



Institute for the Advancement
of Food and Nutrition Sciences

2023 Annual Summer Science Symposium

A Unique Gathering
of Scientific and
Regulatory Experts

Executive Summary

Featuring speakers on AI, bioactives, hazard and risk, food microbiology, heavy metals, food packaging, food processing, and science communications, IAFNS held its Annual Summer Science Symposium at the National Press Club June 13-14, 2023



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Keynote by Dr. Steven M. Musser, Deputy Center Director for Scientific Operations at FDA's Center for Food Safety and Applied Nutrition



8

Eight scientific sessions exploring nutrition, food safety, and innovation



15

Fifteen presenters from the Government sector - including FDA and USDA



11

Eleven presenters from academia - including Canadian and US institutions



3

Tri-Partite Audience Engagement: 35% from Academia, 31% from Industry, and 34% from Government

Advancing Science for Impact!

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2023 Annual Science Symposium

Summary

The IAFNS 2023 Annual Summer Science Symposium exceeded expectations! Connecting researchers and stakeholders, reviewing new data, and engaging with colleagues on advances all helped catalyze actionable science. Bringing together researchers from government, industry and academia enables scientific knowledge. It is through collaboration that science and evidence can inform decision making for all sectors - from consumers to policy makers.

IAFNS was honored to host keynote speaker Dr. Steven M. Musser, Deputy Center Director for Scientific Operations at FDA's Center for Food Safety and Applied Nutrition (CFSAN), who outlined the current direction and challenges facing CFSAN. Dr. Musser outlined priorities and new developments in FDA's food program - including nutrition labeling. He also noted how the agency makes thousands of decisions over short intervals and those functions must be maintained during any possible reforms to the organization.

A diverse slate of cross-sector speakers at the symposium represented organizations like Google, Harvard University, Cornell University, FDA, and the National Institute of Food and Agriculture. Sessions explored Artificial Intelligence, heavy metals (including FDA). As part of the Evening Reception, IAFNS hosted venture capital investor Carter Williams who spoke about innovation and creative destruction in food and agriculture sectors.

Other sessions included hazard, risk and global regulations, non-chemical protection of food, and food packaging/recycling innovations. The meeting closed with a lively session on science journalism and story selection. Speaker Helena Bottemiller Evich from Food Fix urged scientists to work with reporters to enhance the content of stories. The panel, including a reporter from Food Dive and a AAAS science communicator, discussed food and science media, building trust and accuracy, and how food stories break through to mainstream media coverage.

The following are summaries of sessions from IAFNS 2023 Annual Summer Science Symposium:

Artificial Intelligence in Food and Nutrition

The 2021 National AI Initiative Act coordinates government efforts to accelerate AI research and application. Since then, NSF, NIH and USDA have funded research focused on AI's ability to analyze large and complex datasets and generate modeled outcomes. Understanding the potential of these technologies can inform cross-sector resource allocation and a better understanding of the strengths and limitations of AI in the food sector. Starting with an overview of the AI landscape, speakers covered current applications, ethics and the promise of AI for advancing our understanding of the complex relationships between food, nutrition and health.

- Rickey Yada, Moderator (University of British Columbia)

Digesting AI: An Overview of Artificial Intelligence

- Nelly Wilson (Google Cloud)

Ms. Wilson outlined what AI is and how machine learning is a way to use standard algorithms to derive predictive insights from data and make repeated decisions. Training a model can lead to predictive power given enough datasets. But trust and ethical issues are barriers to successful AI adoption that must be addressed.

The Warp Intelligent Learning Engine (WILEE) Project: Unleashing the Power of Big Data for Food Safety

- Ernest Kwegyir-Afful (FDA CFSAN)

Unleashing the power of big data is already enhancing federal food safety efforts. A new project leverages some of FDA's previous work

- Carbohydrates • Cognitive Health • Dietary Lipids • Gut Microbiome • Low- and No-Calorie Sweeteners • Protein • Sodium • Caffeine • Food and Chemical Safety • Food Microbiology • Food Packaging Safety • Scientific Integrity

using machine learning techniques to address some of these challenges and promises to deliver more food safety efficiencies. The first phase of the project builds an architecture that enables advanced analytics and on-demand data analysis. The second phase involves building an intelligent knowledge discovery and analytic agent that enables advanced knowledge discovery, on-demand data analysis, and signal detection.

AI for Enhancing Food Safety and Developing Novel Formulations of Food Bioactives

- Nitin Nitin (University of California, Davis) Modeling, food safety data sharing, scaling up technologies, real-time soil monitoring and prediction are the focus of the AI Institute for Next Generation of Food Systems. By combining imaging, biosensing and AI, experts are training models to distinguish between microcolonies of E. coli from other pathogens with 94% precision.

Funding and Priorities in AI at USDA-NIFA

- Steven Thomson (USDA NIFA) New NIFA Director Manjit Misra is leading an organization of 65 program leaders, 80 percent of whom have less than 2 years of experience due to recent agency moves to Kansas City, MO. Cyber Infrastructure efforts are geared toward reproducibly sharing and managing data assets. This also includes analysis workflows – all of which are shared with a diverse spectrum of the agriculture community.

Complex Systems Modeling for Digital Health and Nutrition

- Giulia Menichetti (Harvard University) AI is needed to connect different layers of data including food composition, classification, population consumption, health and bioinformatics. Attention to nutrient content in food and nutrient distributions across foods are both important in managing the data and drawing accurate conclusions about food intake and health.

Advancements in Dietary Bioactive Science

Interest in bioactive food components remains high for researchers, the food and supplement industries, and consumers seeking foods with elevated health benefits. Speakers covered how bioactives have historically been considered in dietary guidance and the evolution of thinking about dietary recommendations. Speakers provided an update on the current science on bioactive food component benefits including gut chemistry and individual responses. Given interest in food processing, the effects of various common processing technologies on the bioavailability, concentration and bioactivity of compounds were also reviewed.

- Cindy Davis, Moderator (USDA ARS)

Overview of Dietary Recommendations for Bioactives – Where We’ve Been, Where We Are, and Where We’re Headed

- Allison A. Yates (USDA-ARS retired)

Tracing the history of dietary recommendations provides important context for possible future recommendations regarding foods that contain bioactive components. 2021 saw the publication of a framework in *Advances in Nutrition* for developing recommended intakes using a 4-step process vetted by experts to leverage data and ultimately provide recommended ranges for intake.

Processing Considerations in Delivery of Bioactive Benefits from Foods

- Mario Ferruzzi (University of Arkansas for Medical Sciences)

Processing is a well-established modifier of bioactive bioavailability. However, the direction of the impact is not always clear. Bioavailability and metabolism are directly impacted by processing and formulation factors that alter structure, chemistries and accessibilities in the gut lumen. Exploration of plant genetics to identify modifiable traits impacting bioactive bioavailability will prove useful in defining strategies to enhance health impacts.

Gut Microbiome, Microbial Metabolism and Personalized Responses to Bioactive Food Components

- Andrew Neilson (North Carolina State University)

Metaorganisms include both hosts and their microbiome and pose an attractive target for dietary phytochemicals. The microbiome interacts with diet probably more than previously understood. For animal-based research, inbred mice can be an important tool but genetic diversity in test animals is important for improved translatability to humans.

Hazard, Risk and Global Regulation

Across the globe, different countries regulate food additives, ingredients, and food differently. Additionally, global expert groups and authorities take a range of approaches from hazard-based to risk-based in their reviews. When non-aligned conclusions are reached by authoritative bodies, the outcomes have domestic and global implications for policy and regulation. Through case studies and panel discussion, this session included tips for communicating risk.

- Alex Eapen, Moderator (Cargill)

Hazard vs. Risk? Hazard IS Risk

- Chris Borgert (Applied Pharmacology and Toxicology, Inc.)

Dr. Borgert discussed some of the confusion around risk terminology and how that sows misperceptions. The thinking and writing on hazard and risk has become so sloppy and incorrect that it now hinders our ability to distinguish conditions under which chemicals can be used safely from those under which they cannot. Dr. Borgert cited the example of how returning spacecraft always catch fire on atmospheric re-entry but airplanes do not as an important and illustrative distinction.

Hazard, Risk, Candy and the Law

- Lyle Burgoon (Raptor Pharm & Tox)

Dr. Burgoon explored regulatory science policy in concluding that over 4,000 skittles need to be

consumed every day for 9 years to hit the genotoxic risk level that is the basis of the EU and California's proposed regulation on titanium dioxide. According to the FDA, 1 percent of food by weight can contain titanium dioxide but people would have to consume 10 pounds of food a day to reach that level. On average, people only consume 3-4 pounds a day.

The Hazards of Risk Communication

- Kristine Butler (FDA CFSAN)

Ms. Butler focused on the importance of trust and perception in communicating risk. She cited Paul Slovic's work on the perception and feeling of risk and concluded that risk communicators must prepare carefully to address different audiences. Ultimately, communicators serve as "decision framework architects," she concluded. In that way, they bridge new information and consumer questions using science to build decision frameworks so risks, benefits and options are clear.

What Happens There Matters Here: Legal and Regulatory Implications of Food Chemical Safety Determinations by International Bodies

- Andrea Bruce (Hogan Lovells)

Food sector attorney Ms. Bruce reviewed relevant international bodies, key regulatory concepts, case studies and their implications for litigation. Bruce reviewed how FDA's new approach to chemical evaluation may strengthen food safety but also pose burdens. She addressed legal challenges to state bans on food additives.

Non-Chemical Protection of Food

Pathogenic bacteria develop resistance to traditional sanitation strategies requiring alternative methods to ensure food safety. The use of bacteria from the native food microbiome as a protective tool could be a valuable mitigation strategy to reduce foodborne illness. Bacteria such as lactic acid bacteria can inactivate pathogenic bacteria through a competition for nutrients and physical space or through the production of inhibitory antimicrobial byproducts.

- Catalyzing Science that Matters
- Mobilizing Knowledge
- Embracing the Future
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This session focused on the types of bacteria that are present in foods, their use as protective cultures against pathogenic bacteria in food production, and regulatory aspects of the use of non-chemical treatments.

- Chuck Czuprynski, Moderator (University of Wisconsin)

One Health Approaches in the Application of Metagenomic Sequencing to Improve Food Safety

- Karen Jarvis (FDA CFSAN)

Dr. Jarvis addressed the “one health” initiative and how harmonized pathogen surveillance – paired with metagenomics – can advance protections. She focused on the microbiomes associated with plant and animal sources including food microbiomes, smoked salmon and melons/cucumbers. After sequencing, it was found that Masala spice mix microbiomes have the highest microbial species diversity.

FSIS Technical Review Process- Regulatory Implications of Using Non-Chemical Intervention Strategies

- Jennifer Green (USDA FSIS)

Reviewing new technologies and ingredients for USDA-regulated meat, poultry and egg products is the mission of FSIS. When planning non-chemical treatments, following FSIS Directives is key. Regulatory implications may include: noncompliance and tagged products; stopped production lines; product disposition change; and/or public health alerts or recalls.

Human Pathogens, Native Microbiota, Protective Cultures, and their Involvement in Produce Safety

- Luxin Wang (University of California, Davis)

Fresh produce recalls result from pathogen contamination from farm fields, processing plants and pathogens accumulated during transport and storage. They can survive for extended periods and are shaped by the season and contamination events. Dr. Wang concluded by noting that protective cultures have the potential to be used as non-chemical based food safety protections.

Heavy Metals in Food: Regulatory Update and Mitigation Strategies

Reducing the presence of heavy metals in the food supply is a priority for regulators, food companies and growers. In this session, speakers provided an update on the FDA’s ‘Closer to Zero’ initiative and the agency’s efforts to set action limits for heavy metals in baby foods. Important new research findings on prioritizing and mitigating exposure to heavy metals in infant and baby foods were presented. This includes prioritization of foods and related mitigation practices based on risks for sensitive populations, and the impact of these strategies on the predictability of supply. Finally, session panelists summarized challenges and opportunities in reducing heavy metals in fresh produce from the perspective of growers in the Western U.S.

- Hongda Chen, Moderator (USDA NIFA)

Update on FDA’s Closer to Zero Goal to Reduce Childhood Exposure to Contaminants in Foods

- Conrad Choiniere (FDA CFSAN)

Dr. Choiniere outlined FDA’s ‘Closer to Zero’ efforts to reduce heavy metals in children’s foods including reducing lead, arsenic, cadmium and other toxic elements. FDA is funding a National Academy of Sciences study on the food safety risks and nutritional benefits of child seafood consumption. FDA’s Total Diet Study samples by calendar year around the country to evaluate analytes in foods and their dietary intake. More progress on reducing metals exposure is expected as action levels and other tools are developed.

Reducing Heavy Metals in Leafy Greens: Learnings and Perspectives from Growers in the Western US

- De Ann Davis (Western Growers Association)

Dr. Davis outlined how farmers face multiple labor, water, climate, pest, conservation and endangered species challenges in growing fresh produce. Metals in soils present particular problems as atmospheric deposition, natural occurrence of many metals, and some soil

amendments add to soil concentrations. Preliminary field trials have shown potential to reduce cadmium levels in spinach treated with microbes up to 60 percent compared to untreated controls. Access to pragmatic and cost-effective cadmium mitigation strategies that are specific to region/crop/soil/farm is important.

Exposures to Foodborne Heavy Metals by Age Group, Food and Consumption Patterns

- Felicia Wu (Michigan State University)

Dr. Wu presented a robust exposure assessment to metals from food that estimated Cadmium exposure through rice and spinach consumption, as well as cumulative average daily doses from rice, spinach, wheat, oats, potatoes and barley. The analysis looked at consumption by age group using the Food Commodity Intake Database. Next steps include assessing the feasibility and cost-effectiveness of strategies to reduce Cadmium in the rice and spinach supply chains.

Classification of Foods Using Processing Level and Formulation

Global food policies are being implemented around the concepts of “ultra-processed” or “highly processed” foods, due to research suggesting links to adverse health outcomes. However, there are several different schemes for classification of foods as “highly-processed” which categorize foods differently. Classification can also vary among different researchers. Successful nutrition policies are based on validated metrics, which, when applied consistently in research, point to substantial evidence for health impact. As the dialogue intensifies around the concept of “ultra-processed,” it is critical to solidify the reliability and validity of these schemes to support regulations and policies that impact public health. In this session, recent dialogues on the topic – including those hosted by IAFNS and USDA – were summarized.

Considerations for Food Classification Systems that Support Research - Outcomes of the IAFNS Workshop

- David Klurfeld, Moderator (Indiana University)

Dr. Klurfeld summarized the May 16-17, 2023, IAFNS workshop on food processing levels and classification. Several current classification systems include processing levels although only the “NOVA” system uses the term “ultra-processed.” The workshop planning team is generating a “Perspectives” article on processing levels, food formulation and resulting food classification.

Developing a Research Roadmap about Processed Foods, food Processing, and Human Health in the Context of the US Food System

- Lauren O'Connor (USDA ARS)

A March 2023 USDA workshop in Hot Springs, AR was organized to generate higher quality research that disagreeing scholars agree would advance research on ultra-processed foods and health. Such alignment reflects a shared understanding and a cooperative scientific research environment. Further categorizing processed foods, improving exposure assessment and examining clinically meaningful metabolic responses are important factors going forward.

Standardizing NOVA Classification for US Dietary Data

- Kirsten Herrick (NIH - NCI)

Dr. Herrick outlined an approach to standardizing the NOVA classification system for U.S. dietary data. She outlined ASA24 – a freely available web-based tool for 24-hour dietary recall data that will standardize intake data going forward as more users adopt the tool. ASA24 supports standardization of research focusing on NOVA classification of foods. NIH is interested in pursuing standardization, access, transparency and innovation in research in this area.



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IUFoST TaskForce: Food Processing for Nutrition, Diet and Health

- Barbara Schneeman (University of California, Davis)

An initiative of the International Union of Food Science and Technology (IUFoST) on food processing seeks to clarify its role in food classification. What is needed is to develop reliable, scientifically valid approaches for determining the importance of food processing in food-based dietary guidelines. Collaboration across disciplines is needed to generate that science.

Food Processing and the Challenges of Translating Science into Law: Lessons from Latin America

- Valentina Castagnari (Georgetown University)
Policy efforts in Latin America to modify food environments were initiated by Chile in 2016 and Argentina, Columbia and Brazil followed with variants of the Chilean law. These involved marketing restrictions to children and new food environment regulations. The new laws reduced sales of “high in sugar” beverages by 24 percent. Sugar and sodium were reduced in some packaged products and purchases of beverages with non-sugar sweeteners increased.

Food Packaging and Recycling Innovations

What will it take to reach the “moonshot” promise of a future with 100 percent safe and sustainable food packaging? The push toward safe, recyclable, sustainable packaging has hit roadblocks, including complex regulatory landscapes, safety concerns with potential contaminants, and technological challenges. Packaging processes can be disrupted as state and federal regulators move to restrict widely-used packaging chemicals like PFAS and phthalates. The session will include information on the food industry’s efforts to address the “moonshot” challenge along with new state and federal requirements.

- Maggie Pandis, Moderator (Conagra Brands)

Regulatory Considerations for Use of Recycled Plastic in Food Packaging

- Allan Bailey (FDA CFSAN)

Dr. Bailey reviewed the plastics recycling submissions process at FDA with a focus on potential contaminants in recycling streams. Preventing packaging from going to the landfill means that it must be recyclable, renewable, compostable, edible or reusable. Recycling submissions to the FDA for plastics have increased to about 40 per year from an average of 10 per year from 2005-2016.

Innovations to Improve the Sustainability of Packaged Foods

- Julie Goddard (Cornell University)

Food waste would be the third leading cause of greenhouse emissions if it were a country, led only by China and the U.S. Food and plastic landfill waste are the top categories of items found in landfills. Active packaging does something extra to prevent spoilage, extend shelf-life, or sense changes and new properties. The overall goal is bioderived, biodegradable active packaging to reduce food and packaging waste.

Getting Real About the Risks of PFAS in Food

- Britt Erickson (Chemical and Engineering News)

Media coverage of PFAS chemicals sometimes misses their chemical behavior and can mislead and confuse consumers, according to Dr. Erickson an editor and chemist. EPA plans to regulate 6 PFAS chemicals in water which will trigger other state and federal guidance and rules. FDA tested and found 7 PFAS compounds from environmental contamination that the agency can assess for health concerns from food intake. Firms often phase out specific ingredients in products in response to consumer pressure even though the science might not be thorough. Accurate risk communication is important as consumer perceptions of risk are often formed by media outlets.

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What to Cover? Science Journalism and Story Selection

In a world abundant with complex and often conflicting scientific knowledge, how do journalists and their editors synthesize information and decide what to cover? How do reporters stay ahead of what's important and interesting to their readers as interests change and evolve? Can scientists work more effectively with reporters to get their findings out? In this session, these questions and others were addressed by food reporters and experts in science communications.

- Johanna Dwyer, Moderator (Tufts University)

Hot or Not: Why Some Food Stories Break Through

- Helena Bottemiller Evich (Food Fix)

Panelists:

- Christopher Doering (Food Dive)
- Kristin Lewis (AAAS)

Ms. Evich identified recent headlines about erythritol and other emerging topics and how they “broke through” to become mainstream media food stories. Sometimes an errant press release or modest statement by an organization can trigger such coverage. Evich encouraged members of the audience to pay for media as more likely to be accurate, balanced, and ethically-crafted as opposed to dubious social media posts. She also said controversies over science can be like “knife fights” and said she seldom does stories based on one scientific study alone, preferring to look at broader sets of studies. Other panelists took a different approach, suggesting that some individual studies are important enough to warrant coverage on their own. All panelists agreed that building trust with members of the media early is a way to ensure accurate coverage and enhance journalism.

The meeting concluded with audience members engaging with the journalism panel on best ways to respond to media enquiries, how to become a reliable source for journalists, and how to handle tough questions and corrections.



Institute for the Advancement of Food and Nutrition Sciences

- At IAFNS we live our Core Values:
 - Scientific Integrity
 - Transparency
 - Collaboration
 - Public Benefit
- IAFNS mobilizes government, industry and academia to drive, fund and lead actionable science - food safety and nutritional science - to advance public health
- We catalyze the creation of scientific knowledge by funding external researchers and convening experts to support positive change
- Our collaborative and inclusive structure empowers members to bring forward the diverse perspectives of the entire food and beverage ecosystem
- IAFNS is proud to provide connections, support collaborations, and catalyze the science that matters - in support of public health.

Our 12 Scientific Committees are actively supporting over 40 projects - working with scientists in the US, Canada, and around the world. With programs focused on catalyzing science, mobilizing knowledge, and embracing the future, we invite you to JOIN US. Together we can bring positive change for the food and beverage ecosystem.

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