p.m.
Tuesday, July 14	
Exhibit Hall Reception	5:00 p.m. – 6:00 p.m.
IAFP Foundation Fundraiser	6:30 p.m. – 9:30 p.m.
Wednesday, July 15	
Awards Banquet Reception	6:00 p.m. – 7:00 p.m.
Awards Banquet	7:00 p.m. – 9:30 p.m.

SPECIAL EVENTS

Saturday, July 11	
NIFSI Project Directors Meeting	11:00 a.m. – 5:00 p.m.
Tuesday, July 14	
Texas A&M Breakfast	7:00 a.m. – 8:30 a.m.
Tuesday, July 14	
NFPA Alumni and Friends Reception	6:00 p.m. – 8:00 p.m.

REGISTER ONLINE

Register online at **www.foodprotection.org**

EXHIBIT HOURS

Sunday, July 12	7:30 p.m. – 9:30 p.m.
Monday, July 13	10:00 a.m. – 6:00 p.m.
Tuesday, July 14	10:00 a.m. – 6:00 p.m.

HOTEL INFORMATION

Hotel reservations can be made online at **www.foodprotection.org**.

The IAFP Annual Meeting Sessions, Exhibits and Events will take place or depart from the Gaylord Texan Resort.

Gaylord Texan Resort $169.00 per night

CANCELLATION POLICY

Registration fees, less a $50 administration fee and any applicable bank charges, will be refunded for written cancellations received by June 26, 2009. No refunds will be made after June 26, 2009; however, the registration may be transferred to a colleague with written notification. Refunds will be processed after July 20, 2009.

Event and extra tickets purchased are nonrefundable.

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

IAFP 2009 REGISTRATION FORM

3 Ways to Register

ONLINE
www.foodprotection.org

FAX
+1 515.276.8655

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

Member Number: _____

First name (as it will appear on your badge) _____ Last name _____

Employer _____ Title _____

Mailing Address (Please specify: ❒ Home ❒ Work) _____

City _____ State/Province _____ Country _____ Postal/Zip Code _____

Telephone _____ Fax _____ E-mail _____

❒ Regarding the ADA, please attach a brief description of special requirements you may have.

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

PAYMENT MUST BE RECEIVED BY JUNE 9, 2009 TO AVOID LATE REGISTRATION FEES

REGISTRATION FEES	MEMBERS	NONMEMBERS	TOTAL
Registration	$ 430 ($ 480 late)	$ 650 ($ 700 late)	_____
Association Student Member	$ 80 ($ 90 late)	Not Available	_____
Retired Association Member	$ 80 ($ 90 late)	Not Available	_____
One Day Registration* ❒ Mon. ❒ Tues. ❒ Wed.	$ 230 ($ 255 late)	$ 360 ($ 385 late)	_____
Spouse/Companion* (Name): _____	$ 60 ($ 60 late)	$ 60 ($ 60 late)	_____
Children 15 & Over* (Names): _____	$ 25 ($ 25 late)	$ 25 ($ 25 late)	_____
Children 14 & Under* (Names): _____	FREE	FREE	_____
*Awards Banquet not included			
Additional Awards Banquet Ticket – Wednesday, 7/15	$ 55 ($ 65 late)	$ 55 ($ 65 late)	_____
Student Luncheon – Sunday, 7/12	$ 10 ($ 15 late)		_____
DAYTIME EVENTS		**# OF TICKETS**	
Golf Tournament at Tour 18 – Saturday, 7/11	$ 145 ($ 155 late)	_____	_____
JFK and Dallas City Tour – Saturday, 7/11	$ 58 ($ 63 late)	_____	_____
Grapevine Historical Tour – Sunday, 7/12 (Lunch included)	$ 83 ($ 88 late)	_____	_____
Fort Worth Stockyards Tour – Monday, 7/13 (Lunch included)	$ 84 ($ 89 late)	_____	_____
Fort Worth Arts Tour – Tuesday, 7/14 (Lunch included)	$ 85 ($ 90 late)	_____	_____
EVENING EVENTS			
Monday Night Social – Texas Fun on the Ranch – Monday, 7/13	$ 45 ($ 55 late)	_____	_____
IAFP Foundation Fundraiser – Tuesday, 7/14	$ TBD	_____	_____
SPECIAL EVENTS			
NIFSI Project Directors Meeting – Saturday, 7/11	$ 80 ($ 90 late)	_____	_____
Texas A&M Breakfast – Tuesday, 7/14	$ 10 ($ 20 late)	_____	_____
NFPA Alumni and Friends Reception – Tuesday, 7/14	$ 35 ($ 45 late)	_____	_____
ABSTRACTS			
Annual Meeting Abstracts (citable publication to be mailed Sept. 1)	$ 30	$ 30	_____

TOTAL AMOUNT ENCLOSED $ _____ US FUNDS on US BANK

Payment Options: ❒ **VISA** ❒ **Master Card** ❒ **American Express** ❒ **Discover**

❒ **Check Enclosed**

Refunds subject to cancellation policy

CREDIT CARD # _____

CARD ID #* _____ EXP. DATE _____

SIGNATURE _____

JOIN TODAY AND SAVE!!!
(Attach a completed Membership application)

EXHIBITORS DO NOT USE THIS FORM

*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.

❒ Check box if you are a technical, poster, or symposium speaker.

International Association for Food Protection

COMING EVENTS

MARCH

- **30–April 3, 2009 International Molecular Methods in Food Microbiology Symposium and Workshop,** Mahidol University, Bangkok, Thailand. For more information, go to http://ansci.colostate.edu/content/view/701/105/.

APRIL

- **1–3, Missouri Milk, Food and Environmental Health Association Annual Educational Conference,** Stoney Creek Inn, Columbia, MO. For more information, contact Gala Miller at 573.659.0706; E-mail: galaj@socket.net or go to www.mmfeha.org.
- **2–3, Conference on Food Safety and Public Health Frontier: Minimizing Antibiotic Resistance Transmission through the Food Chain,** Embassy Suites – Crystal City – National Airport, Washington, D.C. For more information, call 703.979.9799 go E-mail Wang.707@osu.edu; John.Sofos@ColoState.edu; or Thad.Stanton@ars.usda.gov.
- **8–9, Implementing SQF 2000 Systems,** Eagan, MN. For more information, E-mail foodsafety@ecolab.com.
- **14–15, Advance HACCP Workshop,** Auburn University, Auburn, AL. For more information, call Regina Crapps at 334.844.2610 or E-mail: crappre@auburn.edu.
- **17–22, 2009 NCIMS Conference,** Caribe Royale, Orlando, FL. For more information, contact Marlena Bordson at 217.762.2656; E-mail ncims.bordson@gmail.com.
- **20–22, ISO/IEC 17025 and Accreditation,** Memphis, TN. For more information, contact Julie Stevens at 301.644.3235; E-mail jstevens@A2LA.org.
- **22, SfAM Spring Meeting,** Aston University, Birmingham, UK. For more information, go to www.sfam.org.uk/spring_meetings.php.
- **26–28, 2009 ADPI/ABI Annual Conference,** Hyatt Regency, Chicago, IL. For more information, go to www.adpi.org/Events/tabid/83/Default.aspx.
- **27–29, 2009 Food Safety Summit,** Washington, D.C. Convention Center, Washington, D.C. For more information, go to www.foodsafetysummit.com.
- **28–30, 2009 TAPPI PLACE Flexible Packaging Summit,** Columbus, OH For more information, call 800.332.8686 or go to www.tappi.org/09placesummit.
- **31–April 2, Cultured Dairy Products and Milk Technology Symposium,** St. Louis, MO. For more information, call Kellie Bland at 202.220.3557 or go to www.idfa.org.

MAY

- **2–4, IDFA Spring Board Meeting,** The Wigwam Golf Resort and Spa, Phoenix, AZ. For more information, call Kellie Bland at 202.220.3557 or go to www.idfa.org.
- **4–6, Food Marketing Institute Future Connect Conference,** Hyatt Regency, Dallas, TX. For more information, go to www.fmifutureconnect.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.
- **5–7, Sanitation Workshop,** Randolph Associates, Inc., Birmingham, AL. For more information, call 205.595.6455; E-mail: henry.randolph@raiconsult.com.
- **5–8, 2009 APHL Annual Meeting,** Egan Civic and Convention Center, Anchorage, AK. For more information, contact Terry Reamer at 240.485.2776 or E-mail: terry.reamer@aphl.org.
- **6, 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 or visit www.metrofoodprotection.org.
- **7–8, HACCP Workshop,** Nashville, TN. For more information, contact AIB International at 800.633.5137; or go to www.aibonline.org.
- **10–13, VTEC 2009 7th International Symposium on Shiga Toxin (Verocytotoxin) Producing *Escherichia coli* Infections,** Centro Cultural Borges, Bueno Aires, Argentina. For more information, go to www.vtec2009.com.ar/.
- **11–12, Introduction to HACCP,** (tentatively Eagan, MN). For more information, call 866.ECOSUR1.
- **12–13, Dairy Cost Accounting Workshop,** Hyatt Rosemont, Rosemont, IL. For more information, call Kellie Bland at 202.220.3557 or go to www.idfa.org.
- **13–14, Implementing SQF 2000 Systems,** (tentatively Eagan, MN). For more information, call 866.ECOSUR1.
- **13–14, Pennsylvania Association of Milk, Food and Environmental Sanitarians Meeting,** Nittany Lion Inn, State College, PA. For more information, contact Gene Frey at 717.397.0719; E-mail: erfrey@landolakes.com.
- **18–22, 2009 3-A SSI Education Meeting and Annual Meeting,** Milwaukee Airport Hotel and Convention Center, Milwaukee, WI. For more information, call 703.790.0295 or go to www.3-a.org.
- **18–22, Assessment of Laboratory Competence,** Southfield, MI. For more information, contact Julie Stevens at 301.644.3235; E-mail jstevens@A2LA.org.
- **25–27, Brazil Association for Food Protection Annaul Meeting,** Conselho Regional de Quimica, São Paulo, Brazil. For more information, visit www.abrappa.org.

JUNE

- **2–3, Principles of Inspecting and Auditing Food Plants Workshop,** San Antonio, TX. For more information, call AIB International at 800.633.5137; or go to www.aibonline.org.
- **3–6, HACCP Workshop for Packaging Suppliers Workshop,** Louisville, KY. For more information, call AIB International at 800.633.5137; or go to www.aibonline.org.

COMING EVENTS

- **8–10, 2009 Midwest AOAC Annual Meeting and Exposition,** Embassy Suites on the River, Des Moines, IA. For more information, go to www.midwestaoac.org/2009Hotel_Information.html.
- **10–12, ISO/IEC 17025 and Accreditation,** Minneapolis, MN. For more information, contact Julie Stevens at 301.644.3235; E-mail jstevens@A2LA.org.
- **17–18, IDFA Washington Conference,** Hotel Monaco, Washington, D.C. For more information, call Kellie Bland at 202.220.3557 or go to www.idfa.org.
- **19–26, Twenty-Ninth International Workshop/Symposium–Rapid Methods and Automtion in Microbiology,** Kansas State University, Manhattan, KS. For more information, contact Dr. Daniel Y.C. Fung at 785. 532.1208; E-mail: dfung@ksu.edu.
- **25–26, HACCP Workshop,** Harrisburg, PA. For more information, contact AIB International at 800.633.5137; or go to www.aibonline.org.

JULY

- **6–9, Sfam Summer Conference 2009,** Manchester Metropolitan University, United Kingdom. For more information, go to www.sfam.org.uk/summer_conference.php.
- **9–10, HACCP Workshop,** Bloomington, MN. For more information, contact AIB International at 800.633.5137; or go to www.aibonline.org.
- **10–11, IAFP Workshops,** Gaylord Texan Resort, Grapevine, TX. For more information, go to www.foodprotection.org.
- **12–15, IAFP 2009 Annual Meeting,** Gaylord Texan Resort, Grapevine, TX. For more information, go to www.foodprotection.org.
- **22–25, HACCP Workshop for Packaging Suppliers,** Vancouver, WA. For more information, call AIB International at 800.633.5137; or go to www.aibonline.org.
- **27–28, Engineering for Food Safety,** Manhattan, KS. For more information, contact AIB International at 800.633.5137; or go to www.aibonline.org.
- **29–31, The 2009 NACCHO Annual Conference,** Rosen Shingle Creek Resort, Orlando, FL. For more information, go to www.naccho.org/events/nacchoannual2009/.

ADVERTISING INDEX

BD Diagnostics 135

DuPont Qualicon ..... Back Cover

Ecolab, Inc. 137

Matrix MicroScience 161

Journal of Food Protection®

ISSN: 0362-028X
Official Publication

International Association for Food Protection

Reg. U.S. Pat. Off.

Vol. 72 | February 2009 | No. 2

Evaluation of Treatments for Elimination of Foodborne Pathogens on the Surfaces of Leaves and Roots of Lettuce (*Lactuca sativa* L.) Guodong Zhang, Li Ma, Larry R. Beuchat, Marilyn C. Erickson, Vanessa H. Phelan, and Michael P. Doyle* 226

Inactivation of *Escherichia coli* O157:H7 in Single-Strength Lemon and Lime Juices Elena Enache,* Yuhuan Chen, and Philip H. Elliott 235

Oral and Rectal Administration of Bacteriophages for Control of *Escherichia coli* O157:H7 in Feedlot Cattle Erica A. Rozema, Tyler P. Stephens, Susan J. Bach, Erasmus K. Okine, Roger P. Johnson, Kim Stanford, and Tim A. McAllister* 241

Evaluation of Potential for Inhibition of Growth of *Escherichia coli* O157:H7 and Multidrug-Resistant *Salmonella* Serovars in Raw Beef by Addition of a Presumptive *Lactobacillus sakei* Ground Beef Isolate John R. Ruby and Steven C. Ingham* 251

Use of *Enterobacteriaceae* Analysis Results for Predicting Absence of *Salmonella* Serovars on Beef Carcasses John R. Ruby and Steven C. Ingham* 260

Effects of In-Feed Egg Yolk Antibodies on *Salmonella* Shedding, Bacterial Antibiotic Resistance, and Health of Pigs Alan G. Mathew,* Sukanya Rattanatabtimtong, Charles M. Nyachoti, and Lin Feng 267

Estimation of Prevalence of *Salmonella* on Pig Carcasses and Pork Joints, Using a Quantitative Risk Assessment Model Aided by Meta-Analysis Ursula Gonzales Barron,* Ilias Soumpasis, Francis Butler, Deirdre Prendergast, Sharon Duggan, and Geraldine Duffy 274

An Appraisal of the Use of Meat-Juice Serology Monitoring Data for Estimating Prevalence of Cecal *Salmonella* Carriage of Pigs at Slaughter by Means of Herd-Level and Animal-Level Simulation Ursula Gonzales Barron,* Ilias Soumpasis, Francis Butler, and Geraldine Duffy 286

Fluorescent Protein–Marked *Escherichia coli* Biotype 1 Strains as Surrogates for Enteric Pathogens in Validation of Beef Carcass Interventions Elisa Cabrera-Diaz, Tiffany M. Moseley, Lisa M. Lucia, James S. Dickson, Alejandro Castillo, and Gary R. Acuff* 295

Predictive Model for Survival and Growth of *Salmonella* Typhimurium DT104 on Chicken Skin during Temperature Abuse T. P. Oscar* 304

Inactivation of *Salmonella* and *Escherichia coli* O157:H7 on Sliced and Whole Tomatoes by Allyl Isothiocyanate, Carvacrol, and Cinnamaldehyde in Vapor Phase Mohammad M. Obaidat and Joseph F. Frank* 315

Antipathogenic Properties of Green Tea Polyphenol Epigallocatechin Gallate at Concentrations Below the MIC against Enterohemorrhagic *Escherichia coli* O157:H7 Kang-Mu Lee, Wan-Seok Kim, Jeesun Lim, Sunyoung Nam, Min Youn, Seong-Won Nam, Younghoon Kim, Sae-Hun Kim, Woojun Park, and Sungsu Park* 325

Occurrence and Levels of Fecal Indicators and Pathogenic Bacteria in Market-Ready Recycled Organic Matter Composts W. F. Brinton, Jr.,* P. Storms, and T. C. Blewett 332

Evaluation of an Antimicrobial Ingredient Prepared from a *Lactobacillus acidophilus* Casein Fermentate against *Enterobacter sakazakii* M. Hayes, E. Barrett, R. P. Ross, G. F. Fitzgerald, C. Hill, and C. Stanton* 340

Reduction of *Listeria* on Ready-to-Eat Sausages after Exposure to a Combination of Pulsed Light and Nisin Aaron R. Uesugi and Carmen I. Moraru* 347

Assessment of Antistaphylococcal Activity of Partially Purified Fractions and Pure Compounds from *Eleutherine americana* Beatrice Olawumi Ifesan, Chulida Hamtasin, Wilawan Mahabusarakam, and Supayang Piyawan Voravuthikunchai* 354

Susceptibilities of *Bacillus subtilis*, *Bacillus cereus*, and Avirulent *Bacillus anthracis* Spores to Liquid Biocides J. Hilgren,* K. M. J. Swanson, R. Diez-Gonzalez, and B. Corde 360

Psychrotrophic Lactic Acid Bacteria Used To Improve the Safety and Quality of Vacuum-Packaged Cooked and Peeled Tropical Shrimp and Cold-Smoked Salmon S. Matamoros, F. Leroi, M. Cardinal, F. Gigout, F. Kashi Chadli, J. Cornet, H. Prévost,* and M. F. Pilet 365

Group I *Clostridium botulinum* Strains Show Significant Variation in Growth at Low and High Temperatures Kaija Hinderink,* Miia Lindström, and Hannu Korkeala 375

Certified Kitchen Managers: Do They Improve Restaurant Inspection Outcomes? Sheryl C. Cates,* Mary K. Muth, Shawn A. Karns, Michael A. Penne, Camilly N. Stone, Judy E. Harrison, and Vincent J. Radke 384

Research Notes

Inactivation of *Yersinia pseudotuberculosis*, as a Surrogate for *Yersinia pestis*, by Liquid Biocides in the Presence of Food Residue J. Hilgren,* K. M. J. Swanson, F. Diez-Gonzalez, and B. Corde 392

***Escherichia coli* Thermal Inactivation Relative to Physiological State** D. Glenn Black, Federico Hallo, and P. Michael Davidson* 399

Fate of Surface-Inoculated *Escherichia coli* O157:H7, *Listeria monocytogenes*, and *Salmonella* Typhimurium on Kippered Beef during Extended Storage at Refrigeration and Abusive Temperatures Renata Jacob, Anna C. S. Porto-Fett, Jeffrey E. Call, and John B. Luchansky* 403

Pilot-Scale Continuous Ultrasonic Cleaning Equipment Reduces *Listeria monocytogenes* Levels on Conveyor Belts Riina Tolvanen, Janne Lundén,* Ari Hörman, and Hannu Korkeala 408

Hydrogen Peroxide Vapor: A Novel Method for the Environmental Control of Lactococcal Bacteriophage Jonathan A. Otter* and Andrea Budde-Niekiel 412

A Microbiological Survey of Selected Alberta-Grown Fresh Produce from Farmers' Markets in Alberta, Canada V. M. Bohaychuk,* R. W. Bradbury, R. Dimock, M. Fehr, G. E. Gensler, R. K. King, R. Rieve, and P. Romero Barrios 415

Microbiological Quality of Spices Marketed in the City of Botucatu, São Paulo, Brazil P. L. Moreira, T. B. Lourenção, J. P. A. N. Pinto, and V. L. M. Rall* 421

Modeling Food Spoilage in Microbial Risk Assessment Konstantina Koutsoumanis* 425

Manual Squeezing as an Alternative to Mechanical Stomaching in Preparing Beef Carcass Sponge Samples for Microbiological Analysis Steven C. Ingham,* Ryan J. Algino, Barbara H. Ingham, and John R. Ruby 428

Food Safety Knowledge Retention Study Hyeli Hislop* and Reba Shaw 431

Fumonisins B_1 and B_2 in Agricultural Products Consumed in South Korea: An Exposure Assessment Eunkyoung Seo, Yohan Yoon, Kyeongyeol Kim, Won-Bo Shim, Nina Kuzmina, Keum-Soon Oh, Jong-Ok Lee, Dong-Sul Kim, Junghyuck Suh, Soo-Hyung Lee, Kee-Hey Chung, and Duck-Hee Chung* 436

Review

Chagas' Disease as a Foodborne Illness Karen Signori Pereira,* Flávio Luis Schmidt, Ana M. A. Guaraldo, Regina M. B. Franco, Viviane L. Dias, and Luiz A. C. Passos 441

* Asterisk indicates author for correspondence.

BOOKLET ORDER FORM

SHIP TO:

Member # _____

First Name _____ M.I. ____ Last Name _____

Company _____ Job Title _____

Mailing Address _____

Please specify: ☐ Home ☐ Work

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-Mail _____

BOOKLETS:

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

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

Multiple copies available at reduced prices. — Booklets Total

Phone our office for pricing information on quantities of 25 or more.

OTHER PUBLICATIONS:

QUANTITY	DESCRIPTION	MEMBER OR GOV'T PRICE	NON-MEMBER PRICE	TOTAL
	**JFP* Memory Stick – September 1952 through December 2000	$295.00	$325.00	
	*International Food Safety Icons and International Food Allergen Icons CD	25.00	25.00	
	Pocket Guide to Dairy Sanitation (minimum order of 10)	.75	1.50	
	Before Disaster Strikes…A Guide to Food Safety in the Home (minimum order of 10)	.75	1.50	
	Before Disaster Strikes…*Spanish language version* – (minimum order of 10)	.75	1.50	
	Food Safety at Temporary Events (minimum order of 10)	.75	1.50	
	Food Safety at Temporary Events – *Spanish language version* – (minimum order of 10)	.75	1.50	
	*Annual Meeting Abstract Book Supplement (year requested _____)	30.00	30.00	
	*IAFP History 1911-2000	25.00	25.00	

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

*Includes shipping and handling — Other Publications Total

TOTAL ORDER AMOUNT

Prices effective through August 31, 2009

PAYMENT:

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

☐ Check Enclosed ☐ Visa ☐ Mastercard ☐ American Express ☐ Discover

CREDIT CARD # _____

CARD ID #* _____ EXP. DATE _____

SIGNATURE _____

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

International Association for Food Protection®

4 EASY WAYS TO ORDER

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

MEMBERSHIP APPLICATION

Prefix (❑ Prof. ❑ Dr. ❑ Mr. ❑ Ms.)

First Name _____ M.I. _____ Last Name _____

Company _____ Job Title _____

Mailing Address _____

Please specify: ❑ Home ❑ Work

City _____ State or Province _____

Postal Code/Zip + 4 _____ Country _____

Telephone # _____ Fax # _____

E-Mail _____

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

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

SUSTAINING MEMBERSHIPS

Recognition for your organization and many other benefits.

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

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

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

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

CREDIT CARD # _____

CARD ID #* _____ EXP. DATE _____

SIGNATURE _____

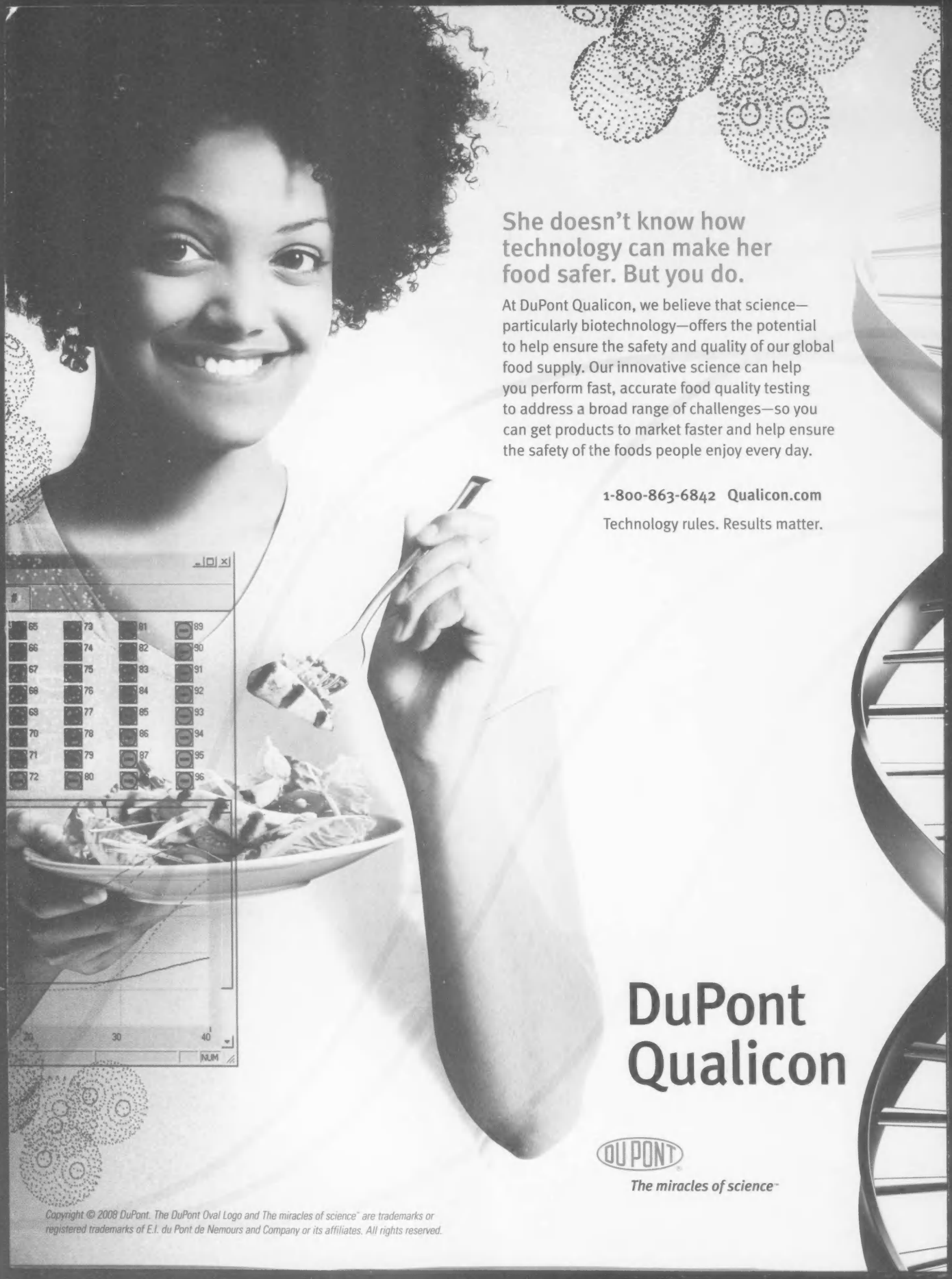
*Visa, Mastercard and Discover: See 3-digit Card ID number on the back of the card after account number.
American Express: See 4-digit, non-embossed number printed above your account number on the face of your card.

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

International Association for Food Protection.

4 EASY WAYS TO JOIN

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



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

DUPONT

The miracles of science™