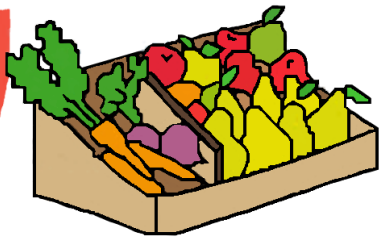
UNIVERSITY OF MARYLAND
JIFSAN 2014 Annual Spring Symposium
Sponsored by JIFSAN Advisory Council

The Case of Avoiding RISK: Truth or Consequences

April 24-25, 2014
Sheraton College Park North Hotel
Beltsville, MD



JOINT INSTITUTE for FOOD SAFETY AND APPLIED NUTRITION
UM FDA

JIFSAN Advisory Council Annual Symposium

THE EVENT IS SPONSORED BY:

MARS chocolate north america

kraft foods

Kellogg's

PerkinElmer® For the Better

ConAgra Foods® Food you love

Waters THE SCIENCE OF WHAT'S POSSIBLE.™

Abbott A Promise for Life

Coca-Cola

Unilever

Nestlé®

GENERAL MILLS

3M

Cargill®

ADM®

MONSANTO

Table of Contents

About JIFSAN:

About:

The Institute is the foundation of public and private partnerships that provides the scientific basis for ensuring a safe, wholesome food supply as well as provide the infrastructure for contributions to national food safety programs and international food standards.

The Joint Institute for Food Safety and Applied Nutrition (JIFSAN) was established between the United States Food and Drug Administration (FDA) and the University of Maryland (UM) in April 1996. The Institute is a jointly administered, multidisciplinary research, education and outreach program.

The Institute fosters the missions of FDA and the University through the creation of partnerships to increase the quantity and quality of research, which will provide the basis for sound public health policy. It promotes food safety, human nutrition, and animal health and production through integrated research, education, and outreach programs. Opportunities exist for collaborative projects with Federal and state agencies, private industry, consumer and trade groups, and international organizations with mutual interests.

Mission:

To advance sound strategies to improve public health, food safety, and applied nutrition using risk analysis principles through cooperative research, education, and outreach programs.

Vision:

To be a premier source of scientific information and education programs on food safety and applied nutrition that enables the development of sound public health policy and reduces the incidence of food related illness.

Advisory Council:

The JIFSAN Advisory Council advises the Director on current issues in areas pertinent to the Institute's interests and responsibilities. These include issues in food safety, nutrition, and related areas. It also advises on areas in which potential JIFSAN research, education, or outreach programs are needed or for which current programs need modification. The Advisory Council meets twice a year and members are in contact with the Director throughout the year.

From the Desk of the Director

Welcome to the 2014 JIFSAN Advisory Council Spring Symposium!

The Joint Institute for Food Safety and Applied Nutrition (JIFSAN) at the University of Maryland was established in 1996 between the University and the US Food & Drug Administration (FDA). The Institute fosters the missions of FDA and the University through the creation of partnerships to promote food safety, human nutrition, and animal health and production through integrated research, education, and outreach programs.

The JIFSAN Advisory Council consists of representatives of industries, academic institutions, and consumer organizations. The Council sponsors an annual symposium on food safety and applied nutrition. The topic of this year's symposium is "the Case of Avoiding Risk: Truth or Consequences". We will leverage key learning's in our quest to ultimately reach zero risk to our food. We hope you will enjoy a comprehensive food safety journey as we peel apart several scenarios that discuss both truth and consequential effects of avoiding risk – chasing zero.

We thank the Advisory Council for supporting the symposium and you for participation.

Sincerely,

Jlanghong Meng, PhD
Director

Symposium Background:

What are the tradeoffs and unintended consequences of avoiding risk? In 2013, we explored the concept of chasing zero. In 2014 we will leverage key learning's in our quest to ultimately reach zero risk to our food. But what are the truths and consequences of actually achieving zero risk? What are the tradeoffs to avoiding food risks altogether and how might unintended consequences impact public health, the environment and consumer confidence in the safety of our food supply.

What would it mean for your overall diet and health if we completely eliminated certain seafood from our diets because of the mercury content; reduced sodium to the lowest recommended levels of intake or set action levels for arsenic in juice and rice at astronomically low levels, or only purchase 'fresh' fruits and vegetables to avoid BPA?

Follow our comprehensive food safety journey as we peel apart several scenarios that discuss both truth and consequential effects of avoiding risk – chasing zero.

Day 1: Thursday, April 24th

8:00 AM **Registration & Continental Breakfast**

9:00 AM **Symposium Opening—Welcome**
Jianghong Meng, JIFSAN, Director
George Evancho, JIFSAN, Symposium Chair

9:10 AM **Session 1: Some Say "To Avoid Food Risks, Buy and Eat Organic Food:**
- **Potential Benefits and Risks of Consuming Either Organic and Conventional Foods**
- **Potential Benefits and Risks to Land Use, Supply Chain, and Economic Impact**
- **Sustainability of Farm Practices: US and Global**

Introduction
Chair: Donna Rosenbaum, Food Safety Partners Ltd., Northbrook, IL

9:20 AM Comparing Farming Systems: Organic, Conventional and Biotechnology
Jennie Schmidt, Registered Dietician, Foodie Farmer, *Blogger, Agricultural Communicator, Eastern Shore, MD*

10:05 AM **Break—Poster Session (Severn/Lochraven Room)**

10:20 AM Conventional or Organic Produce? The Microbiological Question
Shirley Ann Micallef, University of Maryland, College Park, MD

11:05 AM Economic Impact: Sustainability of Current and Future Agriculture Technologies (Biotech)
Robert Thompson, John Hopkins School of Advanced International Studies, Washington, DC

11:50 AM **Lunch—Poster Session (Severn/Lochraven Room)**

1:00 PM Mapping Consumer Trends in Food and Agriculture Technologies
William Hallman, Rutgers University, New Brunswick, NJ

1:55 PM **Session 2: Don't Eat This, Eat That; Don't Eat That, Eat This to Meet Your Goal of Zero Risk – Risk of What?**
- **What Are Factors Driving Consumers to Request 'Zero'**
- **What are the Nutritional and Food Safety Consequences Associated with Achieving 'Zero' (BPA, Arsenic)**

Introduction
Chair: Bradd Eldridge, Abbott Nutrition, Abbott Park, IL

2:05 PM Truth and Consequence in Risk Assessment and Management
Terry Troxell, Exponent, Washington, DC

Day 1: Thursday, April 24th, ctd.

2:50 PM The Arsenic Debate Continues: What are the Facts about Arsenic in Food and Beverages—The Whole Food Discussion
James Coughlin, Coughlin & Associates, Aliso Viejo, CA

3:35 PM **Break —Poster Session (Severn/Lochraven Room)**

3:50 PM Blood Levels of BPA in Human Population: What We Currently Know About BPA—A Scientific Update
Daniel Doerge, Food and Drug Administration, National Center for Toxicological Research, Jefferson, Arkansas

4:35 PM Is there Zero Risk Food Packaging?
Henry Chin, George Mason University, Center for Health and Risk Communication, Maraga, California

5:20 PM Session Wrap Up/ Day Summary

5:30 PM Adjourn

5:45 PM Reception and Participants' Dinner

8:30 PM Conclusion of Dinner

Day 2: Friday, April 25th

8:00 AM **Registration & Continental Breakfast**

9:00 AM **Welcome—Day 2**
George Evancho, Symposium Chair

Session 3: Marketing Fear to Consumers: The Unintended Consequences of Communicating Risk

- **Experts Range of Perspective:**
  - **To Expand the Conversation Beyond Traditional Risk Communication**
  - **To Examine the Unintended Consequences of Communication Zero Risk**
  - **To Consumers and the Public**

Introduction
Chair: Anthony Flood, International Food Information Council, Washington, DC

9:15 AM Studying the Health Risk of Risk Perception: Assessing and Managing Transmission of Perceptions Dangerous to Health
Richard Canady, International Life Sciences Institute, Washington, DC

10:00 AM Is Zero Risk Actually Possible When Communication Risk to Consumers: A Public Health Perspective
Christine Prue, Centers for Disease Control, Atlanta, GA

10:45 AM **Break —Poster Session (Severn/Lochraven Room)**

11:00 AM Media Coverage of Food Risk
David Ropeik, Harvard School of Continuing Education, Cambridge, Massachusetts

11:45 AM **Interactive Roundtable**
Invited Guest Panel of Experts

- William Hallman—*Rutgers University* (Director, Food Policy Institute)
- David Ropeik—*Harvard University*
- Christine Prue, Centers for Disease Contro (Associate Director of Behavioral Science)
- James Coughlin—*Coughlin & Associates*
- Richard Canady—*International Life Sciences Institute*

12:30 **Symposium Wrap-up**

Symposium Speakers and Abstract

Jennie Schmidt

Registered Dietician, Foodie Farmer, *Blogger, Agriculture*

Jennie Schmidt is a Registered Dietitian and full time farmer. She and her husband farm a 3rd generation, 2000 acre family farm in Queen Anne's County on the Eastern Shore of Maryland. They are a large, highly diversified family farm growing a variety of grains, hay, fruits, vegetables, and specialty seeds. Jennie applies her background in human nutrition with the science of soils and plants. Jennie holds a Bachelors degree from the University of Massachusetts in Human Nutrition and International Agriculture and a Masters degree from the University of Delaware in Human Nutrition with a concentration in food and agricultural biotechnology. She speaks extensively about farming systems, comparing conventional, biotechnology, and organic farming practices all of which they have practiced on their family farm. She is active in many agricultural and community organizations and is currently serving as Vice President of the Maryland Grain Producers, and immediate Past President of the Maryland Grape Growers Association.

Comparing Farming Systems: Organic, Conventional and Biotechnology

Jennifer Schmidt, MS, RD
Schmidt Farms Inc
Sudlersville, MD

ABSTRACT

As American citizens become multiple generations removed from the family farm, the lack of understanding, and the heightened misunderstanding of many farming practices has increased. Despite adopting extensive technology in their personal lifestyles, people are often critical of agriculture doing the same. Only citizens alive during the Great Depression have any knowledge of food scarcity and empty grocery shelves. It is a misperception that since food is prevalent, farming must be easy, and therefore has become a target of many who want to see a change in the way food is produced, yet often don't understand food production to begin with. This session will compare and contrast the 3 most common farming systems: organic, conventional, and biotechnology. It will highlight the technology used on today's family farms and provide insight into how farm families make day in and day out decisions that improve the health and safety of the farm, the environment, and the food supply.

Shirley Micallef

University of Maryland

Dr. Shirley A. Micallef is an Assistant Professor at the University of Maryland, in the Department of Plant Science and Landscape Architecture with a Joint Appointment with the Center for Food Safety and Security Systems. She received a Ph.D. in microbial ecology from the University of Massachusetts, and Master's and Bachelor's degrees from the University of Malta. As a post-doctoral research associate at the School of Public Health at the University of Maryland, Dr. Micallef focused on the prevalence, distribution and antibiotic susceptibilities of enteric bacteria in the tomato farm agro-environment. Her research interests include the interaction of foodborne pathogens with plants and the ecology of foodborne pathogens in the agricultural environment. Research focuses on the interaction of *Salmonella* with tomatoes and the influence of plant genetic variation on plant-enteric pathogen relationships. Her work also assesses the survival and persistence of pathogens in various farming systems, including in the rhizosphere and phyllosphere of specialty crops, and how Good Agricultural Practices (GAPs) and cropping methods impact enteric pathogen persistence.

Conventional or Organic Produce? The Microbiological Question

Shirley Micallef
University of Maryland
College Park, MD

ABSTRACT

Foodborne illness outbreaks associated with fresh produce have increased in recent years, posing a risk to public health and causing substantial economic losses to produce growers and associated industries. The majority of multistate outbreaks are attributed to conventionally grown produce. Only two of seventeen multistate outbreaks associated with fresh produce, sprouts or nuts have been reported since 2011. However, organic food sales account for only 3-4% of food sales in the U.S. Moreover, a large proportion of organic producers are small- to medium-sized farms that distribute their products on a local or regional scale. The proportion of foodborne illness due to organic produce consumption, and the risks, if any, associated with this farming system remain under-researched. To address the question of whether the microbiological safety of fresh produce grown conventionally or organically varies, a study was conducted on small- to medium sized farms growing tomatoes and leafy greens in the mid-Atlantic region. In all, 24 tomato farms and 32 leafy green production areas, split equally between conventional and organic certified or non-certified systems, were visited 3 times during summer 2012 (tomato), and fall 2012 and spring 2013 (leafy greens). A total of 999 samples were collected, comprising 259 tomato, 369 leafy greens, 226 irrigation water, 102 field soil, 21 compost and 22 pond sediment samples. Samples were analyzed for the pathogens *Salmonella* and Shigatoxin-producing *Escherichia coli* (STEC), and quantified for the indicator bacteria *E. coli*, total coliforms and aerobic mesophiles, using standard direct plating on appropriate selective bacteriological media for bacterial enumeration, PCR targeting pathogen specific genes, and FDA-BAM approved pathogen isolation culture methods. No *Salmonella* was detected on tomato farms, but 19 out of 577 (3.3%) samples from leafy green farms were positive for *Salmonella invA* gene by PCR, 11/285 (3.9%; 1.7% culture-confirmed) from organic farms and 8/292 (2.7%; 1.4% culture-confirmed) from conventional farm. Farming system was not a factor for levels of indicator bacteria determined for tomatoes, but a significant factor for aerobic mesophilic bacterial counts (p=0.01) and total coliforms (p<0.0001) for leafy greens. Of the total samples analyzed, 11.0% (110/999) were positive for generic *E. coli*. The number of organic tomato samples positive for generic *E. coli* (1.6%; 2/129) was significantly lower (χ^2 (1) = 4.596, p=0.032) than for conventional tomato samples (6.9%; 9/130). On the other hand, the percentage of leafy greens samples positive for generic *E. coli* were equivalent for organic (12/178; 6.7%) and conventional (11/191; 5.8%) farms. In conclusion, no clear differences in pathogen occurrence could be attributed to farming system in the tomato and leafy green production areas investigated. Although differences in microbiological quality were detected, any associative links to food safety risk are not clear. Local effects other than cropping practices might be important factors contributing to microbiological inputs on small- and medium-sized farms in the mid-Atlantic region, and more work is needed to assess risks at the local scale.

Robert Thompson

Johns Hopkins School of Advanced International Studies

Dr. ROBERT L. THOMPSON is a Visiting Scholar at Johns Hopkins University's Paul H. Nitze School of Advanced International Studies in Washington, DC. He is Professor Emeritus at the University of Illinois at Urbana-Champaign where he held the Gardner Endowed Chair in Agricultural Policy. He is also Senior Fellow, global agricultural development and food security, with the Chicago Council on Global Affairs and serves on the Land O'Lakes board of directors, the Nestle corporate Creating Shared Value Advisory Board, and the International Food Information Council Foundation. He is Chairman Emeritus of the the International Food and Agricultural Trade Policy Council and formerly served on the USDA-USTR Agricultural Policy Advisory Committee for Trade.

Previously Dr. Thompson served as Director of Rural Development and Senior Advisor for Agricultural Trade Policy at the World Bank (1998-2002); President and CEO of the Winrock International Institute for Agricultural Development (1993-98); Dean of Agriculture (1987-93) and Professor of Agricultural Economics (1974-93) at Purdue University; Assistant Secretary for Economics at the U.S. Department of Agriculture (1985-87) and Senior Staff Economist for Food and Agriculture at the President's Council of Economic Advisers (1983-85).

Thompson, who received his B.S. degree from Cornell University and his M.S. and Ph.D. degrees from Purdue University, holds honorary doctorates from the Pennsylvania State University and Dalhousie University (Canada). He is a fellow of the American Agricultural Economics Association and the American Association for the Advancement of Science and a foreign member of the Royal Swedish Academy of Agriculture and Forestry and of the Ukrainian Academy of Agricultural Sciences. He is a former president of the International Association of Agricultural Economists.

In January 2011 the American Farm Bureau Federation presented him with its highest honor, the Distinguished Service to Agriculture Award.

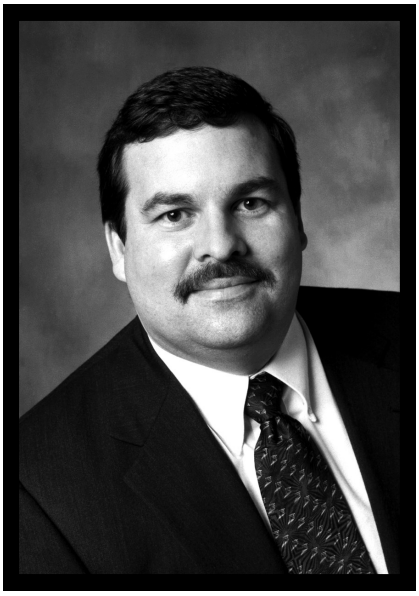
Raised on a small family dairy farm in northern New York State, Dr. Thompson has extensive international experience and has lectured, consulted, or conducted research in more than 90 countries worldwide, including extended periods in Denmark, Laos, and Brazil.

Economic Impact: Sustainability of Current and Future Agriculture Technologies

Robert Thompson
John Hopkins School of Advanced International Studies
Washington, DC

William Hallman

Rutgers University



Dr. William K. Hallman is a professor and Chair of the Department of Human Ecology and a member of the graduate faculties of Psychology, Nutritional Sciences, and Planning and Public Policy at Rutgers, the State University of New Jersey. Dr. Hallman also serves as the Director of the Food Policy Institute (FPI) at Rutgers. He earned a B.S. in Behavioral Analysis from Juniata College in 1983, and a PhD. in Experimental Psychology from the University of South Carolina in 1989. His research explores public perceptions of controversial issues concerning food, health, and the environment. Recent projects have examined consumer perceptions and behaviors concerning agricultural biotechnology, animal cloning, avian influenza, accidental and intentional food contamination incidents, and food recalls. His current research projects include studies of public perceptions and responses to food safety risks, the use of nanotechnology in food, public understanding of health claims made for food products, and food safety and security among older adults.

Dr. Hallman serves on the Executive Committee of Rutgers Against Hunger (RAH), and helped to found the New Brunswick Community Farmers Market, which offers food insecure residents access to fresh, locally grown, affordable, nutritious, and culturally appropriate produce and other food products.

Mapping Consumer Trends in Food and Agriculture Technologies

William Hallman, PhD
Department of Human Ecology
Rutgers University

ABSTRACT

Two controversial technologies, genetic modification and nanotechnology, have already dramatically changed our food and agriculture system. Yet, their use remains contentious and their future application depends a great deal on public acceptance. Understanding public perceptions of these technologies is essential to knowing how to anticipate and respond to consumer needs and concerns about them.

Because constituent opinion has a strong influence on public policy, there is no shortage of consultants and consumer advocates, pollsters, pundits, and politicians, who purport to what the American public believes, feels, wants, or intends to do regarding GMOs and nanotechnology. However, reliably measuring and mapping people's beliefs, values, and attitudes, toward controversial technologies and using these to effectively predict consumer wants, intentions, and behaviors is extraordinarily difficult. Therefore, multiple methods must be used to assess public attitudes, and one must be cautious in interpreting the results of any one study.

This is particularly true with regard to GMOs and nanotechnology. Despite their having been talked about in the media for decades, much of the American public knows little or nothing about either technology. As a result, their opinions often represent "uncrystallized" first impressions rather than strongly held positions supported by complex underlying arguments. In many ways, they signify people's starting points and not their conclusions about the technology or the issues associated with it.

Unfortunately, because many people hold uncrystallized opinions regarding GMOs and nanotechnology, the results of surveys can be easily manipulated by those who wish to provide support for their own positions and arguments for or against the use of these technologies. Our studies show that respondents are strongly influenced by the ways in which the questions are asked, the response categories that are available, and the order in which the questions are presented. In the case of GMOs, even how you refer to the technology seems to matter. Moreover, the context or setting of the research being conducted, and even just knowing who is sponsoring the research may result in response biases that can significantly influence the outcome of a public opinion survey.

Seemingly simple decisions about what to do with the responses of research participants who say they have never heard of the technology can radically alter the results of polling data. For example, our recent nationally representative survey of American's opinions about GMO labeling found that one quarter of the respondents were unaware of the existence of genetically modified foods, and more than half said that they knew very little or nothing at all about them. In some cases, researchers might reasonably choose to screen out or exclude the responses of these participants, arguing that their opinions are uninformed or invalid. Indeed, critics point out that in most surveys, the number of participants who are willing to venture an opinion about GMOs or nanotechnology typically far exceeds the number who say they have heard anything about them. Nonetheless, these opinions matter a great deal. Being well-informed is not a prerequisite to decisions either in the voting booth or the grocery aisle.

Terry Troxell

Exponet

Dr. Terry C. Troxell is a Senior Managing Scientist in Exponent's Health Sciences Center for Chemical Regulation and Food Safety, which he joined in 2006. Dr. Troxell has extensive experience in food safety, with nearly 30 years at the Center for Food Safety and Applied Nutrition of the U.S. Food and Drug Administration, including more than 7 years as Director of the FDA's Office of Plant and Dairy Foods (1992–2006). Prior to that, he directed food safety policy and risk assessment work for that office as the Director of the Division of Programs and Enforcement Policy (1994–1999). He was a member of the Senior Executive Service from 1999 through 2003. He has extensive international food safety experience, particularly with the Codex Committee on Food Additives and Contaminants, for which he was head of the U.S. delegation 6 years. Dr. Troxell's FDA career also included 9 years work on food additives, creation of the carcinogenic impurities policy for food and color additives, and experience directing food standards work. Dr. Troxell has broad scientific training and experience in chemistry and biology and has applied that experience to provide leadership to solve complex scientific, regulatory, and public health policy issues and problems.

Truth and Consequences in Risk Assessment and Management

Terry Troxell, Ph.D.

Exponent, Inc.

Traditionally, when a new chemical contaminant is discovered in food or new studies indicate possible elevated concern, scientists focus on the contaminant by developing more data and performing risk assessments. Regulatory officials ponder what action(s) should be taken to understand the risk or to minimize the risk from this new problem. Consumer activists press for elimination or drastic reduction of the contaminant and if not advise consumers to modify their diets. The media fuels the concerns with its 24/7 news cycle reporting.

However, the one chemical at a time approach to risk assessment and management can lead to serious problems. The consequences for public health need to be viewed globally. This paper will explore the global factors that need to be considered and the implications for public health, including the impact of uncertainty in knowledge.

James Coughlin

Coughlin & Associates

Dr. Coughlin is an internationally recognized expert in food, nutrition and chemical safety, toxicology and regulatory affairs. He received his M.S. in Food Science and Technology, Ph.D. in Agricultural and Environmental Chemistry and postdoctoral training in Environmental Toxicology at the University of California, Davis, where his research focused on the formation, analysis and toxicity of potentially carcinogenic compounds formed during the Maillard Browning Reaction. Before undertaking his current role as an independent consultant in 1991, he worked for two years at Armour Foods and ten years at General Foods & Kraft General Foods headquarters. Dr. Coughlin is a Fellow and Certified Food Scientist of the Institute of Food Technologists, serves as an IFT Food Science Communicator and is also serving for the past decade as IFT's Codex Subject Expert on Contaminants in Food. He served as President of the Association for Science and Information on Coffee in the early 90's and continues as a member of its Board, and has well over 30 years' experience on coffee/caffeine health issues. He also served as Vice President of the International Society for Trace Element Research in Humans and organized numerous society symposia. He guided a decade-long scientific research program seeking to establish the human nutrient essentiality of boron and has also developed extensive expertise on the risk assessment of essential and toxic minerals. He has been deeply involved with managing California Proposition 65 issues since 1986.

Other areas of his expertise include food/nutrition science and regulatory affairs; food, chemical and environmental toxicology and safety; chemical risk assessment; diet and cancer evaluations, especially on coffee and meats; benefit-risk evaluation of foods and food ingredients; GRAS food additive safety evaluations; safety and benefits of functional foods and dietary supplements; health effects of caffeine, dietary nitrite/nitrate, Maillard carcinogens such as acrylamide and furan; safety of imported food ingredients; food and environmental chemical analyses; naturally occurring food toxicants; antioxidants in foods and supplements; and scientific risk communication. Dr. Coughlin provides strategic scientific, toxicologic, nutritional, communications and regulatory counsel to many food, functional food, dietary supplement, chemical, and consumer products companies and their trade associations, law firms and public relations firms.

The Arsenic Debate Continues: What are the Facts about Arsenic in Food and Beverages –The Whole Food Discussion

James Coughlin
Coughlin &Associates
Aliso Viejo,CA

ABSTRACT

Arsenic (As) can exist in the environment at low concentrations in rocks, soil and natural ground water and is unavoidable in many common foods in several different forms, each of which has unique chemical characteristics that influence its toxicity. Within the last decade or so, the increased focus on speciated As, both the inorganic and organic forms and their potentially varying toxicities, has resulted in a large body of literature on speciated As in many different types of food and beverages. Because inorganic arsenic (iAs) is considered the most toxicologically significant form of As, it is critical to focus on both total iAs and speciated iAs (iAs3+ or iAs5+) in foods. In addition, organic As species (*e.g.,* monomethylarsonic acid [MMA] and dimethylarsinic acid [DMA]) have also been measured in many foods. Calculations of dietary intake of As must take into consideration the quality of the analytical studies and the consumption patterns of the populations of interest in order to determine accurate exposure assessments. It is important to note that the mean concentration and the percent of iAs in foods can vary widely by type of food, growing region, soil conditions and even sampling schemes within a given food type. It may be useful to monitor total arsenic (tAs) in food products as a screening tool for iAs because analyzing tAs is easier than iAs and in most cases the reduction of tAs correlates fairly well with the reduction of iAs.

Inorganic As is known to be more toxic than organic arsenic compounds, although both forms of iAs are potentially harmful to human health, with iAs3+ being considered more toxic than iAs5+. The International Agency for Research on Cancer (IARC) classified arsenic and iAs compounds as 'carcinogenic to humans' (Group 1) based on sufficient evidence of carcinogenicity in humans as early as 1973. In 2010 the Joint FAO/WHO Expert Committee on Food Additives (JECFA) withdrew the provisional tolerable weekly intake (PTWI) of 15 µg/kg b.w. Based on epidemiological studies, JECFA identified a benchmark dose lower confidence limit for a 0.5 % increased incidence of lung cancer ($BMDL_{0.5}$) of 3.0 µg/kg b.w. per day (2-7 µg/kg b.w. per day based on the range of estimated total dietary exposure).

The U.S. FDA (with a focus on juices and rice) and the European Food Safety Authority (with a focus on a European population exposure assessment) have undertaken extensive analyses of various arsenic species in food and beverages in recent years. The eventual goal of these evaluations will be to determine the potential human health risks of dietary arsenic intake and to decide what risk management practices should be instituted to try to mitigate the health risks. What we know based on health effects observed in populations exposed at much higher exposures (in excess of the 10 ppb iAs drinking water standard, e.g., at levels from 100 to 1,000 ppb) than from background water and food levels is that we have no reports of adverse health effects from exposure to normal levels of arsenic in food. While it is obviously important to evaluate the toxicological risks of arsenic compounds in food and beverages, it is equally important to fully evaluate the safety of whole foods containing these toxicants using a combination of modern clinical, toxicological, nutritional and epidemiological techniques, in order to arrive at a benefit-risk evaluation of the whole food containing arsenic compounds.

Daniel Doerge

FDA

Daniel R. Doerge was awarded the B.S. degree from Oregon State University and the Ph.D. degree from University California, Davis. He was Assistant and Associate Professor of Environmental Biochemistry at the University of Hawaii, Manoa from 1984 to1992. Since 1992, he has been a Research Chemist in the Division of Biochemical Toxicology at the U.S. Food and Drug Administration's National Center for Toxicological Research in Jefferson, AR. His areas of research specialization have been: chemical and biochemical mechanisms of toxicity; thyroid toxicology; toxicology of soy isoflavones, acrylamide, and bisphenol A; applications of modern mass spectrometry that emphasize high throughput determinations of pharmacokinetics and DNA adducts; and chemical risk assessment. A common strategy for these food safety research projects is the integration of toxicokinetics and human biomonitoring with PBPK modeling to better extrapolate human risks from experimental animal toxicity testing. More than 250 peer -reviewed publications have resulted from this work. Dr. Doerge has served on risk assessment advisory committees for the European Food Safety Authority, the U.S. Environmental Protection Agency, and the World Health Organization. He also served as Editor-in-Chief for *Archives of Environmental Contamination and Toxicology* from 1996-2103.

Bisphenol A: Integrating pharmacokinetics in rodent and primate species, rat toxicology studies, human biomonitoring, and PBPK modeling to assess potential human risks from dietary intake.

Daniel Doerge

Bisphenol A (BPA) is an important monomer used for epoxy-based polymeric food can linings and food is the predominant medium for human exposure. Since the U.S. Food and Drug Administration (FDA) regulates the safety of food contact materials, an extensive research program into the potential toxicity of BPA was inititated at the NCTR in 2008 under the auspices of the National Toxicology Program (NTP) of the NIEHS. This program was comprised of complementary and inter-woven projects: 1) pharmacokinetic studies in rodents and non-human primates with a focus on development of Phase II metabolic capacity, which is important in detoxification of BPA and is often immature in fetuses and neonates; 2) rat toxicology studies that incorporate a wide range of doses and well-defined internal exposures during fetal, neonatal, and adult lifestages to adequately bridge research-scale studies reporting low dose effects and guideline-compliant studies often showing adverse effects only at high doses; 3) measurements of BPA in fluids from human subjects to define the magnitude and extent of exposure in the general population; 4) incorporation of all relevant animal and human data on BPA exposure, metabolism, and disposition into physiologically based pharmacokinetic (PBPK) models to minimize uncertainties inherent in extrapolation between test species to humans and from doses used in toxicology tests to the range of dietary exposures in different age groups of people.

These studies have produced useful information for use in risk assessment of BPA from food contact materials: 1) The pharmacokinetics of BPA following oral administration in rodents and non-human primates is characterized by extensive pre-systemic metabolism in the GI tract and liver to inactive Phase II conjugates (absolute bioavailability ~1%). Phase II metabolism is immature in newborn rodents but newborn non-human primates show a similar total metabolic capacity for BPA as adults. Unconjugated BPA does cross the placenta in rodents and non-human primates, but similar levels of unconjugated BPA are seen in the fetus and the dam. 2) A modified guideline-compliant 90-day toxicology study was conducted by gavage in Sprague-Dawley rats using 8 doses ranging from 2.5-300,000 µg/kg bw/d starting with pregnant dams, continuing with direct dosing of newborns the day after birth, and into adulthood until 90 days of age. While the focus of this study was on reproductive toxicity, including clinical chemistry and histopathology, other endpoints associated with BPA were also evaluated (e.g., fat deposition, serum glucose/insulin, cardiovascular). Clearly adverse effects of BPA, which overlapped with both doses of a concurent reference estrogen, ethinylestradiol, were only observed in the two highest doses (100,000 and 300,000 µg/kg bw/d) and no biologically significant effects were observed in the low dose range (2.5-2,700 µg/kg bw/d). When maximal serum concentrations of either unconjugated BPA produced by the two highest BPA doses or both doses of ethinylestradiol were compared with concurrent serum levels of endogenous estradiol, the estrogen receptor binding equivalents were similar to or above endogenous levels in males and females of all age groups tested. 3) BPA was measured in serum and urine from human subjects consuming a test diet comprised of common canned foods throughout a 1-day clinical study. The total BPA exposures in these subjects were were within a factor of 4-times the 95th percentile of American aggregate daily exposure. Even from these high dietary exposures, no detectable unconjugated, and therefore active, BPA was detected in serum from any subject. These results reinforce the constraints placed on blood concentrations of unconjugated BPA by the total BPA consumed and the relationship between concurrent concentrations of total BPA in urine and serum. Similarly, a meta-analysis of 30,000 BPA measurements in blood and urine from the literature showed that typical dietary exposures to BPA produce levels of unconjugated BPA in blood that are undetectable by current analytical methodology. 4) PBPK models were produced from adult and neonatal non-human primate and rat pharmacokinetic data and combined with available literature human pharmacokinetic data to produce a model for adults and infants. Blood concentrations of unconjugated and conjugated BPA were simulated for infants and adults using mean and 90th percentile values for BPA consumption using FDA's current dietary intake assessment. This combination of experimental and computational approaches enable a critical evaluation of the potential for BPA toxicity in people consuming different amounts of BPA in the diet during different lifestages.

ACKNOWLEDGEMENT. This work was supported in part by an Interagency Agreement between the NCTR/FDA and the NTP/NIEHS. The views presented do not necessarily reflect those of the FDA or NTP/NIEHS.

Henry Chin

George Mason University, Center for Health and Risk Communication

Dr. Henry Chin retired in 2013 as the Senior Director for Food Safety, Scientific and Regulatory Affairs at The Coca-Cola Company. At The Coca-Cola Company he was responsible for scientific and regulatory policy on food safety issues, including ingredients, and standards. He has made numerous presentations on food safety and on managing food safety risks. As a chemist, he is a recognized expert on the analysis and risk assessment of food contaminants including heavy metals, pesticide residues, other environmental contaminants, and on the chemical composition of foods.

Prior to joining Coca-Cola, he was with the National Food Processors Association (NFPA) for nearly 30 years, providing scientific and technical advice to most of the major food companies in the United States. At NFPA, Henry held positions as Vice President of the Laboratory Centers, with responsibility for analytical chemistry, food microbiology and process development, and as Vice President of Toxicology and Food Science, with responsibility for food safety programs related to food composition, and chemical contaminants.

Henry is currently a Guest Faculty Scholar at the Center for Health and Risk Communication at George Mason University and does a limited amount of consulting.

Henry is a past President of AOAC International (the Association of Official Analytical Chemists), and has been a member of several government and academic advisory panels on various aspects of food safety including food additives and pesticide residues. He has served on the Board of Trustees of the Health and Environmental Sciences Institute (HESI) and the International Life Sciences Institute (ILSI), co-chaired the

Is There Zero Risk Food Packaging?

Henry Chin,
George Mason University, Center for Health and
Risk Communication

ABSTRACT

Ever since prehistoric times, humans have searched for materials and objects to store their food and drink. We have arrived at modern food packaging through arguably hundreds of years of trial and error and decades of scientific and technical knowledge about the microbiological and chemical nature of foods and container materials. To better understand the "non-toxicological" aspects of the BPA controversy, it is instructive to look at the history of food packaging in terms of the evolution of food packaging, the desired benefits, the recognized short-comings, and to look at whether food packaging is really necessary. Do the benefits of food packaging justify the insignificant risks that may exist with modern food packaging, including materials like BPA? Does something like zero risk food packaging really exist?

Richard Canady

International Life Sciences Institute

Richard Canady, PhD directs the Center for Risk Science Innovation and Application of the ILSI Research Foundation, which fosters collaborative research supporting risk management needs. Expert in regulatory risk assessment covering a wide range of cutting edge health risk management issues over a 25 year teaching and public policy career, including genomics, nanotechnology, biotechnology, obesity, and contaminants in the environment and in foods. Doctorate is from Rockefeller University. Positions include the US Centers for Disease Control, Food and Drug Administration, and the Office of Science and Technology Policy of the White House.

When Zero Risk is Actually Dangerous to Your Health

Richard Canady
International Life Sciences Institute
Washington, DC

ABSTRACT

Risk of Risk Perception: Health risk assessment tools for application to information flow

Causal linkages can be drawn between the initiation of a risk perception in a population and adverse health effects in cases such as reports of vaccine risk leading to lowered herd immunity and of airline terrorism news leading to increased mortality from driving. Many other examples have been discussed in recent workshops. The proposed research posits that health could be improved if there were widely accepted methods for assessing the consequences of behaviors changed by risk perceptions. Based on preliminary workshop outcomes, elements of traditional risk assessment apply to such evaluation. Potency; severity, likelihood, incidence of effects; pathways of exposure; susceptible populations; and externalities are identifiable and quantifiable for perceptions of risk in some cases. Methods drawn from behavioral economics and information flow analysis can be combined with exposure analysis and epidemiology in population risk frameworks. Opportunities for risk management can be identified and acted upon to reduce health effects.

We are seeking to stimulate research under this framework that will 1) identify potent scenarios and susceptible populations where risk assessment and management could reduce health risks caused by risk perceptions, 2) identify methods that can predict effects and the actionable causal pathways for them, and 3) propose methods development to quantify utility of specific interventions. The research will seek to establish a new focus for risk analysis in the management of the health effects of information. Case studies for this research were recently presented at a conference funded by the project at the Harvard School of Public Health.

The research will join experts in behavioral economics, risk perception, risk communication, risk assessment, and information flow analysis to apply risk analysis and decision science approaches to effects analysis for information flow. The research will generate new areas of practice in public health assessment and protection.

Broader impacts New patterns of information flow through Internet and social media are changing how information about risk is received and acted upon. Expert dialogue about risk is available directly to consumers who do not have the contextual grounding of the experts to temper decisions of what to do about the risk. The research will impact how we approach expert evaluation of emerging risk information by asking when and how uncertain information should be conveyed to larger audiences. Areas of focus for the project include medical practice, emerging technologies, food safety, energy production and use, and safety of chemicals and industrial materials. The research will raise awareness of the need to "do no harm" through public discussions of risk.

Christine Prue

Centers for Disease Control

Christine E. Prue, MSPH, Ph.D.

Dr. Christine Prue is the Associate Director for Behavioral Science at the National Center for Emerging and Zoonotic Infectious Diseases at the Centers for Disease Control and Prevention (CDC). She works to apply and advance the science of health behavior and health communication to prevent and control infectious diseases. Since 2008 she has led communication response efforts to numerous foodborne outbreaks, conducted research to develop messages promoting consumer food safety behaviors, guided communication of new scientific findings, led efforts to engage public health, industry, and consumer advocacy partners on a number of issues including Lyme Disease, vaccine safety, and One Health (the notion the people, animals and the environment are interconnected for disease and health). She is the co-developer of CDC's Clear Communication Index, a research-based tool to plan and assess communication products.

Chris received a bachelor's of science degree in biology from the University of Maine, Orono in 1986, a master's of science in public health in community health education from the University of Massachusetts, Amherst in 1988, and a PhD in health education (focusing on health behavior and health communication) from the University of Maryland, College Park in 1998. In the late 1980's, Chris began her career in public health working on the frontlines at state and local health departments in Maine. She joined CDC in 1996 in CDC's Office of Communication, where she assisted programs across CDC with health communication planning, implementation, and evaluation activities. In 2002, she joined the National Center on Birth Defects and Developmental Disabilities (NCBDDD) as a senior behavioral scientist who developed, implemented, and evaluated interventions to prevent serious birth defects. In 2006, she became the chief of the Prevention Research Branch which focused on the primary prevention of fetal alcohol syndrome and folic acid-preventable neural tube defects as well as early identification of autism. In 2008, she started working with CDC's infectious disease programs. Chris has been deployed to India and Indonesia to address large-scale refusal of polio vaccine. Her efforts led to substantial increases in polio vaccination rates.

Chris enjoys writing poetry, reading biographies, learning about cultures different from her own, singing all kinds of music, hosting dinner parties, and quilting. She is the proud mother of a dog and cat named Luvie and Mercy, respectively.

Is Zero Risk Actually Possible When Communicating Risk to Consumers: A Public Health Perspective

Christine Prue
Centers for Disease Control
Atlanta, GA

While zero risk (the idea that risk can be completely eliminated)is an appropriate pursuit of food industry and food safety professionals for preventing foodborne illnesses, promising zero risk to consumers is a risky behavior. Communications that set expectations that food may be "risk free" works against much of what is known in the social sciences which examines consumer perceptions, expectations, information needs, decision-making, and behaviors. When consumers are given accurate information in a timely, empathetic and transparent way, told what is known and unknown about a situation that may be affecting the risk/safety of a food product, and given concrete behavioral recommendations, they are much more likely to make informed decisions that protect their health.

The *Dietary Guidelines for Americans, 2010* provides evidence-based nutrition information and advice for people age 2 and older. In general, it recommends a healthy eating pattern that limits intake of sodium, solid fats, added sugars, and refined grains and that emphasizes nutrient-dense foods and bever-ages—vegetables, fruits, whole grains, fat-free or low-fat milk and milk products, seafood, lean meats and poultry, eggs, beans and peas, and nuts and seeds.
The guidelines acknowledge that a healthy eating pattern needs not only to promote health and help decrease the risk of chronic diseases, but it also should prevent foodborne illness. It promotes four basic food safety principles (Clean, Separate, Cook, and Chill) which can reduce the risk of foodborne illnesses and acknowledges that some foods (such as milks, cheeses, and juices that have not been pas-teurized, and undercooked animal foods) pose high risk for foodborne illness and should be avoided. However, some foods, like fruits, vegetables, and nuts, are a vital part of a healthy diet and are typically consumed raw. If they are contaminated, there is no risk reduction offered by cooking and limited risk reduction offered by washing.

Each year roughly 1 in 6 people in the United States gets sick from eating contaminated food. Local, state, and federal public health officials track sicknesses, hospitalizations, and deaths in addition to investigating outbreaks to find the foods or the settings where food is served that are making people sick. Investigators also look into the circumstances that led to the food becoming contaminated so that lessons learned from their investigation can inform food industry practices and policies.

Of the estimated 9.6 million foodborne illnesses caused by known pathogens, forty-six percent of these illnesses are associated with produce commodities (fruits-nuts and fungi, leafy, root, sprout and vine-stalk vegetables) with norovirus as the culprit in 46% of the illnesses. The number of outbreaks involving produce underline concerns about contamination of produce consumed raw.

Using preliminary findings from research exploring consumer perceptions of the risks and benefits of eating raw fruits and vegetables, this presentation will describe work that is aimed at addressing challenges of communicating both the risks and benefits of foods in a way that meets audience needs for clear and actionable information.

David Ropeik

Harvard University

David Ropeik is an Instructor at Harvard University, author, and consultant on risk perception, risk communication, and risk management. He is author of How Risky Is It, Really? Why Our Fears Don't Always Match The Facts (2010, McGraw Hill) and co-author of RISK, A Practical Guide for Deciding What's Really Safe and What's Really Dangerous in the World Around You, (2002, Houghton Mifflin).

He has written more than 50 articles, book chapters, and other essays, in both the peer-reviewed literature and the general media, on risk perception and risk communication. He is a widely cited expert on risk perception in the general press and he blogs for BigThink.com, Psychology Today, Nature, Scientific American, Climate Central, Columbia Journalism Review, and The Huffington Post.

Mr. Ropeik was a television reporter for WCVB-TV in Boston from 1978 – 2000, where he specialized in reporting on environment and science issues. He twice won the DuPont-Columbia Award, often cited as the television equivalent of the Pulitzer Prize, and seven regional EMMY awards. He wrote a science column for The Boston Globe 1998-2000. He was a Knight Science Journalism Fellow at MIT 1994-95, a National Tropical Botanical Garden Fellow in 1999, and a member of the Board of Directors of the Society of Environmental Journalists from 1991-2000.

He is creator and director of the program "Improving Media Coverage of Risk", a training program for journalists. He has taught journalism at Boston University, Tufts University, MIT, and Northwestern University.

Media Coverage of Food Risk

David Ropeik
Harvard University

ABSTRACT

There is no question that the news media play an important role in what Kasperson *et.al.* have called the Social Amplification of risk (http://onlinelibrary.wiley.com/doi/10.1111/j.1539-6924.1988.tb01168.x/pdf , the idea that secondary and tertiary risks arise not from the first case Hazard X Exposure, but from what people learn about the initial threat, and how they behave. So it is important for those involved in food issues of all kinds, particularly those associated with risk, to understand how the news media bring the public information about those issues.

This talk will offer reflections from a former journalist about the psychology that informs decision making in the news media; which stories to cover and which ones to ignore, which facts to play up and which to play down (or omit), which questions to ask, which pictures to take. While it is important to understand the evolving 'new media' delivery infrastructure, in order to influence how the news media report on food risk issues it is most valuable to understand the underlying psychology that informs the decisions that journalists of all kinds make as they choose what to cover, and how.

Poster Session Abstracts

1. Visualizing Food Safety Trends in Support of Foodborne Illness Outbreak Prevention

Lauren Neal and Jason DeChancie
Booz Allen Hamilton
Rockville, MD

A cloud-based solution was developed to support Food and Drug Administration (FDA) reviewers in analyzing data on a massive scale with the goal of gaining new insight into food safety. A "big data" backend was developed to provide a platform to ingest publicly available data and facilitate the analysis of trends and patterns in food imports and refusals, number of FDA consumer safety inspectors from the Office of Personnel Management (OPM), facility inspection events from the FDA, and daily local temperature and precipitation readings from the National Oceanic and Atmospheric Administration (NOAA). An interactive, web-based dashboard, built using JavaScript D3 and Google Maps, provides three views for the exploration of data from different perspectives and to help inform FDA decisions on resource allocation for port inspections: 1) a motion chart that shows broad trends in imports and refusals by country of origin, 2) a time series plot to provide information on detailed variations over time, and 3) geographic view that breaks down import and inspection information by FDA district office.

2. Next-generation DNA sequencing in support of epidemiological investigation of infectious disease at a national scale

Andrew Huang
Booz Allen Hamilton
Rockville, MD

Booz Allen Hamilton supports federal government clients in building a next-generation sequencing-based (NGS) epidemiological surveillance capability and supporting state public health labs. Tens of thousands of pathogen samples are analyzed each year and traditional testing is both expensive and time-consuming. Next-generation sequencing promises to provide improvements in both speed and data over existing tests and higher resolution to distinguish between similar samples. Epidemiological surveillance efforts by public health laboratories aim to study the spread of disease by identifying common exposure and risk factors. NGS offers strong improvements in speed and resolution over traditional methods like pulsed-field gel electrophoresis and biochemical testing. BAH personnel have been integral in setting up Illumina MiSeq sequencers and training federal agency personnel on sequencing library preparation and sequencer operation, as well as streamlining the data storage and analysis pipeline. Comparative analysis using these DNA sequences can yield high quality phylogenetic trees that are used to cluster related samples and test exposure/risk factor hypotheses based on traditional epidemiological data. Samples that previously would have clustered as one group can now be distinguished as sub-groups, allowing epidemiologists to more accurately link exposures to cases of disease. This has allowed the public health agencies to maintain situational awareness over disease incidents scattered across time and geography, and quickly make interventions that reduce illness and death. These efforts at combining next-generation sequencing and epidemiology will improve the state and federal public health infrastructure that protects millions of Americans, and serve as a model for the expansion of advanced molecular detection technologies.

3. Digital Disease Detection Using Open Source Health Intelligence

Jane Blake
Booz Allen Hamilton
Rockville, MD

ABSTRACT

Non-traditional data streams are increasingly being used in food safety surveillance. These might include U.S. Census figures, weather data, 911 calls, Poison Control Center, product recalls, restaurant inspection scores, inventory stock-outs, and social media, each investigated as potential indicators or signals of disease. The Booz Allen team will present our Digital Disease Detection Dashboard (D4) workbench, which focuses on using open source health intelligence (OSHINT) and advanced statistical techniques to answer eight key questions related to foodborne illness events: (1) where is the issue; (2) how many are affected; (3) how many data streams are reporting similar activity and data points; (4) how severe is the event; (5) how confident can I be in the validity of the data; (6) who is affected; (7) what will happen next; (8) was the event influenced by outside factors? D4 is a user-friendly application providing intuitive visualizations aimed at indicating alerts greets the user, and provides navigation and links for detailed drill-down and exploration of statistics.

4. Harmonizing Food Safety Oversight: Mapping FSMA's Policy Landscape

Emily Ohland
Booz Allen Hamilton
Alexandria, VA

ABSTRACT

The U.S. Government Accountability Office, the National Academies and others continue to highlight coordination and resource challenges resulting from the fragmentation of federal food safety oversight (e.g., 15 agencies collectively administering at least 30 laws). One of the most critical and sweeping food safety laws, the Food Safety Modernization Act (FSMA), includes mandates for the U.S. Food and Drug Administration to coordinate with a variety of stakeholders to address risk. Policy Mapping was used to systematically create a holistic, network-based visualization of these policy drivers (e.g., organizations, authorities, missions, functions) and is intended to be part of a broader analysis to identify areas of "friction" between organizations (e.g., white space, conflicts, overlaps, complements, settled areas). This visualization and subsequent analysis will clarify how the FDA can best engage with federal, state, local, tribal and other organizations under FSMA.

5. Food insecurity, poverty, and obesity in Huntington, West Virginia

Clare Wise
University of Maryland
College Park, MD

ABSTRACT

Huntington, West Virginia was named the country's most unhealthy state by the CDC in 2010. While rates of childhood obesity have declined 8.6% since 2006, they are still at a high rate of 27.8%, compared to the 18% national average.

The Alternative Breaks community service-learning program at the University of Maryland sent a team of 13 students to Huntington to learn and serve the community, focusing on childhood obesity. The team worked with government programs, childcare facilities, and organic farmers, and concluded that food insecurity and poverty are key root causes in the issue of childhood obesity. 29.4% of Huntington's population is below the poverty line, as compared to 17.6% of the overall state and 15.1% of the country, and through observation of the community and interaction with the citizens, the team learned that access to healthy foods played a major role in the diets of the people in Huntington.

6. Genetic diversity of *Salmonella* pathogenicity islands SPI-5 and SPI-6 in *Salmonella* Newport

Guojie Cao
JIFSAN
College Park, MD

Salmonella Newport is one of common serovars causing foodborne salmonellosis outbreaks in the United States. It consists of three lineages with extensive genetic diversity. Most *S*. Newport strains from North America belong to *S*. Newport lineages II and III. A total of 28 strains of lineages II and III from diverse sources and geographic locations were analyzed using whole genome sequencing technology. Because of the importance of *Salmonella* pathogenicity islands 5 and 6 (SPI-5 and SPI-6) in virulence activity of pathogenic *Salmonella*, the presence and genetic diversities of these two SPIs may be highly associated with *S*. Newport pathogenicity. SPI-5, encoding translocated effector proteins of SPI-1 and SPI-2, was identified in all *S*. Newport strains with variations. It contained two genomic islands (SPI5-GI1 and SPI5-GI2) of over 40 kb encoding bacteriophage genes between tRNA-ser and *pipA* and 146 single nucleotide polymorphisms (SNPs). SPI5-GI1 was identified in *S*. Newport multidrug-resistant strains of *S*. Newport. There were 39 lineage-defining SNPs identified, including 18 none-synonymous SNPs. SPI-6 was also present in all *S*. Newport strains except three Asian strains in subgroup IIA. The Asian strains shared a common genomic island at the same locus of SPI-6. The *saf* fimbrial operon in SPI-6 was present in the *S*. Newport strains. The phylogenetic trees of SPI-6 constructed with 937 SNPs showed that all *S*. Newport displayed a clear geographic structure at the lineage level. These findings illustrated the genetic diversity of these important SPIs and implied the potential differences of virulence among *S*. Newport strains.

7. Risk factors identification for *Toxoplasma gondii* infection in meat products destined for human consumption

Miao Guo
University of Maryland
College Park, MD

Toxoplasma gondii is a parasite that is responsible for approximately 24% of all estimated deaths per year, attributed to foodborne pathogens in the U.S. The main transmission route for human infection is through consumption of raw or undercooked meat products that contain *T. gondii* tissue cysts. Risk assessment studies related to meat-borne *T.gondii* infection were very limited so far. The objective of this study was to compare risk among different meat products, identify risk factors and summarize risk assessment studies for human *T. gondii* infection through consumption of meat products, both conventional and organic, in the past twenty years. Relevant studies in literature were searched in PubMed and Google Scholar database by key words '*Toxoplasma gondii*' and in combination with 'pig', 'pork', 'sheep', 'lamb', 'chicken', 'cattle', 'meat', 'organic meat', 'risk', and 'risk assessment'. This structured review focused on studies of *T. gondii* infection through meat-consumption route. Risk factors identified on farm include outdoor access, farm type, feeding, presence of cats, rodent control, bird control, farm management, carcasses handling, and water quality. Seroprevalence of *T. gondii* is greater in conventional pig and sheep compared to cattle and poultry. Seroprevalence of *T. gondii* is greater in organic compared to conventional meat products indicating higher risk of *T. gondii* infection from organic meats. To better understand the risk of toxoplasmosis in humans from meat consumption in the U.S., a quantitative microbial risk assessment of meat-borne toxoplasmosis based on data and information relevant to the U.S. is critically needed. This study would serve as a useful resource and information repository for informing quantitative risk assessment studies for *T. gondii* infection in humans through meat consumption.

8. Foodborne pathogens in leafy greens: Data, predictive models, and quantitative risk assessments

Mishra Abhinav
University of Maryland
College Park, MD

In the last few years, technological innovations in production, harvesting, processing, and packaging of fresh produce and their consumption have increased tremendously in the U.S. Consumers are eating more fresh produce, purchasing a broader variety and demanding more convenience products such as ready-to-eat salads. Fresh produce is generally consumed raw, making it a high-risk food in terms of pathogen contamination. A recent study by the Centers for Disease Control and Prevention indicated that in between 1998 and 2008, leafy greens outbreaks accounted for 22.3% of foodborne outbreaks. Contamination with pathogens of fresh produce including leafy greens has been a major concern to various stakeholders such as food industry, regulatory agencies, and consumers. In this study, we performed a structured review of literature to gain more insight into the available data and information related to contamination sources, predictive microbial models, and quantitative risk assessment models for different pathogens such as *Listeria monocytogenes*, *Salmonella, Escherichia coli* O157:H7 in leafy greens in the farm-to-table continuum. It was observed that microbial contamination mostly originated from the pre-harvest environment. Contamination can effectively be controlled by storing the leafy greens at appropriate temperature and time, and by the application of intervention steps such as washing and irradiation. Several research studies on predictive modeling and quantitative microbial risk assessments of pathogens in fresh produce, which are focused on one or more steps such as irrigation, harvesting, processing, transportation, storage, and washing, have been reported in the last few years. We divided those into three categories: pre-harvest models, storage models, and models related to intervention steps, primarily washing. Overall, our study provides valuable information to inform future quantitative microbial risk assessment studies related to leafy greens.

9. Risk Assessments for *Listeria monocytogenes* and *Salmonella* spp. in Melons

Miao Wang
University of Maryland
College Park, MD

ABSTRACT

In the past decade, with the increasing public preference for fresh produce, the risk of illnesses associated with consuming raw and minimally processed fruits and vegetables has drawn increased scrutiny from various stakeholders including consumers, industry, government, and academia. Annual consumption of non-citrus fresh fruits, including melons, increased 45.5% from 1976 to 2009. Melons are considered as the second highest fresh produce commodity of concern for microbial risk. *Salmonella* spp. and *Listeria monocytogenes*, two of the most deadly foodborne pathogens, have been associated with melons contamination, recalls, and most importantly two recent large-scale outbreaks in 2011 and 2012. While government guidelines on Good Agricultural Practices and post-harvest Best Practices have been published for cantaloupes, no quantitative estimate of risk and mitigation effectiveness are available for any melon variety. In support of such quantitative risk assessment efforts, the goal of this study was to systematically review existing data on the risk of contamination from *Salmonella* spp. and *Listeria monocytogenes* and their ecology in the melon production chain. Specific objectives were to review: (i) production and consumption of common melon varieties (cantaloupe, honeydew, and watermelon), (ii) potential contamination sources in the farm-to-fork supply chain, (iii) prevalence and survival of pathogens associated with melons, and (iv) potential intervention strategies for risk reduction in the melon industry. This systematic review synthesizes critical information needed for conducting farm-to-fork quantitative microbial risk assessment (QMRA) models for *L. monocytogenes* and *Salmonella* spp. on melons.

10. Quantitative Risk Assessment for *Escherichia coli* O157:H7 in Fresh-Cut Lettuce

Hao Pang
University of Maryland
College Park, MD

ABSTRACT

Leafy green vegetables, including lettuce, are recognized as potential vehicles for foodborne pathogens such as *Escherichia coli* O157:H7. Fresh-cut lettuce, despite its convenience as ready-to-eat food is at greater risks of causing foodborne illnesses as no cooking process is needed for consumption. This study was aimed at developing a quantitative microbial risk assessment (QMRA) model for *E. coli* O157:H7 in fresh-cut lettuce, and evaluating the effects of intervention strategies on public health risks. The fresh-cut lettuce production chain was modeled from infield production, with both irrigation water and soil as initial contamination sources, until consumption at home. Each step in the process was modeled stochastically, based on available experimental data and industry expert opinion. With a prevalence of 0.1% of lettuce entering the processing line, the baseline model (with no intervention strategies) predicted a mean of 2,160 cases per year in the U.S. All intervention strategies evaluated (chlorine, ultrasound and organic acid, irradiation, bacteriophage, and consumer washing) significantly reduced the estimated illness incidence. The sensitivity analysis indicated that soil *E. coli* concentration was the most important factor affecting the predicted number of cases. The developed risk model could be used to estimate the microbiological risks associated with *E. coli* O157:H7 in fresh-cut lettuce and to further evaluate additional intervention strategies to mitigate risk from *E. coli* O157:H7 contamination.

JIFSAN

Advisory Council Membership

Scott Hood

General Mills, Inc.

Scott Hood, Ph.D is the Director for Global Food Safety and Regulatory Affairs at General Mills with responsibility for microbiology, toxicology, and thermal processing. Over the past 14 years, he has held various roles in quality and food safety at General Mills. Previous experience includes roles in both R&D and Quality at Michael Foods and Land O'lakes. Scott is active in a number of industry initiatives related to food safety, including; the
National Advisory Committee on the Microbiological Criteria for Food and the Board of Advisors for University of Georgia Center for Food Safety. Scott has a BS in Food Science from the University of Wisconsin and an MS & PhD in Food Science from the University of Minnesota.

Sarah Geisert

Alternate, General Mills Inc.

Sarah Geisert, Senior Director leads General Mills Global Product Safety and Regulatory Affairs department.

Sarah joined General Mills in 1983. She has spent the last 30 years with General Mills in a variety of roles and departments including R&D, Operations and most recently Quality & Regulatory Operations. In her current capacity, she is responsible for leading General Mills global product safety and regulatory affairs department. This department has responsibility for leading the establishment of food safety & sanitation standards, the assessment and measurement of product safety risk, auditing of GMI
operations, identifying emerging issues & prevention strategies and management of global regulatory affairs. Sarah has direct responsibility for leading the food safety incident management team. She represents General Mills external interests in numerous scientific, trade and regulatory associations.

Sarah is on the Grocery Manufacturers of America Science & Regulatory Affairs Board of Directors. She is active in numerous scientific and regulatory affairs efforts including the Council to Improve Foodborne Outbreak Response, Association of Food and Drug Officials where she is currently chairing the Industry Member Committee and has participated in several Asia Pacific Economic Cooperative collaboration training meetings. Outside of work, Sarah is on Second Harvest Heartland Board of Directors which is focused on ending hunger in Minnesota.

Jason Hlywka

Kraft Foods, Inc.

Representative Information Not Available

Mark Moorman

W.K. Kellogg Institute

Mark Moorman is the Senior Director of Global Scientific Regulatory Affairs for the Kellogg Company in Battle Creek, MI with responsibilities for formulating plans against emerging food safety and nutrition issues that may affect the Kellogg Company. Mark is on the Board of Directors for Food Allergy Research and Resource Program and has chaired the Grocery Manufacturers Association Microbiological Safety Committee. Prior to joining the Kellogg Company in 1998, Mark spent 10 years with Silliker Laboratories as the Technical Director of Microbiology responsible for assisting clients with microbiological food safety and quality issues. Mark has his undergraduate and Ph.D. degrees from Michigan State University in Microbiology and Food Science and has an adjunct faculty appointment in the Department of Food Science and Human Nutrition.

Laurie Post

MARS Global Chocolate

Dr. Laurie S. Post has spent over 25 years in the food industry as a Food Microbiologist and Food Safety professional. She is an expert in pathogen control programs for low moisture foods and processes. Dr. Post earned her B.S. degree in Microbiology and Master's degree in Food Microbiology from the University of Maryland and her PhD in Food Microbiology from the University of Tennessee. Following a post-doctorate fellowship in the Department of Food Science, Rutgers University and a three-year period as an Assistant Professor of Food Microbiology, Dr. Post joined Mars Inc. as a Senior Research Scientist. She is currently the Senior Manager for Food Safety and Microbiology for Mars Global Chocolate. Dr. Post is the author of numerous publications and has chaired the microbiological food safety committees of the International Life Sciences Institute and GMA.

Ravindra Ramadhar

Thermo Fisher Scientific

is Food Safety Business Director at Life Technologies**,** a ThermoFisher Brand, where he leads a growing food safety portfolio including molecular pathogen detection and solutions for viruses, food authenticity and quality testing. Ramadhar began his career in the food industry Monsanto working on foundational molecular biology technologies, which he later applied to pathogen detection at DuPont, where he led technology and business development. Ramadhar holds a B.S. in molecular biology from Rutgers University and an M.B.A. from the Whitman School of Management at Syracuse University. He lives in Austin, TX and enjoys great outdoors hiking and mountain biking when not working on food safety.

Patrizia Barone

Unilever

Dr. Patrizia Barone is the Regional Regulatory Affairs Vice President at Unilever, leading the strategic regulatory activities for the North American region as well as Foods and Refreshment globally. Before joining Unilever, Patrizia held positions at Reckitt Benckiser, initially as Vice President of R&D for North America. She moved to Australia to head the Asia Pacific & South Asia R&D Laboratory, and upon her return held positions culminating as Global R&D Category Group Director - Regulatory Affairs & R&D Systems, responsible for product safety and regulatory strategies for all products globally. Earlier, Patrizia worked with Colgate-Palmolive and Miles, Inc. Household Products Division, a division of Bayer AG.

Patrizia has a Bachelor of Science in Chemistry from the University of Maryland College Park and a Ph.D. in Inorganic Chemistry from Georgetown University, Washington, D.C.

Joseph Scimeca

Cargill, Inc.

Joseph Scimeca currently holds the position of Vice President of Global Regulatory & Scientific Affairs, Corporate Food Safety and Regulatory Affairs at Cargill, where he provides leadership for ensuring that company food and feed products and processes are safe, included being protected against intentional acts of adulteration and bioterrorism, and are in com pliance with the appropriate food/feed regulations. He manages a team of regulatory professionals based in various regions of the world. Before joining Cargill in February 2004, Dr. Scimeca was a Senior Manager for Quality & Regulatory Operations, at General Mills, Inc. Previously he held the position of Director, Food Safety and Regulatory Affairs with The Pillsbury Company, where he was employed since June 1999. Prior to joining Pillsbury, he was employed with Kraft, Inc. where for nearly twelve years he held various positions in toxicology and nutrition. Prior to Pillsbury, he received his Ph.D. in Pharmacology and Toxicology from the Medical College of Virginia, Virginia Commonwealth University, in 1987. He has and continues to serve on various technical committees for several scientific organizations and trade associations, such as Grocery Manufacturers Association, Food Allergy Resource and Resource Program, Joint Institute for Food Safety and Nutrition, and the International Life Sciences Institute. For the latter organization, he is currently serving as chair of the Food Nutrition and Safety Program, and has been past chair of the Technical Committee on Food Toxicology and Safety Assessment. At the request of the National Academy of Sciences, he has served on a subcommittee involved in the development of a framework for evaluating the safety of dietary supplements. Similarly, he served on an expert panel for the Institute of Food Technologists in developing a report on evaluating food chemical safety. Recently he was selected to serve on the 2010-2015 Food Ingredients Expert Committee of the USP. He has actively participated in the Society of Toxicology Food Safety Section since its inception, where he has held several positions, including president. Joe is currently serving as the co-chair of the Industry Working Group of the National Center for Food Protection and Defense, based at the University of Minnesota. He also chairs the Minnesota Food Safety and Defense Task Force, held under the auspices of the Minnesota Departments of Agriculture and Health. He has authored over thirty peer-reviewed scientific publications, two monographs, and four book chapters.

Phillip Kilby

Waters Corporation

Phil Kilby is the Senior Director of Strategic Relations at Waters Corporation, USA. With over ten years of experience in the pharmaceutical industry, Phil led a team focused on technology and business development before joining Waters, Europe in 1998. Highly experienced with managing sophisticated analytical scientific projects across broad markets, he now manages the diverse and successful engagements with customers and partners within Worldwide Marketing. Mr. Kilby moved to Waters, US in 2001 and is based at the worldwide headquarters in Milford, Massachusetts.

Brent Flickinger

Archer Daniels Midland Company (ADM)

Brent D. Flickinger, Ph.D., is Senior Manager, Nutritional Science for the Archer Daniels Midland Company in Decatur, IL. He has been employed by ADM since April 1999. During his tenure at ADM, his area of expertise and responsibility has grown to include scientific and regulatory support for ADM's entire portfolio of food and dietary supplement ingredients. He and his colleagues evaluate scientific literature to identify new areas for
ingredients, conduct evidence-based reviews to substantiate marketing claims, submit product dossiers for and rulemaking comments to global regulatory agencies, and provide regulatory guidance for food labeling.

Dr. Flickinger received his doctoral degree in Nutritional Sciences from the University of Illinois at Urbana-Champaign and his bachelor's degree in Chemistry from Juniata College in Huntingdon, PA. Immediately prior to joining ADM, he held a postdoctoral research fellowship in the Department of Biochemistry at the
University of Texas Health Science Center at San Antonio during which he was awarded an individual NIH Postdoctoral National Research Award fellowship. His training has an emphasis in lipid chemistry, biochemistry and metabolism. He has published in the areas of metabolism of unique dietary fatty acids, cellular targeting of bioactive lipids and emerging research/innovations in dietary fats and oils.

Professionally, he is an active in the American Oil Chemists' Society (past president of the Health and Nutrition Division), the Institute of Food Technologists, the American Society for Nutrition and the American Dietetics Association. Dr. Flickinger also participates in numerous industry associations including Institute of Shortenings and Edible Oils, International Food Information Council (currently chair of Dietary Fats Committee), United Soybean Board, International Life Sciences Institute – North America (currently chair of Technical Committee on Dietary Lipids and Food Nutrition and Safety Program Committee) as well as the American Heart Association's Industry Nutrition Advisory Panel (chair from 2009 -2011).

DeAnn Benesh

3M

DeAnn L. Benesh is a Global Regulatory Affairs Manager in 3M Food Safety, where she provides strategic leadership to teams engaging in local and regional regulatory activities to help drive recognition and acceptance of methods; and to actively partner with government and non-government organizations to participate in development of ideas, technologies, and processes to address food safety challenges and requirements within the food industry. She has worked in the food industry for 25 years, and at 3M for the past 32 years in a variety of businesses and capacities including:
research in 3M Pharmaceuticals, new product development within 3M Health Care, and more recently as International Technical Services Manager within 3M Microbiology.

DeAnn has a Bachelor of Science degree in Medical Technology from the College of Pathology, University of Minnesota, Minneapolis, MN; a Mini-Masters in International Business from the University of St. Thomas, St. Paul, MN; and is currently working on a Certificate in International Food Law from Michigan State University, East Lansing, MI.

Steven Hermansky

ConAgra Foods, Inc.

Dr. Steven J. Hermansky is the Vice President and Fellow in Scientific and Regulatory Affairs and Toxicology at ConAgra Foods. Steve joined ConAgra Foods in May 2007 to direct & oversee the corporation's toxicology & product safety risk assessment programs and now heads the Scientific and Regulatory Affairs department. He has over 20 years of post-doctoral toxicology experience in the chemical and pharmaceutical industries and has worked in a variety of product development and safety positions. Prior to coming to ConAgra, Steve was the Director of Product Safety and Performance for Schering-Plough HealthCare Products. In that capacity, he was responsible for pre-clinical toxicology, human clinical safety testing, claims substantiation, post-marketing safety surveillance (adverse event monitoring and reporting), and consumer relations.

Steve has a Doctor of Pharmacy degree as well as Master of Science and Doctor of Philosophy degrees in toxicology. He is a Diplomate of the American Board of Toxicology and has published over 40 textbook chapters, peer reviewed publications and scientific abstracts.

Timothy Jackson

Nestle North America

Tim Jackson is the Director of Food Safety for Nestlé US and Nestle Canada, with responsibility for thermal processing and food safety programs in
hygiene, microbiology, allergens and chemical contaminants. He has held this position since 2009. Tim has worked for Nestlé as a research and industrial microbiologist since 1995 as a research associate, head of the microbiology department of Nestlé's reference laboratory for the US and Canada and from 2004 to 2008 as Microbiology Advisor to Corporate Quality Management for Nestlé world-wide.

Tim received his Bachelor of Science in Biology from Abilene Christian University and his Master of Science and Ph.D. in Food Microbiology from Texas A&M University.

Kelsey Albright

National Consumers League

Kelsey Albright joined the National Consumers League in September of 2013. She works on a variety of issues related to food safety, nutrition, and transparent labeling. Kelsey represents NCL on various coalitions, which work to improve food safety systems and promote healthy eating and physical activity in the U.S. She advocates for food safety and nutrition legislation that best represents consumer interest and rights.

Before coming to NCL, Kelsey was a press intern at the House of Representatives in Congressman Emanuel Cleaver's Office where she worked on various media issues and fielded constituent concerns on a variety of topics. She also spent time as an intern in Congressman Towns' Office and Congresswoman Sanchez's Office. She earned her Bachelors of Science in Communication with a minor in Nutritional Sciences from Cornell University. Originally, she hails from Maine, New York.

Julie Miller Jones

St. Catherine University

Julie Miller Jones, a board Certified Nutrition Specialist and Licensed Nutritionist, received her B.S. degree from Iowa State University and her Ph.D. Food Science and Nutrition (Home Economics) from the University of Minnesota. Currently, she is Professor Emerita and Distinguished Scholar of Food and Nutrition at St. Catherine University in St. Paul. She has twice been named their outstanding professor, was awarded the Myser Award as a professor 'who made a difference in people's lives.

She regularly communicates about whole grains and dietary fiber, carbohydrates, sugars, the glycemic index, fat, antioxidants, diets, celiac and gluten-free, and various aspects of food safety. She authored a number of books and scientific articles. She has appeared on radio and TV shows in many cities and has answered hundreds of consumer letters in the FIXIT column of the *Minneapolis Star and Tribune*. She is a frequent speaker for many professional and consumer organizations, locally, nationally and internationally.

As part of her many activities in many professional organizations, she has served as President and Board Chair of the American Association of Cereal Chemists. In 2004 she received their highest award, the Geddes Award. In 2011 she was named an Academic Fellow of the International Cereal Chemists. She currently is chair of the Whole Grains Working Group. In 2012 she received the Dream Maker Award for menu plans that were highly successful for improving health and causing weight loss of residents of Dakota Communities.

She is a scientific advisor for the Joint Institute of Food Safety and Nutrition of the US Food and Drug Administration and the University of Maryland, the International Life Sciences Institute, and the Grain Food Foundation and the Wheat Foods Council.

Gilbert Leveille

Leveille Associates

GILBERT A. LEVEILLE is President of Leveille Associates, a company providing consultation in the areas of Nutrition, Food Science and Regulatory Affairs.

Dr. Leveille started his career as a Biochemist for the US Army Nutrition Research Laboratory in Denver Colorado (1960-1965), then moved to academia as Professor of Nutritional Biochemistry at the University of Illinois (1965-1971) then was Professor and Chairman of the Department of Food Science and Human Nutrition at Michigan State University from 1971 to 1980. In 1980 he moved to the private sector where he has been employed by a number of food firms including General Foods, Nabisco, McNeil Nutritionals, and Cargill.

Dr. Leveille received his Ph.D. from Rutgers University and received his undergraduate degree from the University of Massachusetts at Amherst. He also has been awarded an honorary D.Sc. degree from Purdue University.

Dr. Leveille is a past president of the Institute of Food Technologists and of the American Society for Nutrition and is a Fellow of both organizations. He is a member of numerous other professional organizations. He lectures widely and has published more than 300 scientific papers and several books and patents. Dr. Leveille is the recipient of several awards including the Mead Johnson and the Conrad Elvehjem Awards from the American Society for Nutrition and the Carl Fellers, Industrial Scientist and Appert Awards from the Institute of Food Technologists. In 2010 an endowed lectureship was established, The Gilbert A Leveille Award and Lectureship, honoring Dr. Leveille's commitment to the disciplines of Food Science and Nutrition, the award will be jointly managed by the American Society for Nutrition and the Institute of Food Technologists

David Lineback

JIFSAN

Dr. Lineback is a member of the American Chemical Society, AACC International (formerly the American Association of Cereal Chemists) (Past-president and Fellow), the American Association for the Advancement of Science (Fellow), the American Society for Nutritional Sciences, the Institute of Food Technologists (Past-president and Fellow), the International Union of Food Science and Technology (IUFoST) (Past President and Fellow of the International Academy of Food Science and Technology), the Japanese Society of Applied Glycoscience (formerly the Japanese Society of Starch Science), Gamma Sigma Delta, Phi Tau Sigma, and Sigma Xi.

Dr. Lineback has received the IUFoST Lifetime Achievement Award (2012); the IUFoST Distinguished Service Award (2012); Permanent Honorary Member of the Chinese Institute of Food Science and Technology (CIFST) (2008); Fellow, ICC Academy, International Association for Cereal Science and Technology (ICC) (2008); Food Chemistry Division Lecture, IFT Annual Meeting and Expo, Orlando, Fl, 2006; CFSAN Director's Special Citation Award (2002); Outstanding Food Science Award, Department of Food Science, Purdue University (2002); Geddes Me morial Award, American Association of Cereal Chemists (1998); Carl R. Fellers Award, Phi Tau Sigma/IFT (1991); William F. Geddes Lecture, Northwest Section, AACC (1988), Purdue University "Old Master" (1986); and Special Award of Merit, Japanese Society of Starch Science (1985).

Dr. Lineback is author or coauthor of more than 75 scholarly papers or book chapters. His research interests encompassed carbohydrate and cereal chemistry with an emphasis on starch structure, properties, and functionality in foods, and enzymes involved in starch degradation/hydrolysis. Current interests involve the issues of acrylamide in foods, food safety and security (domestic and international). He served as major professor for 13 Ph.D. and 7 M.S. students.

Deirdre Schlunegger

STOP Foodborne Illness

Deirdre Schlunegger, Chief Executive Officer for STOP has over twenty years of nonprofit experience. Before she joined STOP, she held the position of President & CEO with the Make A Wish Foundation in Oklahoma. Prior to Make A Wish, she was Vice-President of Affiliate Relations at Breast Cancer Network of Strength (formerly known as Y-Me National Breast Cancer Organization). She had oversight of all the organization's chapters around the country. She developed business plans and launched new chapters in new markets She has served as the Executive Director of a Chicago nonprofit organization and a national foundation, has been the Director of Child Life Programs in a number of Children's Hospitals, served as an adjunct faculty member at the Medical College of Georgia Hospital and Clinics, developed a program at Cabrini Green and was the Director of a Chicago Head Start Program. Deirdre has also worked as a consultant for various organizations.

Deirdre graduated from Colorado State University with a Bachelors of Science degree in Human Development and Family Studies, completed a Child Life Internship at Johns Hopkins Children's Hospital and a program in Nonprofit Management at Kellogg School of Business and has attended numerous courses in leadership including one at the Wharton School of Business. She served on the Chicago Mayor's Office on Domestic Violence Advisory Committee, the Juvenile Court Domestic Violence Committee and was a Board Member of the Illinois Coalition of Domestic Violence.

Donna Rosenbaum

Food Safety Partners, Ltd.

Donna Rosenbaum is the CEO and lead consultant for Food Safety Partners, Ltd. of Northbrook, Illinois. Food Safety Partners is a national food safety consulting firm that specializes in consumer-based projects. Donna is
currently a candidate in the Master of Science in Communication program at Northwestern University; recent studies include issues in change management, leadership and development, global strategies, contemporary media in business and government, managing information for innovation, and crisis management. She became devoted to food safety in 1992 when *E. coli* disease claimed the life of her daughter's best friend as the first victim in the Jack in the Box outbreak.

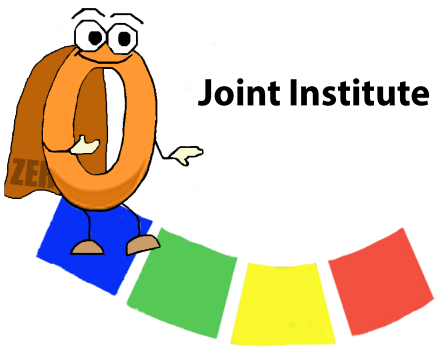
Donna has twenty years of advocacy expertise in working on consumer food safety issues including having personally worked with thousands of
foodborne illness victims. She also worked for three years on the development of the Food Safety Modernization Act and on traceability requirements for food products. Recent endeavors include consultation on the development of traceability software, work on various foodborne illness cases, development of food safety material for white papers, educational material for management of recalls and outbreaks for a food industry insurance group, media work with national journalists, and media and social media outreach platforms on food safety for interested corporations.

Tony Flood

International Food Information Council

As Director of Food Safety Communications at the International Food Information Council (IFIC), Tony has worked for over 13 years developing a number of food safety education and outreach programs. Additionally, he directs the development and continuation of risk / crisis communication programs among academic, government and industry stakeholders on emerging food safety and defense topics. Tony is a graduate of James Madison University, Harrisonburg, VA, where he received a BS degree in Communications.

Tony is an active member of the International Association for Food Protection (IAFP), the Institute of Food Technologists (IFT), The Conference for Food Protection (CFP) and the National Center for Food Defense (NCFPD) risk communication core team.



Joint Institute for Food Safety and Applied Nutrition (JIFSAN)
University of Maryland
5201 Paint Branch Parkway
Patapsco Building, Suite 2134
College Park, MD 20742, USA
jifsan.umd.edu