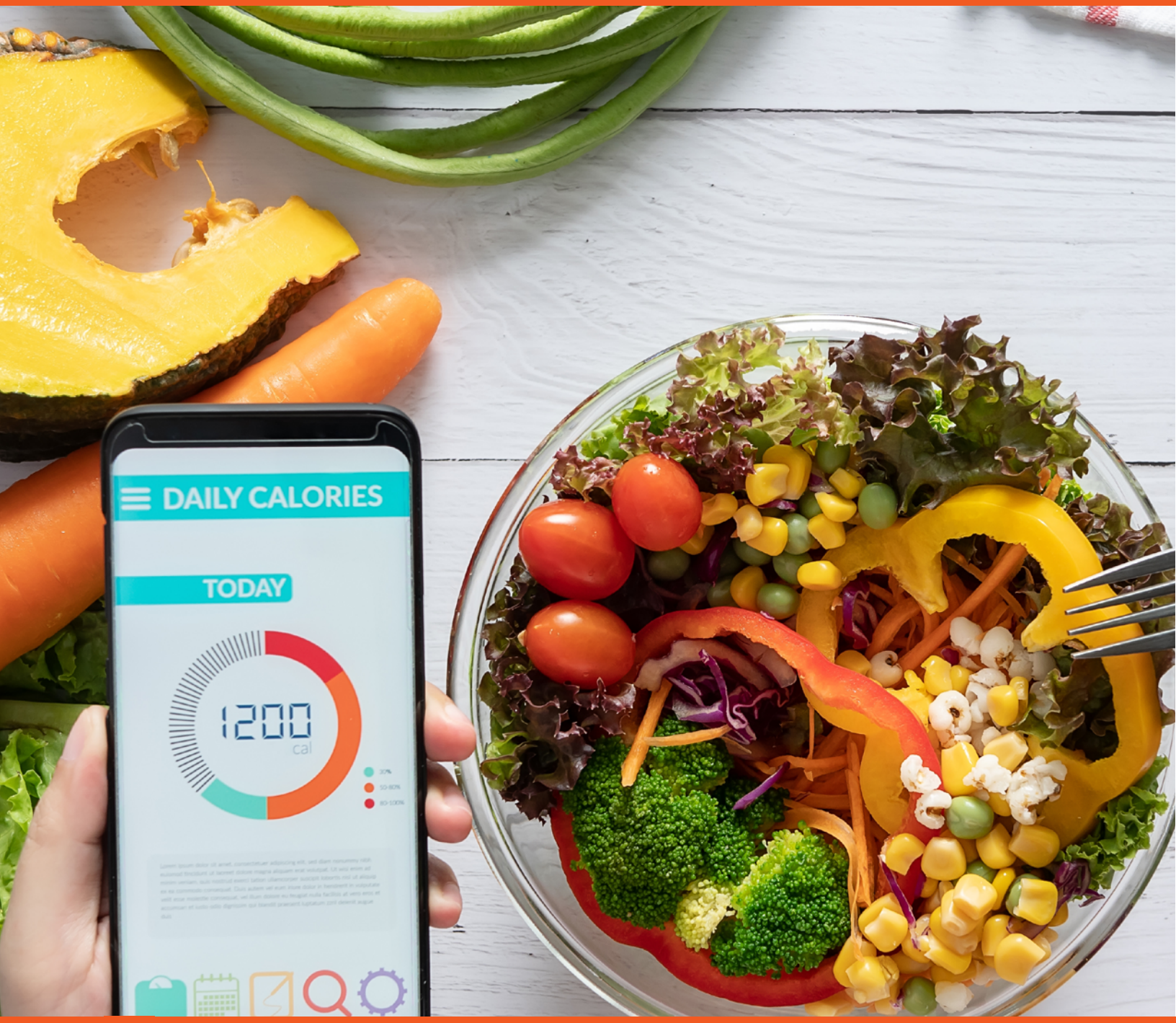
In-Person and Live-Streamed

2022 Personalized Nutrition Innovation Day

Wednesday, November 16, 2022 | 7:30 AM to 7:30 PM CST



Personalized Nutrition Initiative University of Illinois, Urbana-Champaign

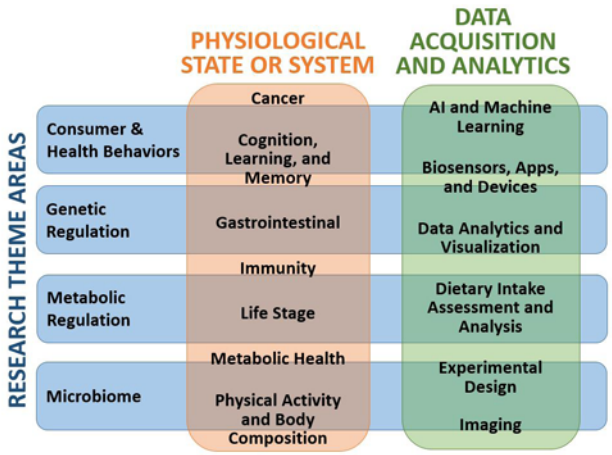
Table of Contents

The Personalized Nutrition Initiative is a campus-wide partnership between the Office of the Vice Chancellor for Research and Innovation (OVCRI), the Carl R. Woese Institute for Genomic Biology (IGB), and the College of Agricultural, Consumer and Environmental Sciences (ACES).

Welcome

Welcome to the 2022 Personalized Nutrition Innovation Day hosted by the Personalized Nutrition Initiative at the University of Illinois Urbana-Champaign. This is our first in-person meeting since the Personalized Nutrition Initiative was launched a little over two years ago, so we are excited to see you all attend.

A special welcome to the representatives from our eleven External Partners and our External Advisory Committee members. We have many sessions planned today to showcase personalized nutrition research and tours of facilities at the University of Illinois Urbana-Champaign.



The Personalized Nutrition Initiative facilitates transdisciplinary collaborative efforts across campus to answer fundamental questions regarding how nutrition modulates health and disease across the lifespan and to translate that information to clinical care and the public. The University of Illinois Urbana-Champaign is uniquely positioned to advance this field due to our long-standing international leadership in human, plant, and animal nutrition, engineering, and computer science, coupled with the emerging strengths in microbial systems biology, bioengineering, and medicine. Bringing expertise in bioengineering, engineering, and computer science to bear on nutrigenomic systems biology (e.g. biosensors for monitoring biomarkers, analysis of large datasets, and novel data visualization) could more rapidly advance the field and would put a decidedly "Illinois" stamp on the approach. Collaborations with social and behavioral scientists are key to providing insights into the different ways individuals, groups, and institutions make decisions, exercise power, and respond to change in areas pertinent to personalized nutrition.

Personalized nutrition offers a way to optimize human health and the quality of life by tailoring recommendations based not only on diet history and phenotype, but also on an individual's genetics, microbiome, and metabolome. It encompasses almost all known aspects of science, ranging from the genomes of humans, plants, and microorganisms, to the highest levels of analytical sciences, computing, and statistics of large systems, as well as human behavior.

Sincerely,
Sharon Donovan, PhD, RD
Professor and Director, Personalized Nutrition Initiative

Leadership and Staff

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Steering Committee

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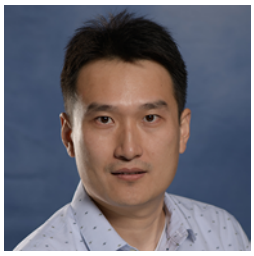

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External Advisory Committee

Mariëtte Abrahams, PhD, RD, MBA
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Founder/CEO, Nlumn

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Jessica Campbell, PhD
Director, Bell Institute of Health and Nutrition, General Mills, Inc.

Bridget Hannon Esteves, PhD, RD
Senior Scientist – R&D Nutrition, Kraft Heinz with affiliate Primal Kitchen

External Advisory Committee

Purna Kashyap, MBBS
Professor of Medicine and Physiology, Co-Director, Microbiome and High-Definition Therapeutics program in the Center for Individualized Medicine, and Director, Germ Free Mouse Facility, Mayo Clinic

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Professor Emeritus of Nutrition, University of California, Davis and FDA

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Principal Regulatory Scientist, Amway

Alison Steiber, PhD, RD
Chief Science Officer, Academy of Nutrition and Dietetics

José Ordovas, PhD
Professor, Tufts University, Jean Mayer USDA Human Nutrition Research Center on Aging

Moises Torres-Gonzalez, PhD
VP, Nutrition Research, National Dairy Council

Machiel Reinders, PhD
Senior Researcher, Food Consumer Science, Wageningen University & Research, Wageningen Economic Research

Eline van der Beek, PhD
Head, Nestlé Institute of Health Sciences, Nestlé Research

External Partners Program

The External Partners Program for the Personalized Nutrition Initiative was designed to create opportunities for university and external researchers to learn from each other and accelerate translational developments in personalized nutrition. Through regular and structured discussions, science symposia, and potential collaborative research projects, our Personalized Nutrition Initiative campus researchers will learn about trends in industrial products and research needs, and our external colleagues will learn about campus-based personalized nutrition research as well as have the opportunity to share ideas in a non-competitive environment.

Personalized Nutrition Initiative External Partners advises the Director on a wide range of topics including, but not limited to, prioritizing research initiatives, strategic planning, procedures, Personalized Nutrition Initiative events, and the future structure of the External Partners Program. An External Partner is a company, association, or other entity outside of academia. External partners are invited by the Director to join the External Partners Program for an annual fee.

External Partner Program Members for 2022-2023 are:

- Amway
- Archer Daniels Midland Co
- General Mills
- Givaudan
- International Flavors & Fragrances, Inc.
- Kraft Heinz and affiliate Primal Kitchen
- Mars Wrigley
- National Dairy Council
- Nestlé
- PepsiCo
- Pharmavite

External Partners Directed Research Program

External Partner fees support faculty initiated research proposals that have the potential to impact personalized nutrition supporting the health and wellbeing of healthy human populations across the lifespan.

The goal of the External Partners Directed Research program is to fund research with the potential to provide new applied and translatable innovation in personalized nutrition to advance health or solutions to personalized nutrition-related barriers that meet shared and critical needs in companies of all sizes.

This event is hosted by the Personalized Nutrition Initiative at the ACES Library, Information and Alumni Center (ACES Library), University of Illinois Urbana-Champaign on Wednesday, November 16, 7:30 AM to 7:30 PM Central Standard Time (in-person and live-streamed).

All oral presentations and panel discussions of Sessions 1-4 are held in the Monsanto Room (008) at the ACES Library and these four sessions are also live-streamed.

Agenda

7:30 – 8:00 A

Breakfast

The Heritage Room (107), ACES Library

8:00 – 8:30 A
Livestreamed

Welcome

Sharon Donovan, PhD, RD, *Professor and Director of the Personalized Nutrition Initiative, UIUC*

Susan A. Martinis, PhD, *Vice Chancellor for Research and Innovation, Stephen G. Sligar Professor of Molecular and Cellular Biology, Professor of Biochemistry, UIUC*

Germán Bollero, PhD, , *Professor and Interim Dean, College of Agricultural, Consumer and Environmental Sciences, UIUC*

8:30 – 9:30 A
Livestreamed

Session 1: Current State of Personalized Nutrition – Academic, Therapeutic, and Public Private Partnerships

Moderator: Sharon Donovan, PhD, RD
Director of the Personalized Nutrition Initiative, UIUC

Keynote Speaker: José M. Ordovas, PhD
Director Nutrition and Genomics, Professor Nutrition and Genetics, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University
"Precision Nutrition: Guiding Healthy Aging Through the Lifespan"

Panel and Q&A (35 minutes)

José M. Ordovas, PhD

Hannah Holscher, PhD, RD
Associate Professor, Food Science & Human Nutrition, UIUC

Machiel Reinders, PhD
Senior Researcher, Consumer Behavior and Marketing, Wageningen University and Research, Wageningen Economic Research

Purna Kashyap, MBBS AGAF
Professor of Medicine and Physiology, Co-Director, Microbiome and High-Definition Therapeutics program in the Center for Individualized Medicine, and Director, Germ Free Mouse Facility, Mayo Clinic

9:30 – 10:00 A

Break and refreshments

The Heritage Room (107), ACES Library

10:00 – 11:00 A
Livestreamed

Session 2: Personalized Nutrition Initiative Seed Grant Funded Research

Moderator: Colleen Bushell, MFA
Associate Director & Associate Professor Research, National Center for Supercomputing Applications, UIUC

Halil Kilicoglu, PhD
Associate Professor, iSchool, UIUC
"Mining the Scientific Literature to Support Personalized Nutrition Applications"

ChengXiang Zhai, PhD
Professor, Computer Science, UIUC
"PNDataLab: A Cloud-based Data Lab for Personalized Nutrition"

Zeynep Madak-Erdogan, PhD
Associate Professor, Food Science & Human Nutrition, UIUC
"Spatial Analysis to Develop Personalized Dietary Interventions for Liver Metastatic Tumors"

Margarita Teran-Garcia, MD, PhD
Assistant Dean & Research Assistant Professor, Extension, UIUC
"MEXIMEDI Diet: A Personalized and Cultural Adaptation to Improve Health Outcomes in Mexican Adults"

11:00 A – 12:00 P
Livestreamed

Session 3: Innovation in Personalized Nutrition Technologies for Monitoring and Data Collection

Moderator: Naiman Khan, PhD, RD
Associate Professor, Kinesiology and Community Health, UIUC

Panel Discussion

Brian Cunningham, PhD
Professor, Electrical & Computer Engineering, UIUC; represented by graduate student Skye Shepherd, Bioengineering, UIUC

Catharine Fairbairn, PhD
Associate Professor, Psychology, UIUC

Nancy McElwain, PhD
Professor, Human Development & Family Studies, UIUC

Bill Sullivan, PhD
Professor, Landscape Architecture & Office of the Provost, UIUC

12:00 – 12:45 P

Lunch

The Heritage Room (107), ACES Library

12:45 – 1:45 P
Livestreamed

Session 4: Industry Needs and Barriers to Innovation

Moderator: Katheryne Rehberg,
Director of Business Development, Office of Corporate Relations, UIUC

Joshua Anthony, PhD
Founder/CEO, Nlumn
"10 Barriers to Personalized Nutrition Innovation in Industry and How to Fix Them (in 10 Minutes)"

Mariëtte Abrahams, PhD, MBA
Founder/CEO, Qina
"Be Better, Not Unique – Understanding Real Consumer Needs by Leveraging Tech"

Panel Discussion (30 minutes)

Tristin Brisbois, *PepsiCo*
Mark Cope, *International Flavors & Fragrances*
Emilie Fromentin, *Givaudan*
Bibiana Garcia-Jackson, *General Mills*
Ryan Grant, *Pharmavite*
Elena Nerasov, *Amway*
Kristin Ricklefs-Johnson, *National Dairy Council*
Jessica Smith, *Mars Wrigley*
Lindsay Taylor, *Kraft Heinz & Affiliate Primal Kitchen*
Eline van der Beek, *Nestlé Institute of Health Sciences*

1:45 – 2:00 P
Livestreamed

Wrap-up

Sharon Donovan, PhD, RD, *Director of the Personalized Nutrition Initiative, UIUC*

2:00 – 2:30 P

Break

The Heritage Room (107), ACES Library

2:30 - 5:30 P

Pre-scheduled Tours and meetings with researchers

External Advisory Committee Meeting (members only)

The Morgan-Caterpillar Room (130), ACES Library

5:30 – 7:30 P

Reception | Poster Session | Technology Showcase

The Heritage Room (107), ACES Library

Sessions 1-4

Welcome and Wrap-up

Sharon Donovan, PhD, RD
Professor and Director of the Personalized Nutrition Initiative, University of Illinois Urbana-Champaign

BIOGRAPHY
Sharon Donovan received her BS and PhD in Nutrition at the University of California at Davis. After completing a post-doctoral fellowship in Pediatric Endocrinology at the Stanford University School of Medicine, she joined the faculty at the University of Illinois Urbana-Champaign, where she is the Melissa M. Noel Endowed Chair and Professor. In July 2020, she was named the inaugural Director of the Personalized Nutrition Initiative.

Dr. Donovan's laboratory conducts basic and translational pediatric nutrition research, with a focus on the nutritional regulation of gut microbiome development and health outcomes, which has resulted in over 250 peer-reviewed publications and book chapters and more than $35M in grant support.

She served as President of the American Society for Nutrition for 2011-2012 and the International Society for Research on Human Milk and Lactation (ISRHML) for 2018-2020. Dr. Donovan served on the 2020-2025 Dietary Guidelines for Americans Scientific Advisory Committee and was elected to National Academy of Medicine in 2017.

Susan A. Martinis, PhD

Vice Chancellor for Research and Innovation
Stephen G. Sligar Professor of Molecular and Cellular Biology
Professor of Biochemistry, University of Illinois Urbana-Champaign

BIOGRAPHY

Susan Martinis is Vice Chancellor for Research and Innovation at the University of Illinois Urbana-Champaign, where she provides leadership for the campus-wide interdisciplinary research institutes, promotes new research initiatives, and oversees the administrative and business processes that ensure the safe, ethical, and productive conduct of research at Illinois.

Dr. Martinis, the Stephen G. Sligar Professor of Molecular and Cellular Biology and Professor of Biochemistry, studies the mechanisms, evolution, and biomedical applications of protein synthesis and RNA-protein interactions.

She is a successful researcher, engaged in entrepreneurial activities and corporate partnerships; a committed educator; and an experienced administrator.

Germán Bollero, PhD

Professor and Interim Dean, College of Agricultural, Consumer and Environmental Sciences, University of Illinois Urbana-Champaign

BIOGRAPHY

Interim dean Dr. Germán Bollero brings more than a decade of administrative leadership to the role, having served as associate dean for research and head of the Department of Crop Sciences. More importantly, he has been a member of the College of ACES family for nearly 30 years. Dr. Bollero is a native of Rosario, Argentina. After receiving a BS degree in agronomy from the National University of Rosario, Argentina, he came to the University of Illinois Urbana-Champaign to continue his education. He earned his MS and PhD degrees from the Department of Agronomy (now crop sciences) and continued on as a postdoctoral research associate and senior research specialist in agriculture. In 1998, he joined the crop sciences faculty of biometry and cropping systems. Dr. Bollero then led the department as head from 2009 to 2018. In 2018, he became associate dean for research and director of the Illinois Agricultural Experiment Station, investing in convergent research collaborations across the college and campus.

Dr. Bollero is internationally recognized for his scholarship in biometry and cropping systems. His teaching, service, and research contributions have placed him among an elite handful of truly outstanding faculty members. He has been included on the Incomplete List of Teachers Ranked as Excellent by Their Students dozens of times. Among other recognitions, he has received several College of ACES awards, was selected as a member of the ACES Academy of Teaching Excellence and was in the first class of the ACES Global Connect program. Dr. Bollero is a Fellow of the Crop Science Society of America and the Agronomy Society of America.

Session 1:
Current State of Personalized Nutrition – Academic, Therapeutic, and Public Private Partnerships

Moderator: Sharon Donovan, PhD, RD
Professor and Director of the Personalized Nutrition Initiative, University of Illinois Urbana-Champaign

Keynote Speaker and Panelist:

José M. Ordovas, PhD
Director Nutrition and Genomics, Professor Nutrition and Genetics, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts University

BIOGRAPHY

José M. Ordovás, Ph.D., (born in Zaragoza, Spain) is Professor of Nutrition and a Senior Scientist at the USDA-Human Nutrition Research Center on Aging at Tufts University in Boston, Massachusetts where he also is the Director of the Nutrition and Genomics Laboratory. In addition, he is Professor of Genetics and Pharmacology at the School of Biomedical Sciences. Dr. Ordovas was educated in Spain at the University of Zaragoza where he completed his undergraduate work in Chemistry and received his doctorate in Biochemistry. He did postdoctoral work at MIT, Harvard, and Tufts University. Dr. Ordovas' primary research interests focus on the genetic and epigenetic factors predisposing to age-related chronic diseases (i.e., cardiovascular disease, obesity, and diabetes) and their interaction with environmental and behavioral factors with particular emphasis on diet. He has published over 900 scientific articles in peer review journals (h-index 146), written books and book chapters and participated as an invited speaker in hundreds of international congresses, symposia, and courses related to personalized nutrition. In this regard, he is considered a pioneer and one of the most distinguished world experts in gene-diet interactions pertaining to cardiometabolic traits. Moreover, he has trained in his laboratory over 60 scientists, and his current network involves populations and investigators from all Continents.

Throughout his career, Dr. Ordovas has received multiple honors for his scientific achievements including the Secretary's Award from the USDA, the Centrum, the David Kritchevsky career achievement and Dannon Institute Mentorship awards from the American Society for Nutrition, the Gold Medal from the Spanish Society of Cardiology, and the Francisco Grande Award from the Mediterranean Diet Foundation. He has been awarded an honorary degree in Medicine bestowed by the University of Cordoba in Spain, and he is a Member of the Royal Academies of Sciences, Medicine, Nutrition and Pharmacy in Spain.
Dr. Ordovas has been a member of the Food and Nutrition Board of the National Academies and the FDA National Toxicology Center Advisory Committee, and he currently serves on multiple national and international steering committees, scientific peer review committees, advisory and editorial boards.

ABSTRACT

Precision Nutrition: Guiding Healthy Aging Through the Lifespan

The human lifespan and healthy aging depend on complex interactions among genetic, environmental, and lifestyle factors, with nutrition playing an essential role. However, significant interindividual heterogeneity in response to nutritional factors cast some doubts about the efficacy of one-size-fits-all dietary recommendations and pave the way to Precision Nutrition. The initial research conducted in the 80s and 90s, known as nutrigenetics, was based on the hypothesis that genetic factors could drive individual responses. Decades of research and hundreds of publications have supported the hypothesis but have yet to provide reliable tools with significant impact in the real world. One of the limitations of previous research is that, for the most part, it has been based on post-hoc analyses of observational studies with low statistical power to look at interactions. Thus, the need for studies specifically designed to examine interindividual differences in dietary response. Preferably randomized clinical trials or more

novel n-of-1 studies. Moreover, the accumulated knowledge made it evident that nutrigenetics was only one piece of the puzzle. Thus, in recent years other players, such as the gut microbiome, were identified and the current notion is that the progress in Precision Nutrition cannot rely on “one-omic-fits-all” and that it will be essential to integrate multiple omics and the exposome. An example of such an approach is the PREDICT study, which uses meal challenges to capitalize on the added information provided by the postprandial state and uses artificial intelligence and machine learning to generate predictive algorithms. Likewise, the goal of the newly launched NIH Nutrition for Precision Health Initiative is to deliver, by 2027, algorithms that predict individual or more novel n-of-1 studies. Moreover, the accumulated knowledge made it evident that nutrigenetics was only one piece of the puzzle. Thus, in recent years other players, such as the gut microbiome, were identified and the current notion is that the progress in Precision Nutrition cannot rely on “one-omic-fits-all” and that it will be essential to integrate multiple omics and the exposome. An example of such an approach is the PREDICT study, which uses meal challenges to capitalize on the added information provided by the postprandial state and uses artificial intelligence and machine learning to generate predictive algorithms. Likewise, the goal of the newly launched NIH Nutrition for Precision Health Initiative is to deliver, by 2027, algorithms that predict individual responses to diets using data from over 12,000 subjects. Such studies will provide the scientific knowledge needed to offer actionable, personalized health recommendations to transform the promise of personalized nutrition and healthy aging into reality.of nutritional biomarkers. This presentation will share two sensing paradigms that can be adapted easily for many biomarker detection tests from bodily fluids to quantitatively measure proteins, nucleic acids, metabolites, pathogens, and vitamins. personalizedZnutrition and longitudinal measurement of changes in diet, environment, and exercise through the lifespan will require simple and convenient self monitoring and point of care monitoring of nutritional biomarkers. This presentation will share two sensing paradigms that can be adapted easily for many biomarker detection tests from bodily fluids to quantitatively measure proteins, nucleic acids, metabolites, pathogens, and vitamins.

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Panelist: Hannah Holscher, PhD, RD

Associate Professor, Food Science & Human Nutrition, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Hannah Holscher is an Associate Professor of Nutrition in the Department of Food Science and Human Nutrition and a member of the Division of Nutritional Sciences, the Carl R. Woese Institute of Genomic Biology, and the National Center for Supercomputing Applications at the University of Illinois Urbana-Champaign, where she joined the faculty in 2015. She completed postdoctoral training focused on the human microbiome, a Ph.D. in Nutritional Sciences, and a B.S. in Food Science and Human Nutrition at the University of Illinois Urbana-Champaign. She is also a Registered Dietitian. Dr. Holscher's laboratory uses clinical interventions and computational approaches to study the interactions of nutrition, the gastrointestinal microbiome, and health. Her creative use of machine learning approaches to determine microbial biomarkers of food intake and human health status resulted in her recognition as a 2017 New Innovator in Food and Agricultural Research and a 2020 National Academy of Medicine Emerging Leader. She also received the 2021 American Society for Nutrition's Mead JohnsonYoung Investigator Award for her series of work on nutrition and the human microbiome. She has received grant funding from the United States Department of Agriculture (USDA), the Foundation for Food and Agriculture Research, food commodity boards, and private industry. She has published 60 peer-reviewed manuscripts and given many invited presentations at locations including the National Academy of Medicine, National Institutes of Health, USDA, universities, and national society meetings of nutrition scientists, food scientists, and dietitians. She has served in local and national leadership roles, including Chair of the Nutrition Translation (2017-2020) and Nutritional Microbiological (2020-2023) Research Interest Sections of the American Society for Nutrition. Dr. Holscher serves on The Journal of Nutrition editorial board and as an associate editor for Nutrition Research.

Panelist:
Machiel Reinders, PhD

Senior Researcher, Consumer Behavior and Marketing, Wageningen University and Research, Wageningen Economic Research

BIOGRAPHY

Machiel J. Reinders (PhD, 1977) is a Senior Researcher in Food Consumer Science at Wageningen Economic Research, part of Wageningen University & Research. He coordinates and conducts (international) consumer research projects and has the role of senior scientist within the organization. His research focuses on consumer behavior and behavioral change in relation to healthy and sustainable food choices, with a specific interest in designing, testing and evaluating behavioral interventions and personalized nutrition. He has published his work in international peer-reviewed journals like Appetite, Food Quality and Preference, International Journal of Behavioral Nutrition and Physical Activity and Trends in Food Science and Technology.

Panelist:
Purna Kashyap, MBBS AGAF

Professor of Medicine and Physiology, Co-Director, Microbiome and High-Definition Therapeutics program in the Center for Individualized Medicine, and Director, Germ Free Mouse Facility, Mayo Clinic

BIOGRAPHY

Dr. Purna Kashyap is Professor of Medicine and Physiology, Co- Director of the Microbiome and High-Definition Therapeutics program in the Center for Individualized Medicine and Director of the germ-free mouse facility at Mayo Clinic, Rochester, MN. The Gut Microbiome laboratory led by Dr. Kashyap is interested in understanding the complex interactions between diet, gut microbiome and host physiology and strives to move the field beyond associations of microbiome with different diseases to defining the functional role of gut microbes in regulating host physiology. The laboratory uses germ-free mouse models in conjunction with measures of gastrointestinal physiology in vitro and in vivo to investigate effects of gut microbial products on host gastrointestinal function. In parallel, they use a systems approach incorporating multi-omics, patient metadata, and physiologic tissue responses in human studies, to aid in discovery of novel microbial drivers of disease. The overall goal of the program is to develop novel microbiota-targeted therapies. Dr. Kashyap has published over 80 peer reviewed articles including journals like Cell, Cell Host Microbe, Science Translational Medicine, Nature Communications, and Gastroenterology. He previously served on the scientific advisory board of American Gastroenterology Association Gut Microbiome Center, and on the council of American Neurogastroenterology and Motility Society. He now serves on the council and the research committee of American Gastroenterology Association, and in editorial roles for Gut Microbes and Neurogastroenterology and Motility journal and was recently inducted to American Society of Clinical Investigation.

Session 2:
Personalized Nutrition Initiative Seed Grant Funded Research

Moderator: Colleen Bushell, MFA

Associate Director & Associate Professor Research, National Center for Supercomputing Applications, University of Illinois Urbana-Champaign

BIOGRAPHY

Colleen Bushell's work is in the area of visual analytics. She is an Associate Director at the National Center for Supercomputing Applications (NCSA) at the University of Illinois Urbana-Champaign leading the Healthcare Innovation program office. She is also a research scientist and advisor for the NCSA Visual Analytics group, an Associate Research Professor in the Carle Illinois College of Medicine and an Instructor in the Gies College of Business teaching an MBA class on data representation. Previously she was the Director of Product Development at RiverGlass Inc., an NCSA spin-off that she co-founded which provided seven years of commercial software production experience. Highlights of her accomplishments include Mosaic: the first web browser and NetWorkPlace: the first web-based office space (developed for Vice President Al Gore). She has co-authored recent publications appearing in Nature Scientific Reports, PLOS Biology, mBio, and Integrative Biology and her work is featured in Edward Tufte's book, Visual Explanations.

Halil Kilicoglu, PhD

Associate Professor, iSchool, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Halil Kilicoglu is an Associate Professor in the School of Information Sciences at the University of Illinois Urbana-Champaign. He conducts research in natural language processing and text mining, with a particular focus on biomedical text. He uses a combination of data-driven analytical techniques and knowledge-based semantic approaches to extract and organize knowledge buried in textual artifacts, with potential benefits for biomedical discovery and scholarship. Dr. Kilicoglu earned his PhD in computer science from Concordia University in 2012. Prior to joining the iSchool faculty, he worked as a research scientist at the U.S. National Library of Medicine, National Institutes of Health, where he led the Semantic Knowledge Representation project.

ABSTRACT

Mining the Scientific Literature to Support Personalized Nutrition Applications

A core premise of personalized nutrition is that personal "big data" (e.g., clinical, omics, behavioral, environmental) analyzed using advanced computational techniques can predict individualized responses to diet, thereby informing dietary recommendations and interventions. Published research literature is a rich source of existing scientific evidence on nutrition and microbiome and can aid in a) contextualizing and interpreting computational model results and b) generating plausible explanations and hypotheses that can lead to new insights, experimental studies, and discoveries. However, much of the literature evidence remains buried in unstructured text and is not readily accessible to artificial intelligence/machine learning (AI/ML) algorithms. To support such algorithms, we are currently annotating a dataset of biomedical publications for personalized nutrition-related information and building natural language processing (NLP) models based on this dataset. In this presentation, I will discuss our early findings. We envision that the outcomes of the project will underpin knowledge-guided analysis of nutrition-related findings generated by AI/ML algorithms, identify plausible hypotheses for biological phenomena of interest that can be validated in experimental studies and clinical trials, and support dietary recommendations.

ChengXiang Zhai, PhD

Professor, Computer Science, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. ChengXiang Zhai is a Donald Biggar Willett Professor in Engineering at the Department of Computer Science at the University of Illinois Urbana-Champaign, where he is also affiliated with the Carl R. Woese Institute for Genomic Biology, Department of Statistics, the School of Information Sciences, and the Personalized Nutrition Initiative. His research interests are in developing intelligent algorithms and systems that can analyze large amounts of data, especially natural language text data, and extract from the data useful insights and knowledge to augment human intelligence and optimize complex decisions in application domains such as biomedical and health informatics, online learning, and E-commerce. He has published over 300 papers in these areas with a Google Scholar h-index of 89 with extensive technical contributions in models and algorithms for intelligent information retrieval, big data analytics, and optimization of human-AI collaboration. He holds 5 patents. Dr. Zhai is America Editor of the Springer Information Retrieval Book Series and a Senior Associate Editor of ACM Transactions on Intelligent Systems and Technology. He is a program co-chair of multiple major conferences including ACM SIGIR 2009 and WWW 2015. He is a general conference co-chair of CIKM 2016, WSDM 2018, and IEEE BigData 2020. He is an ACM Fellow and a member of the ACM SIGIR Academy, and has received a number of awards, including ACM SIGIR Gerard Salton Award, multiple best paper awards such as the ACM SIGIR Test of Time Award (three times), the 2004 Presidential Early Career Award for Scientists and Engineers (PECASE), an Alfred P. Sloan Research Fellowship, multiple research awards from industry (IBM Faculty Award, HP Innovation Research Award, Microsoft Beyond Search Research Award, and Yahoo Faculty Research Engagement Program Award), UIUC Rose Award for Teaching Excellence, and UIUC Campus Award for Excellence in Graduate Student Mentoring. He has graduated 38 PhD students and over 50 MS students.

ABSTRACT

PNDataLab: A Cloud-based Data Lab for Personalized Nutrition

Recent progress in Data Science (DS) and Artificial Intelligence (AI) has opened unprecedented opportunities for using intelligent algorithms to analyze the complex associations between diet, nutrition, and disease and accelerate research in personalized nutrition (PN). However, the cutting-edge algorithms developed by DS and AI researchers are often not immediately available for PN researchers to use, nor have they been evaluated using PN data sets, making it hard to identify the most effective algorithms for use in PN research. To remove these barriers and simultaneously accelerate research in PN, DS, and AI, a team of UIUC researchers from Computer Science, Nutrition Sciences, and Statistics are building a cloud-based Personalized Nutrition Data Lab (PNDataLab) to enable PN researchers and DS and AI researchers to use the same lab infrastructure to closely collaborate within a sustainable ecosystem. The new algorithms developed by the AI researchers would be uploaded and evaluated using PN data sets on PNDataLab, making them immediately available to PN researchers, ensuring reproducibility, and enabling PN researchers to identify and use the best algorithms for a specific analysis task. At the same time, AI researchers would benefit from using the lab to access realistic large data sets and problem formulations needed for evaluating and inventing new AI algorithms, thus effectively removing the "domain barrier" that currently hinders the collaboration between PN researchers and AI/DS researchers. Learners can further use the lab to learn about AI algorithms and PN research, allowing PNDataLab to naturally integrate education and research. In this talk, I will present the vision of PNDataLab, our current progress, and opportunities for broad collaborations with researchers, education or workforce training programs, and industry partners.

Zeynep Madak-Erdogan, PhD

Associate Professor, Food Science & Human Nutrition, University of Illinois Urbana-Champaign

BIOGRAPHY

Professor Zeynep Madak-Erdogan is the Sylvia D. Stroup Scholar of Nutrition and Cancer, a Health Innovation Professor at Carle Illinois College of Medicine, Graduate College Faculty Fellow, and the Director of Women's Health, Hormones and Metabolism lab at the University of Illinois Urbana-Champaign. She is also the education program leader at Cancer Center at Illinois. She received her Ph.D. and undertook postdoctoral studies on mechanisms of estrogen receptor action at the University of Illinois Urbana-Champaign, then joined the Department of Food Science and Human Nutrition at the University of Illinois Urbana-Champaign in 2014. Her lab uses various animal and 3D-reengineered models, as well as advanced statistical and computational analysis, to understand how nutrients, environmental toxicant exposures, and hormones impact metabolic health and hormone-dependent cancer outcomes.

ABSTRACT

Spatial Analysis to Develop Personalized Dietary Interventions for Liver Metastatic Tumors

Tumor heterogeneity is a significant contributor to therapy resistance. As tumors grow, the spatial difference in oxygen and nutrient availability and crosstalk between tumor and stromal cells generate metabolic heterogeneity, which impacts the expression of genes important for tumor aggressiveness and drug response. Spatially resolved transcriptomics can uncover key insights that are not otherwise possible to study using bulk-OMICS approaches. In this talk, Professor Zeynep Madak-Erdogan will present spatially resolved data from metastatic breast tumors supporting the premise tumor heterogeneity reflects phenotypic differences in different regions of tumors. This renders cancer cells in certain regions of tumors transcriptionally distinct, and in some cases non-responsive to therapies. She will include examples of how this novel information can be used to design dietary interventions to improve responses to therapy.

Margarita Terán-Garcia, MD, PhD, FTOS

Assistant Dean and Program Leader for Integrated Health Disparities, Illinois Extension, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Teran-Garcia is a pediatric physician-scientist with a Ph.D. in Metabolism/Nutrient-gene interactions from the University of Texas at Austin and a Fellow of The Obesity Society (F.T.O.S.). Dr. Terán conducts transdisciplinary research on obesity and other nutrition-related diseases (e.g., diabetes, hypertension) among low-income populations. She works on promoting health and wellness among families of Hispanic heritage and translates evidence-based science to community-based programs that serve children and families in need. She is a faculty member of the Carle Illinois College of Medicine, the Division of Nutritional Sciences, an Affiliate of the Personalized Nutrition Initiative, the Family Resiliency Center, and the Center for Latin American and Caribbean Studies. As Program Leader for Integrated Health Disparities, Dr. Terán is combating health disparities with advocacy, leadership, and teamwork to increase awareness and promote new systems or policies for comprehensive, sustainable solutions from micro- to macro-environments for health.

ABSTRACT

"MEXIMEDI Diet: A Personalized and Cultural Adaptation to Improve Health Outcomes in Mexican Adults"

Diet quality among Mexican adults remains low with Healthy Eating Index scores ranging from 45 – 55 out of 100. Poor diet quality contributes to the development of metabolic diseases including type II diabetes mellitus and cardiovascular disease. There is an urgent need to develop sustainable dietary interventions to improve dietary behaviors in Mexican adults. The MEXIMEDI study aims to implement a culturally adapted Mediterranean-influenced dietary intervention to improve dietary behaviors. Therefore, in the first phase, group interviews were conducted to explore Mexican adults' current eating practices and healthy eating beliefs to inform the dietary intervention study. Mexican-born adults (n=12) in the US Midwest were recruited by word of mouth and flyers to participate in semi-structured group interviews. Briefly, participants reported making recent positive dietary changes and perceived their current dietary patterns to be healthier than when they lived in Mexico. Despite making positive dietary changes, participants reported difficulties with portion control, beverage selection, and finding methods to make vegetables more appetizing. Several participants perceived Mexican cuisine to have many healthy meal options, but the lack of portion control with energy-dense foods makes the meals less healthy. In sum, Mexican adults in the US Midwest demonstrate motivation to make positive dietary changes. The second phase aims to determine if implementing the MEXIMEDI diet intervention can increase dietary adherence and improve metabolic markers from baseline to five weeks. Mexican adults with overweight or obesity are being recruited and randomized into a personalized traditional Mediterranean or a culturally tailored Mexican diet. The study design and preliminary baseline data (n=12) on diet acceptability will be presented. Overall, the results of this project will advance our understanding of strategies to improve and objectively measure dietary adherence to healthy dietary patterns, which can serve as solutions to personalized nutrition-related barriers.

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Session 3:
Innovation in Personalized Nutrition Technologies for Monitoring and Data Collection

Moderator:
Naiman Khan, PhD, RD
Associate Professor, Kinesiology and Community Health, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Naiman Khan is an Associate Professor in the Department of Kinesiology and Community Health at the University of Illinois Urbana-Champaign. He is the Director of the Neurocognitive Health Behavior Laboratory and has appointments in the Department of Kinesiology and Community Health and affiliations with the Division of Nutritional Sciences, Neuroscience, Family Resiliency Center, as well as the Beckman Institute for Advanced Science and Technology. The mission of his laboratory is to discover and translate nutritional and physical activity approaches to improve cognitive health across the lifespan. He has received over 30 extramural research grants from multiple funding agencies including the NIH, USDA, foundations, food commodity boards, as well as industry. This work has resulted in over 100 publications and has contributed to the understanding of how obesity and health behaviors impact neurocognitive health.

Panelist: Brian Cunningham, PhD

Professor, Electrical & Computer Engineering, University of Illinois Urbana-Champaign

BIOGRAPHY

Professor Cunningham has been a faculty member in the Department of Electrical and Computer Engineering and the Department Bioengineering at the University of Illinois Urbana-Champaign since 2004, following a 15-year career in Industry. Prof. Cunningham's technical focus is the utilization of photonics for biosensing in applications that include life science research, diagnostics, environmental monitoring, and pharmaceutical screening. He has over 85 issued US patents and over 188 peer reviewed journal publications. He is a Fellow of NAS, IEEE, OSA, RSC, AAAS, and AIMBE.

Panelist: Skye Shepherd

Graduate Student, Bioengineering, University of Illinois Urbana-Champaign

BIOGRAPHY

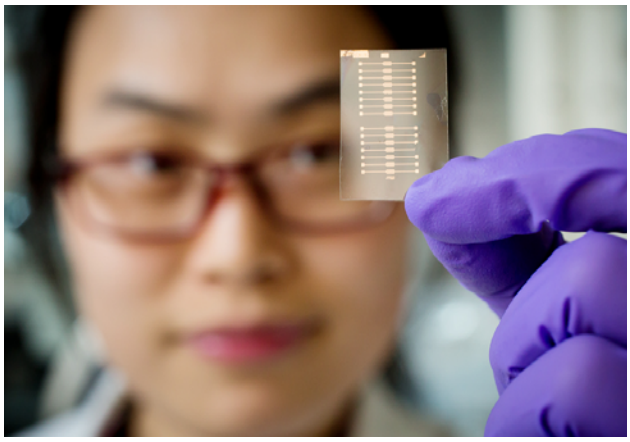
Skye Shepherd is a third-year graduate student in Bioengineering at the University of Illinois Urbana-Champaign. She focuses on using optical biosensors for the detection of nucleic acids and proteins. Her current project involves using photonic crystal biosensors to detect circulating and exosomal microRNAs of interest in prostate cancer studies.

Panelist: Catharine Fairbairn, PhD

Associate Professor, Psychology, University of Illinois Urbana-Champaign

BIOGRAPHY

Catharine Fairbairn is a Helen Corley Petit Associate Professor in the Department of Psychology at the University of Illinois Urbana-Champaign. Her doctoral training in clinical-health psychology spanned multiple disciplines ranging from social psychology to biostatistics, a transdisciplinary perspective that has expanded through her years as an independent investigator to encompass fields ranging from machine learning to social neuroscience. In recognition of her alcohol research, she was named a Rising Star by the Association for Psychological Science, a Lincoln Excellence Assistant Professor at the University of Illinois Urbana-Champaign, and was the 2020 recipient of the Early Career Investigator award from the Research Society on Alcoholism. She has also built her program of work while managing a major visual disability, an element she shares in hopes that we might develop a sense of possibility and belongingness among trainees from a range of backgrounds.



Panelist:
Nancy McElwain, PhD

Professor, Human Development & Family Studies, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Nancy McElwain is Professor of Human Development and Family Studies in the College of ACES at the University of Illinois Urbana-Champaign and a faculty member at the Beckman Institute for Advanced Science and Technology. She is also an affiliate of the Center for Social and Behavioral Science, Family Resiliency Center, and Personalized Nutrition Initiative at Illinois. Her research advances understanding of the dynamic early-life interactions between parents and children that shape children's developing abilities to regulate stress. Through investigating stress regulation during early development, she aims to promote healthy parent-child relationships and children's long-term social and emotional well-being. Her research has been supported by the National Science Foundation, the Eunice Kennedy Shriver National Institute of Child Health and Human Development, the National Institute of Mental Health, and the National Institute on Drug Abuse.

Panelist:
Bill Sullivan, PhD

Professor, Landscape Architecture & Office of the Provost, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. William Sullivan works to create healthier, more sustainable communities. He is a Professor and Director of the Smart, Healthy Community initiative at the University of Illinois Urbana-Champaign. Dr. Sullivan and his colleagues have developed Rokwire, an open-source software platform for mobile apps that supports smart, healthy places and people. The goal of this work is to enhance human capabilities: to create healthier, safer, more equitable, sustainable places; enable ground-breaking research; and fuel innovation for all members of our community. Dr. Sullivan is a Senior Fellow at the National Council for Science and the Environment, a Fellow in the Council of Educators in Landscape Architecture, and Adjunct Professor at National Taiwan University in Taipei. He holds a PhD from the University of Michigan with a concentration in Environment and Behavior. According to Google Scholar, Dr. Sullivan is the most cited landscape architect in the world and among the top 1% of cited scholars in Environmental Psychology and Nature and Health.

Session 4:
Industry Needs and Barriers to Innovation Technologies for Monitoring and Data Collection

Moderator:
Katheryne Rehberg
Director of Business Development, Office of Corporate Relations, UIUC, University of Illinois Urbana-Champaign

BIOGRAPHY

Katheryne Rehberg joined the Office of Corporate Relations at the University of Illinois Urbana-Champaign in 2016 and serves as the Director of Business Development and is responsible for cultivating and strengthening corporate relationships in the agriculture, food, and life sciences industries. An alum of the College of ACES, Katheryne is very passionate about Illinois and also brings industry perspectives to her role. She spent 14 years at ADM in the specialty food ingredients business with corporate roles in sales, product & business management, and served as a general manager of a global selling and marketing joint venture. ADM also supported Katheryne in completing her MBA at Millikin University and a CEO led executive leadership training at Harvard Business School.

Speaker:
Joshua Anthony, PhD
Founder/CEO, Nlumn

BIOGRAPHY

Joshua Anthony is the founder and CEO of the personalized nutrition consultancy Nlumn. Nlumn works with food, nutrition and health technology companies to translate the latest science and consumer trends needed to deliver new products and services to the personalized nutrition marketplace. Nlumn's mission is to make personalized nutrition accessible to help every individual make better choices and live a healthier life. Throughout his career as a scientist, innovator, and entrepreneur, he has focused on helping people live healthier through better nutrition. Before starting Nlumn, he was a founder and Chief Science Officer of the personalized nutrition company Habit. Over the past 25 years, he has led all phases of the product lifecycle from discovery to commercialization for food and nutrition companies, including Campbell Soup Company, Mead Johnson Nutrition, and Unilever. During this time, he developed a deep understanding of technical, environmental, and societal trends. He applied this knowledge to help companies better address evolving consumer wellness needs and enabled the launch of more than 150 science-based products, businesses, and services.

ABSTRACT

10 Barriers to Personalized Nutrition Innovation in Industry and How to Fix Them (in 10 Minutes)

It is clear people are continually seeking more personalized approaches to managing their health through food. In fact, more than 50% of consumers followed a specific eating plan in 20221. Despite the movement toward personalization, it has been difficult for many food and nutrition companies to capitalize on these trends and tailor products that better meet consumer's individual health and functional needs. In this talk, we will examine some of the unique challenges industry faces in successfully commercializing more personalized products and services. We will explore a series of opportunities from the perspective of the consumer, examine science and technology needs, and consider the regulatory and policy environment. For each area, we will also offer some practical tips for meeting these challenges to help enable successful innovation in the personalized nutrition and health marketplace.

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Speaker:
Mariëtte Abrahams, PhD, MBA
Founder/CEO, Qina

BIOGRAPHY

Mariëtte Abrahams is the CEO and Founder of Qina, a platform that helps companies connect and innovate in personalised nutrition by providing data and insights. Qina bridges the gap between science and solutions to make nutrition accessible to all.

ABSTRACT

Be Better, Not Unique – Understanding Real Consumer Needs by Leveraging Tech

The personalised nutrition industry is growing at a fast pace with new solutions launched each month driven by an increased interest and consumer awareness. Despite the excitement and supportive emerging science, studies show that we may be missing the mark in a few key areas that could have a huge impact on health outcomes. This talk will address the topics stakeholders need to consider if we are to move Personalised nutrition into the next post pandemic phase.

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Panelist:
Tristin Brisbois, PhD
Director, Advanced Personalization Ideation Center, Global R&D, PepsiCo

BIOGRAPHY

Dr. Brisbois is the Director of the Advanced Personalization Ideation (API) Center for PepsiCo Life Sciences in Global R&D in New York. The API center functions similar to a start-up company, with the mantra of "learn first, scale second." Its mission is to deliver actionable and eventually profitable personalized nutrition solutions to improve the health and wellness of our consumers. This includes developing internal capabilities as well as identifying and forming key partnerships with leading academic institutions and external vendors. Tristin has had various roles in R&D at PepsiCo in both USA and Canada, translating strategic intent and science-based analyses into actionable work plans and optimal project portfolio to meet PepsiCo's short and long-term needs.

Prior to working for PepsiCo (September 2013), Tristin was the Manager of Nutrition and Scientific Affairs at a trade association (2010-2013), where she led the Institute's scientific affairs and nutrition communications program. Tristin completed her PhD and BSc (Nutrition and Food Science) at the University Alberta in Western Canada, also where she grew up. Her PhD investigated food intake behavior in cancer with a focus on appetite stimulation and improvement of taste and smell perception using marijuana therapy. She studied appetite and reward related pathways in healthy and disease populations and explored mechanisms which may cause a surfeit (obesity) or deficit (cancer) of calories. Tristin also recently completed her Master's in Business and Science in Global Food Technology and Innovation at Rutgers University.

Panelist:
Mark Cope, PhD
Global Innovation Program Director, Re-Imagine Wellness™, International Flavors & Fragrances (IFF)

BIOGRAPHY

Mark earned a Doctorate degree in Nutritional Sciences from the University of Alabama Birmingham. He worked in academia for eight years prior to working at DuPont where he worked for 12 years in Nutrition and Health. In his current role as the Global Innovation Program Director, Re-Imagine Wellness™ at IFF, he leads the team that works on market-driven and trend-forward approaches to bring innovations aligned with breakthrough trends to the consumers, including personalized nutrition.

Panelist: Emilie Fromentin, PhD

Head of Health and Nutrition, Science & Technology, Givaudan

BIOGRAPHY

Emilie Fromentin, PhD is the leader of the Explore Health and Nutrition group, within S&T Taste and Well-Being at Givaudan. Together with her team, she builds research programs to design innovative nutritional ingredients for the food and dietary supplement industry. Their goal is to bridge the gap between what we eat and our health in the most enjoyable way possible. They strive to understand the efficacy of our ingredients for health benefits, nutritional value as well as how are they perceived by the consumers. Nature and sustainability are at the heart of what they do, they are constantly scouting for technologies to make cleaner, more sustainable, natural ingredients that taste great. Emilie holds a MS in Food Science from AgroParisTech (France) and a PhD in pharmacology obtained in partnership between AgroParisTech and Emory University (Atlanta, GA – USA). She is the author and co-author of over 20 peer-reviewed publications and has established successful collaborations with start-ups, universities and customers for new discovery and research purposes.

Panelist: Bibiana Garcia-Jackson, PhD

Senior Nutrition Scientist, Bell Institute of Health and Nutrition, General Mills, Inc.

BIOGRAPHY

Dr. Bibiana Garcia-Jackson is a Sr. Nutrition Scientist with the Bell Institute of Health and Nutrition at General Mills. Dr. Garcia-Jackson's interest in personalized nutrition began at Tufts University, where she conducted nutrigenetics research for several years before embarking on a PhD in Nutritional Sciences at the University of Toronto. There, she studied the relationship between genetic variation, lifestyle factors, vitamin D and cardiometabolic risk. Prior to her present role at General Mills, Dr. Garcia-Jackson was Director of Research and Development at Nutrigenomix Inc., a company that develops genetic test for personalized nutrition to be offered exclusively by healthcare providers. In addition to her work in industry, Dr. Garcia-Jackson has remained involved in academia through faculty appointments at the University of Toronto and Sonoran University of Health Sciences, and she has taught courses in nutritional genomics and personalized nutrition at both the undergraduate and graduate level.

Panelist:
Ryan Grant, PhD
Manager, Nutrition Science, Pharmavite

BIOGRAPHY

Ryan Grant is Senior Manager of Nutrition Science at Pharmavite. He received a PhD in Nutritional Sciences from the University of Illinois Urbana-Champaign. Ryan's research has focused on nutrition, obesity, diabetes, adipose tissue, immunology and inflammation. His current position oversees nutrition science research projects, product donations for studies, and leveraging science for consumer solutions.

Panelist:
Elena Nekrasov, PhD
Principal Regulatory Scientist, Amway

BIOGRAPHY

With 11+ years in development and regulatory approval of functional food, health food, supplement and medical device products and 7+ years of academic research, Dr. Nekrasov developed an extensive expertise in global regulations, science and market analysis. Her passion is to bridge the science, products, and regulations, so consumers around the world have access to cutting-edge health and wellness solutions. In the current role, Dr. Nekrasov leads regulatory strategy for personalized wellness, weight management- and microbiome-focused solutions for US, European and Asian markets. Elena earned a Doctorate degree in Chemistry from the University of Minnesota, and multiple certifications from US Regulatory Affairs Professional Society.

Panelist: Kristin Ricklefs-Johnson, PhD, RD

Director, Nutrition Research, National Dairy Council

BIOGRAPHY

As a Director of Nutrition Research at the National Dairy Council, Kristin Ricklefs-Johnson oversees the Childhood Health, Personalized Nutrition, and Nutrition AI research platforms. Her main responsibilities include staying current on the existing body of literature, strategic planning and management of dairy-related research related to her areas of subject matter expertise. In addition to being an external member of the Personal Nutrition Initiative, she is active in several societies along with special interest groups, including the American Society of Nutrition, The Academy of Nutrition and Dietetics, and the American Association for the Advancement of Science. Dr. Ricklefs-Johnson has obtained a BA in biology from the University of Northern Iowa, an MS in Human Nutrition from Kansas State University, as well as her PhD in nutritional sciences from Arizona State University. She is also a registered dietitian.

Panelist: Jessica Smith, PhD

Senior Principal Scientist, Scientific & Regulatory Affairs Nutrition, Mars Wrigley

BIOGRAPHY

Jessica Smith is a Senior Principal Scientist at Mars Wrigley North America supporting regional nutrition initiatives and commitments, claims, and external engagement. Previous to her role at Mars Wrigley, Jessica held various positions of increasing responsibility from 2015 to 2022 at General Mills' Bell Institute of Health and Nutrition leading nutrition regulatory, communications, and science workstreams and strategies. She earned her BS in Nutrition from Western University (London, ON); an MS. in Nutrition from McGill University (Montreal, QC); and a PhD in obesity physiology from Laval University (Quebec, QC). Prior to joining the food industry, Jessica completed two postdoctoral fellowships: the first at Laval University (Quebec, QC) in cardiometabolic risk epidemiology and the second at the Harvard T.H. Chan School of Public Health (Boston, MA) in nutrition epidemiology. She currently lives in New Jersey with her husband, two children, two dogs, and two cats.

Panelist:
Lindsay Taylor, PhD

Senior Scientist – R&D Nutrition, Kraft Heinz with affiliate Primal Kitchen

BIOGRAPHY

Lindsay Taylor, PhD, is a Senior Writer and Educator for Primal Kitchen, a certified Primal Health Coach, and the co-author of three keto cookbooks. As a frequent contributor to the Mark's Daily Apple blog and consumer and retailer educator, Lindsay's goal is to help people understand and implement wellness-promoting behaviors using an ancestral health lens. Before joining the Primal team, she earned her PhD in Social and Personality Psychology from the University of California, Berkeley, where she also worked as a researcher and instructor. Lindsay lives in northern California with her husband and two sons. She is an avid trail runner, triathlete, and mom-cheerleader at her sons' sporting events.

Panelist:
Eline van der Beek, PhD

Head, Nestlé Institute of Health Sciences, Nestlé Research

BIOGRAPHY

Since April 2021, Eline has been the Head of the Nestlé Institute of Health Sciences at Nestlé Research in Lausanne. Based at our R&D sites in Vers-chez-les-Blanc (VCLB) and at the EPFL campus, the institute focuses on advancing nutritional research and developing science-based nutritional solutions for brain development and cognitive function, gut health and microbiome, physical performance and healthy growth as well as metabolic health across life stages. Eline holds a PhD in Neurobiology from the Faculty of Medicine at Utrecht University and brings extensive experience with more than 25 years in research in both academic and commercial environments. She joined Numico as Research Manager in 2000 and was appointed Program Director of New Health Benefits in Danone Baby Nutrition in 2008. Between 2010 and 2015, she was Research Director at Danone Nutrition Research in Singapore, with a specific focus on maternal and child health, after that working as Research Director of Metabolism and Growth at Danone Research in Utrecht. Eline is also Professor for Nutritional Programming (Endowed Chair) at the University of Groningen since 2016. Her preclinical, epidemiological and clinical research in molecular metabolism and nutrition aims to understand the role of nutrient quality and the contribution of maternal health and diet on child development. Eline has published over 150 peer-reviewed research papers and is inventor of more than 25 patent applications.

Tori A. Holthaus, BS, RDN
Doctoral Student, Division of Nutritional Sciences, University of Illinois Urbana-Champaign

BIOGRAPHY

Tori Holthaus is a second-year PhD student in the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign. She is advised by Dr. Naiman Khan. She received her BS in Dietetics from the University of Wisconsin-Madison and practiced clinical dietetics prior to starting in the Division of Nutritional Sciences. Her work on investigating the relationship between the MIND dietary pattern and metabolic syndrome features and visceral adiposity was presented at the Academy of Nutrition and Dietetics' Food and Nutrition Conference and Expo® this past October.

Areas of Personalized Nutrition: Metabolic Health

ABSTRACT

MIND Dietary Pattern Adherence is Inversely Associated with Visceral Adiposity and Metabolic Syndrome Risk Factors Among Adults

Background and Hypothesis: The effects of consuming the MIND diet (Mediterranean-DASH Intervention for Neurodegenerative Delay) on metabolic health remains understudied. We hypothesized that the MIND diet would show beneficial associations with a larger proportion of metabolic syndrome (MetS) risk factors relative to other dietary patterns (i.e., Mediterranean, Dietary Approaches to Stop Hypertension [DASH], and Healthy Eating Index 2015 [HEI-2015]) in adults.

Methods: Cross-sectional analysis of 163 adults (95 female) aged 25-45 years who completed the Dietary History Questionnaire II (Past Month and Year with Serving Size) to assess adherence to four diet indices. Visceral adipose tissue (VAT) was assessed using Dual-energy X-ray absorptiometry. Waist circumference (WC), systolic blood pressure (SBP), and diastolic blood pressure (DBP) were obtained. Venous blood samples were collected following a ten-hour fast. Blood triglyceride (TG), high-density lipoprotein cholesterol (HDL), and fasting glucose (FG) levels were quantified using a chemical analyzer. Stepwise regression modeling with adjustment for significant covariates (i.e., age, sex, income, physical activity) was conducted for each metabolic outcome.

Results: VAT and DBP were inversely associated with Mediterranean, DASH, HEI-2015, and MIND diet adherence. WC, TG, and SBP were inversely associated with DASH, HEI-2015, and MIND diet adherence. HDL was positively associated with Mediterranean and MIND diet adherence. FG was inversely associated with MIND diet adherence.

Conclusions: While adherence to each dietary pattern exhibited potential benefits for adiposity and MetS risk factors, only a greater degree of adherence to the MIND diet pattern was associated with lower VAT and improvement in each metabolic risk factor. Future interventions are needed to test the effects of MIND diet consumption on measures of physical and cognitive health, especially in the context of personalized nutrition.

Funding: The research was funded by the Hass Avocado Board and the USDA National Institute of Food and Agriculture, Hatch Project 1009249.

AUTHORS

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[5]Beckman Institute of Advanced Science and Technology, University of Illinois Urbana-Champaign, Urbana, IL

Rhea Sarma, BS
Master Student, Department of Kinesiology and Community Health, University of Illinois Urbana-Champaign

BIOGRAPHY

Rhea Sarma is a second year MS student in Kinesiology at the University of Illinois Urbana-Champaign; advised by Dr. Naiman Khan. She completed her undergraduate degree in Biotechnology from India. Currently she is gaining interdisciplinary translational research experience in the realm of nutrition, cognition and behavioral sciences. Her research interest is to learn about human eating behaviors, appetite regulation and benefits of eating healthy diet on brain health through neuroscience perspective.

Areas of Personalized Nutrition: Cognition, Learning, & Memory | Consumer & Health Behaviors | Dietary Intake Assessment & Analysis

ABSTRACT

Individuals with Greater Memory Abilities Exhibit Higher Food Label and Numeracy Nutrition Skills

Background and Hypothesis: Dietary practices on human health has received considerable interest, however, the influence of nutritional literacy on adherence to dietary guidelines and nutritional status remains understudied. Further, direct participation of specific cognitive abilities on nutrition literacy is unknown. We aimed to investigate the relationship between nutrition literacy, diet quality, carotenoid status, and cognitive function.

Methods: Adults aged 37.5 ± 17 years (N=52) completed the 42 item Nutrition Literacy Assessment Instrument (NLit). Dietary History Questionnaire III (DHQIII) was analyzed to determine adherence to the Dietary Guidelines for Americans (Healthy Eating Index [HEI-2015]). Reflection spectroscopy estimated skin carotenoids as a biomarker of diet quality. Attentional inhibition was evaluated using a modified Flanker Task. Hippocampal-dependent relational memory and pattern separation abilities were assessed using a Spatial Reconstruction Task and the Mnemonic Similarity Task, respectively. Statistical analyses were adjusted for age, sex, education level, and body mass index (BMI).

Results: No correlations were observed for NLit scores and NLit subscales with HEI-2015 and skin carotenoid status. However, the NLit Food Label & Numeracy subscale was related to greater pattern separation abilities (rho=.33, p=0.027).

Conclusions: Nutrition literacy was unrelated to diet quality, carotenoid status, or cognitive function. However, quantitative comprehension of food label & numeracy information were associated with memory abilities. Future interventions improving nutrition knowledge should target cognitive domains to improve dietary patterns in larger samples.

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BIOGRAPHY

Laura Rosok is a second-year predoctoral neuroscience student in Dr. Naiman Khan's Neurocognitive Health Behavior Laboratory at the University of Illinois Urbana-Champaign. Laura studies the visual and cognitive function of children in relation to dietary and developmental factors. She uses EEG, cognitive batteries, reflection spectroscopy, heterochromatic flicker photometry, blood markers, and dietary recalls to assess these relationships.

Areas of Personalized Nutrition: Cognition | Learning, & Memory | Dietary Intake Assessment & Analysis

ABSTRACT

Skin Carotenoids are Related to Cognition Among Toddlers: Preliminary Findings from the Early Life Influences on Attention Study (ELIAS)

Background and Hypothesis: Carotenoids are antioxidant pigments found abundantly in green leafy vegetables that accumulate in the human body (i.e., skin, adipose, and brain) and can serve as biomarkers for higher diet quality. Although carotenoid status has been previously associated with cognitive benefits in older children and adults, the relation between carotenoids and cognition during early life has received little attention. The Early Life Influences on Attention Study (ELIAS) is an on-going longitudinal study examining the influence of nutrition on visual and cognitive development among toddlers. The present abstract aimed to understand the cross-sectional relationship between skin carotenoids and cognitive, language, and motor abilities among toddlers, with the hypothesis that higher carotenoid levels would be positively related to these abilities.

Methods: Baseline data from ELIAS were utilized to conduct cross-sectional analyses among toddlers between 12-18 months (N = 47). Skin carotenoids were measured using reflection spectroscopy (i.e., VEGGIE METER®). Cognitive, receptive communication, expressive communication, fine motor, and gross motor abilities were measured using the Bayley Scales of Infant and Toddler Development IV Screening Test (BSID-IV). Following initial bivariate correlations, partial correlations were conducted assessing relationships between skin carotenoids and BSID-IV subsets, adjusting for age in months as a covariate.

Results: BSID-IV cognitive ability scores were positively related to skin carotenoids (Rho=0.33, P=0.02). No significant associations were observed between skin carotenoids and receptive communication (Rho = 0.05, P=0.39), expressive communication (Rho=-0.14, P=0.19), fine motor (Rho=-0.15, P=0.17), or gross motor abilities (Rho=0.03, P=0.42).

Conclusions: Skin carotenoids were positively associated with cognitive abilities in toddlers. The domain-specificity of the findings points to the importance of carotenoid status for early cognitive development. Pending longitudinal data have the potential to provide insights into the impact of changes in carotenoid intake and development of visual and cognitive function between 12-30 months.
Funding: The Egg Nutrition Center.

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Areas of Personalized Nutrition: Immunity | Microbiome

ABSTRACT

Optimizing Bioactive Metabolites in Fermented Foods That Have the Potential to Improve Human Immune Function

Background and Hypothesis: Fermented food intake is associated with improvements in human immune function. These benefits may result from the bioactivity of microbe-derived metabolites (i.e. xenometabolites) found in fermented foods. A group of aryl-lactates: phenyllactic acid (PLA), 4-hydroxyphenyllactic acid (4-HPLA), and indole-3-lactic acid (ILA), are metabolized from aromatic amino acids (ArAA) through shared enzymatic pathways in select lactic acid bacteria (LAB), many of which can be found in fermented foods. This led us to hypothesize that manipulating ArAA metabolism in a fermented food matrix can optimize the production of aryl-lactates with immune-modifying potential.

Methods: LABs including Lactiplantibacillus plantarum and Bifidobacterium infantis were cultured with metabolic cofactors for 24h and sent to Metabolomics Core for liquid chromatography/mass spectrometry (LC/MS) analysis to investigate the production of aryl-lactates. To test if ArAA metabolism can be manipulated in a fermented food matrix, sauerkraut was made and fermented for 10d with cofactors, then analyzed for the production of aryl-lactates via LC/MS.

Results: ArAA metabolism was manipulated in cultures of LABs commonly found in fermented foods. Co-factors alpha-ketoglutarate and citrate synergized to increase all aryl-lactates in L. planatarum culture (at least 42-fold increase). The addition of specific aryl-pyruvates increased each downstream aryl-lactate metabolite at least 500-fold in both L. plantarum and B. infantis. These effects transferred to a whole wild-ferment food matrix (sauerkraut) whereby addition of an aryl-pyruvate (phenylpyruvate) robustly increased a downstream aryl-lactate (phenyllactate).

Conclusions: Fermented foods represent an ideal opportunity to further examine the significance of microbial-derived ArAA in humans. These data suggest that the production of aryl-lactates can be manipulated in fermented foods and help to build a foundation for future studies exploring novel pathways by which select fermented food diets can promote immune modulating xenometabolites.

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BIOGRAPHY

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Areas of Personalized Nutrition:
Immunity | Microbiome

ABSTRACT

Effects of Lutein Consumption on Carotenoid Status and Cognition Among Persons with Multiple Sclerosis

Background and Hypotheses: Multiple sclerosis (MS) is a demyelinating disease of the central nervous system often accompanied by visual and cognitive impairment. Carotenoids have anti-inflammatory properties, and the xanthophyll carotenoid lutein preferentially accumulates in macular and brain tissue. Higher macular pigment optical density (MPOD), a non-invasive measure of macular xanthophyll status, is associated with greater cognitive and visual processing speed in healthy adults. The effects of lutein consumption on carotenoid status and cognitive function have not been examined among persons with MS.

Methods: We conducted a randomized control trial design that examined the effects of 4-months of lutein supplementation on carotenoid status and cognitive function in persons with MS (n = 21). Participants were randomly assigned to placebo (safflower oil without lutein, n = 9) or treatment (20 mg/day lutein with safflower oil, n = 12). Carotenoid status was assessed in the macula (MPOD) and skin using heterochromatic flicker photometry and reflection spectroscopy at the fingertip, respectively.
Results: There was a significant group by time interaction whereby the treatment group exhibited a significant increase in MPOD (Δ0.20 ± 0.33, p=0.029) and skin carotenoids (Δ139.4 ± 81.55, p<0.001). There was a significant positive association between change in MPOD and change in flanker incongruent accuracy in only the treatment group (rho = 0.70, p = 0.008).

Conclusions: 4-month lutein supplementation improved carotenoid status in the skin and macula. Improvement in macular carotenoids was associated with increased attentional inhibition, providing support for neural carotenoids having cognitive benefits in persons with MS. Although larger intervention trials are necessary, the present study provides novel evidence demonstrating improvement in carotenoid status following lutein supplementation and the potential to support cognitive function in persons with MS.

Funding: Division of Nutritional Sciences at the University of Illinois Urbana-Champaign and the National Institutes of Health Rehabilitation Research Resource to Enhance Clinical Trials Center.

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BIOGRAPHY

Professor Kelly Bost is a faculty member in the Department of Human Development and Family Studies at the University of Illinois Urbana-Champaign. Her research examines how families and parent-child attachment relationships impact children's socioemotional and health-related outcomes using multi-method approaches. Dr. Bost's work is advancing knowledge about the role of self-regulatory processes in the development of pediatric obesity, and cuts across disciplinary boundaries to examine complex interactions between biological and family factors to ultimately improve the health and well-being of children and families.

Areas of Personalized Nutrition:
Imaging, Cognition| Learning, and Memory | Consumer & Health Behaviors

ABSTRACT

Self-Regulation and Children's Eating Behavior

Background and Hypothesis: Capacities to self-regulate play an important role in eating-related behaviors. Over childhood, transactional associations between temperament and the synchrony and quality of parent-child interactions influence emerging self-regulation skills. Research has also revealed parenting characteristics that promote appetite regulation in children, and how temperament impacts dietary behavior. However, there are gaps in our understanding of mechanisms underlying these associations at socio-behavioral and neurobiological levels of influence. The objectives of this pilot project are to collect brain imaging data on a sample of 6-8 yr old children participating in the STRONG Kids2 (SK2) birth cohort study, and characterize interpersonal and eating synchrony in mother- and father-child dyads during family mealtimes. We hypothesize that regulation characterized across brain, behavioral, and dyadic levels of analysis will impact children's eating-related behavior over time.

Methods: Participants will include 20 children between 6 – 8 year of age enrolled in the SK2 study. Brain activity will be collected during a Focused Attention task in a 3T scanner, and eye-tracking data will be recorded. Video-taped family mealtimes (n = 110) are being coded to determine sequential and matched verbal/emotional exchanges and food approach/withdrawal behaviors in dyads using video-based tracking. Longitudinal measures of child temperament and eating behaviors are collected as part of the SK2 protocols.

Results: 90 food stimuli for the Focused Attention task have been created. Episodes of m-c and f-c interaction during mealtime are being selected to examine dyadic eating and behavioral synchrony. Path Modeling (R 4.1.2) of SK2 data has revealed that children higher on Negative Affectivity ($P < .001$) and lower on Effortful Control ($P < .01$) at 18mo are more likely to emotionally overeat at 36 months, adjusting for covariates.

Conclusions: Gaining insight into how child temperament and parenting phenotypes translate into eating dysregulation will be important for identifying precision approaches to obesity prevention and nutritional health.

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Areas of Personalized Nutrition: Dietary Intake Assessment & Analysis | Physical Activity & Body Composition

ABSTRACT

Skin Carotenoids are Negatively Associated with Body Mass Index in School Aged Children

Background and Hypothesis: Carotenoids are dietary components that deposit in a variety of regions of the body including the brain, retina, adipose tissue, and skin. Carotenoids in skin and macula protect against photo-oxidative damage and age-related macular degeneration. Conveniently, carotenoid's ability to absorb short-wavelength light provides a way to non-invasively assess the density of pigment present in the skin and macula using techniques known as reflection spectroscopy (RS) and heterochromatic flicker photometry (HFP), respectively. While studies have investigated the relationship between macular pigmentation and demographic characteristics in adults, no studies have done this in children, or with regards to skin carotenoids (SC). Thus, this study analyzed characteristics of a child population in relation to skin and macular carotenoids.

Methods: One-hundred and sixty-one children (7-14y; 51% male) completed HFP to assess macular pigment optical density (MPOD). A sub-sample of these participants completed anthropometric (N=157), body composition (N=143), and SC (N=134) assessment. Whole-body percentage fat (%Fat) was assessed utilizing dual energy x-ray absorptiometry. Skin carotenoids were assessed using RS. One-tailed Pearson's correlations and independent samples t-test were utilized to assess relationships.

Results: MPOD and SC were not associated ($r=-0.03$, $p=0.49$). MPOD and SC were not associated with age ($r=0.07$ $p=0.18$; $r=-0.06$, $p=0.24$) or sex ($t=0.41$, $p=0.34$; $t=0.26$, $p=0.39$). %Fat was negatively associated with SC ($r=-0.38$, $p<0.001$), but not MPOD ($r=-0.03$, $p=0.38$). Similarly, BMI was negatively associated with SC ($r=-0.32$, $p<0.001$) but not MPOD ($r=0.04$, $p=0.29$).

Conclusions: These findings differ from studies in adults, which have displayed a negative correlation between MPOD and BMI. Additionally, this study displays a novel relationship between SC and BMI, as well as %Fat. This is the first large-scale population analysis of macular and skin carotenoids in children.

Funding: This study was funded by the Egg Nutrition Center and the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign.

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Annemarie Mysonhimer received a BS in Neuroscience and Minor in Human Nutrition from the Ohio State University in 2016. She is now a PhD Candidate in the Department of Food Science and Human Nutrition at the University of Illinois Urbana-Champaign. Her dissertation research focuses on the impact of prebiotic and probiotic consumption on gastrointestinal health and the microbiota-gut-brain axis in human adults.

Areas of Personalized Nutrition: Imaging, Cognition, Learning, and Memory | Consumer & Health Behaviors

ABSTRACT

Comparison of Microbiota Analytic Techniques

Background and Hypothesis: Increasingly, there are many bioinformatic and statistical programs available to analyze microbiota data. We aimed to compare analytic techniques.

Methods: We utilized data from a crossover trial in adults (n=24) who consumed prebiotics (5 g/d fructooligosaccharides + 5 g/d galactooligosaccharides; PRE) and no-fiber control (CON) for 4 weeks each. The 16S rRNA V4 region was amplified from extracted fecal DNA with a Fluidigm Access Array prior to high-throughput sequencing on Illumina HiSeq. FASTX-Toolkit, DADA2, and QIIME2 were used to process sequence data. Taxonomy was assigned with SILVA 138. Microbiota data were analyzed with differential abundances and taxa rankings. Differential abundance analyses were conducted via Wilcoxon signed-rank tests, Analysis of Compositions of Microbiomes with Bias Correction (ANCOM-BC), and Linear Discriminant Analysis Effect Size (LEfSe). Compositional taxa rankings were created with DEICODE and Songbird. Qurro (Quantitative Rank/Ratio Observations) was used to visualize taxa rankings and sample log-ratio plots. Wilcoxon rank-sum tests or Welch's t-tests quantified Qurro findings.

Results: Using Wilcoxon signed-rank tests, Actinobacteriota increased in PRE compared to CON (P=0.004, q=0.02). Bifidobacterium (P=0.001, q=0.03) and Anaerostipes (P=0.02, q=0.16) increased, while Roseburia (P=0.03, q=0.16) and Ruminococcaceae CAG352 (P=0.02, q=0.16) decreased in PRE. From LEfSe, Bifidobacterium increased (d=4.35, P=0.03), while Dielma (d=1.95, P=0.03) and Eubacterium brachy group (d=2.08, P=0.04) decreased in PRE. With Qurro, ratio of top to bottom ranked taxa from DEICODE principal component axis 3 increased in PRE (P=0.05), with Bifidobacterium and Anaerostipes among top taxa. From the Songbird treatment differential, ratio of top to bottom ranked taxa increased in PRE (P=0.001), with Bifidobacterium among top taxa.

Conclusions: Bifidobacterium enrichment was consistently detected using various analytic techniques. However, microorganisms affected to a lesser degree were not consistent across platforms.

Funding: USDA National Institute of Food and Agriculture, Hatch Project 1009249.

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BIOGRAPHY

David A. Alvarado is a doctoral student in the Division of Nutritional Science at the University of Illinois Urbana-Champaign. He is working in the Nutrition and Human Microbiome laboratory under Dr. Hannah Holscher's advisement. He has always had a passion for learning everything about microbes. For his undergraduate research he investigated alternative treatments for multidrug-resistant bacteria; focusing on how to kill microbes. In his master's research, he tested how the viability of probiotic bacteria is affected by different food matrices; shifting his focus to seeing what helps microbes live through hostile environments. He is currently conducting a collaborative clinical trial that aims to answer his next question about microbes and the gut-brain axis. He believes microbes play an intrinsic role in our health, so his goal is to merge his three passions: microbiology, nutrition, and mental health. This can hopefully lead to the prescription of personalized treatments using this multi-discipline approach in the near future.

Areas of Personalized Nutrition: Gastrointestinal Health

ABSTRACT

Determination of Honey Varietals' Impact on Bifidobacterium animalis ssp lactis Survivability in Commercial Yogurt Through Simulated In Vitro Digestion

Background and Hypothesis: Consumption of yogurt containing the probiotic strain Bifidobacterium animalis lactis DN-173 010/CNCM I-2494 (B. animalis) has been shown to improve digestive health and improve quality of life in adults. To optimize the benefits of this probiotic, we aimed to test our hypothesis that adding honey to commercial yogurt would increase the survivability of B. animalis under simulated gastrointestinal tract digestion conditions.

Methods: Yogurt samples were subjected to in vitro simulated oral, gastric, and intestinal phase digestion using simulated salivary, gastric, and intestinal fluids, respectively. At four time points, pre-digestion (baseline), and then after each phase of digestion (i.e., oral, gastric, and intestinal) -probiotic cells were enumerated first by spread plating on MRS agar and incubated for 5 h at 37ÀöC under anaerobic conditions to allow B. animalis cells to recover. Then, plates were overlaid with MRS supplemented with lithium chloride and sodium propionate and incubated at 37oC for an additional 67 h prior to quantification of the probiotic colony forming units (CFU).

Results: Significantly higher B. animalis survivability was observed in yogurt with clover honey after exposure to simulated intestinal fluids (~3.5 Log CFU/g reduction) compared to undiluted yogurt, sucrose-added yogurt, and water-added yogurt (~5.5 Log CFU/g reduction, $P < 0.05$). Phase 2 demonstrated significant B. animalis survivability after exposure to simulated intestinal fluids at new concentrations of clover honey, 14 and 10% w/w (~ 4.6 Log CFU/g reduction, $P < 0.05$) and verified the previously observed significance using 20% w/w (~3.9 Log CFU/g reduction, $P < 0.05$) compared to undiluted control (~5.6 Log CFU/g reduction).

Conclusions: These results demonstrated that clover honey increased B. animalis survivability in commercial yogurt during in vitro digestion.

Funding: The National Honey Board.

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BIOGRAPHY

María Sanabria was born and raised in the archipelago of Puerto Rico. During her undergraduate education, she gained interest in research pertaining nutrition and the gut microbiome. She recently got her Registered Dietitian Certification and decided to join the graduate program in Food Science and Human Nutrition at the University of Illinois Urbana-Champaign to combine her clinical experience with research. Currently, María is working with Dr. Hannah D. Holscher's in the research project titled: Persea Americana for Total Health 2 (PATH-2): Effects of Avocado Intake on Gastrointestinal and Cognitive Health, which expects to start over the summer.

Areas of Personalized Nutrition: Cognition, Learning, & Memory | Gastrointestinal Health | Metabolic Health| Microbiome

ABSTRACT

Persea Americana for Total Health 2 (PATH-2): Effects of Avocado Intake on Gastrointestinal and Cognitive Health

Background and Hypothesis: Dietary interventions can positively modify the intestinal microbiome and metabolome to promote health benefits. Previously, we demonstrated fresh Hass avocado (AV) consumption increased Faecalibacterium spp., and short-chain fatty acid (SCFA) concentrations, improved attention abilities, and decreased abdominal adiposity in adults with overweight and obesity. Therefore, the proposed research aims to establish that avocado consumption positively affects the gastrointestinal microbiome and improves cognitive function. Our primary hypothesis is that consuming an average American (AA) diet with AV will increase Faecalibacterium spp. and SCFAs and reduce secondary bile acid formation compared to the control groups: AA and high oleic oils + fiber-group (OF) group. Our secondary hypotheses are that daily avocado consumption will improve cognitive function relative to the control groups. Lastly, the potential benefits of avocado consumption on intestinal health and cognitive benefits via the gut microbiome will be explored.

Methods: This study will use a randomized-controlled crossover complete feeding design with 3 dietary periods (AA, AV, and OF). Each 4-week dietary period will be separated by a 2-week washout. Weight-stable adults (25-74 y) without diabetes with overweight or obesity (BMI > 25 kg/m2) will be eligible. Fecal, blood, and urine samples will be collected during week 4 of each condition. Fecal microbiome and metabolites will be assessed using metagenomic sequencing analysis and gas liquid chromatography, respectively. Circulating and fecal inflammatory markers will be quantified using ELISA. Gut permeability will be assessed by quantifying the urinary excretion of orally ingested sugar substitutes. Neuropsychological performance will be evaluated by measuring neuroelectric function during cognitive tasks.

Conclusions: We expect that avocado consumption will beneficially affect the intestinal microbiome and metabolome, thereby contributing to decreased systemic and intestinal inflammation and improved neuropsychological performance.

Funding: University of Illinois Urbana-Champaign Graduate College and Department of Food Science and Human Nutrition and Hass Avocado Board.

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BIOGRAPHY

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Areas of Personalized Nutrition: AI & Machine Learning | Cancer

ABSTRACT

Assessing the Alignment Between the Unified Medical Language System and Foods That Have Estrogen-Like Activity

Background and Hypothesis: Foods that mimic estrogen have a complicated role in the cancer lifecycle. For example, some studies of genistein, an isoflavone found in foods such as soy and fava beans show an increased breast cancer risk, while others show a protective effect. Moreover, studies on genistein and isoliquiritigenin, another food with estrogen-like activities found in licorice root, suggest that there might be differences in the underlying biological mechanisms. The goal in this project is to develop computational tools that can accelerate the systematic review of foods, food groups, and diets with respect to breast cancer. We report the first installment that focuses on foods with estrogen-like activities and present a preliminary analysis of MetaMap, an entity recognition tool that aligns text to concepts within the Unified Medical Language System (UMLS).

Methods: MetaMap was used to detect foods from a collection of over 8K abstracts that mention estrogen and either food or diet. A random sample of 100 abstracts was evaluated by 2 reviewers.

Results: Of the 1,437 concepts identified by the system over 200 were marked as partially correct because words within a phrase were captured, but the overall concept was missing in the UMLS. For example, each word (orange, blossom, and honey) was identified for orange blossom honey, but the overall concept is not in the UMLS. Precision, recall, F1 and accuracy were 0.69, 0.78, 0.73 and 0.66 respectively. Preliminary experiments that combine MetaMap with dependency processing appear to provide a promising way to manage multi-concept phrases.

Conclusions: MetaMap provides a good baseline for detecting foods and diets that have estrogen-like activity. Further work is underway to manage concepts that do not appear in existing ontologies.

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Seed Grant Funding from the Personalized Nutrition Initiative at Illinois

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Veronica Hindle is a first-year graduate student in the Department of Food Science and Human Nutrition, University of Illinois Urbana-Champaign. She works under Dr. Hannah Holscher's mentorship in the Nutrition and Human Microbiome Laboratory, and she is the lead graduate student on an innovative study entitled "Mining the Scientific Literature to Support Personalized Nutrition Applications". Currently, she interprets and translates scientific nutrition and microbiome-related publications utilizing an annotation software system.

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Nadine Veasley is a first-year graduate student in the Division of Nutritional Sciences. She received her bachelor's degree in microbiology from Iowa State University. She is currently text mining through articles related to the gut microbiome and nutrition in efforts to support personalized nutrition initiatives.

Areas of Personalized Nutrition: AI & Machine Learning | Gastrointestinal Health | Microbiome

ABSTRACT

Annotating the Scientific Literature to Support Personalized Nutrition Applications

Background and Hypothesis: Nutrition is fundamental in maintaining health and preventing disease. Personalized nutrition aims to provide tailored dietary recommendations to support health. The published research literature is a rich and growing source of scientific evidence on nutrition and the human microbiome; however, this knowledge mostly remains buried in unstructured text. Thus, research is needed to enhance literature mining on human metabolism, gut microbiome, and nutrition. The objectives of our project include 1) annotating a corpus of scientific publications for nutrition and microbiome-related information, 2) developing NLP (Natural Language Processing) models to extract and standardize this information to support personalized nutrition applications to enhance literature mining on human metabolism, gut microbiome, nutrition, and 3) constructing a comprehensive literature-based knowledge graph for downstream applications.

Methods: Utilize the Brat Annotation Tool to annotate 300 PubMed nutrition/microbiome-related publications with relevant entities (e.g., foods, bacteria, metabolites, diseases) and their relationships (e.g., food-microbe interactions). First, we identify relevant entities by selecting from a refined list (e.g., nutrient, diet pattern, microorganism, disease). Second, when a relationship is described between two entities, identify the word or phrase that indicates the relationship (e.g., affects, increases, causes) and assign agent(s) (e.g., nutrient, diet pattern) and theme(s) (e.g., abundance of Akkermansia) to create the relationship. Lastly, we assign a factuality value to the relationship type (e.g., fact, possible, probable, unknown).

Results: To date, we have annotated 72 abstracts and 17 full-text publications, generating 5033 entities and 1135 relationships.

Conclusions: We are in the process of developing baseline neural network models based on the annotated dataset.

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Areas of Personalized Nutrition: Gastrointestinal Health | Metabolic Health | Metabolic Regulation | Microbiome

ABSTRACT

Microbial and Metabolic Impact of Walnut Consumption in Adults with Obesity

Background and Hypothesis: The intestinal microbiome may mediate the metabolic effects of obesity, including systemic inflammation and insulin resistance. Our previous work demonstrated that walnuts, a food rich in fiber and unsaturated fatty acids, reduced secondary bile acids and increased Faecalibacterium spp. and Roseburia spp., butyrate-producing bacteria that have been linked to reduced gut inflammation and improved glucose tolerance. Therefore, our central hypothesis is that walnut consumption increases Faecalibacterium spp., Roseburia spp., and butyrate concentrations and decreases secondary bile acids compared to the control groups (corn oil and walnut oil), which in turn reduces postprandial inflammation with subsequent improvements in whole-body insulin sensitivity.

Methods: This study is a randomized, controlled, crossover, complete feeding trial with three, 3-week diet conditions that are identical except for the presence of walnuts, walnut oil, or corn oil within the diet. Each condition is separated by a 3-week washout. Adults (n=30) with obesity (BMI > 30 kg/m2; 30-60 yrs of age) and without physician-diagnosed gastrointestinal or metabolic diseases are eligible for enrollment. Fecal, blood, and urine sample are collected between days 18-21 of each condition. The fecal microbiome will be assessed using metagenomic sequencing, and microbial metabolites will be quantified using gas chromatography. Blood glucose, insulin, chylomicrons, bile acids, and inflammatory biomarkers will be measured. Gut permeability will be assessed by quantifying the urinary excretion of ingested sugar substitutes.

Results: 10 participants have been randomized, 4 have finished, and 3 will complete the study in 2022. We expect to enroll 20 participants in 2023.

Conclusions: We expect that walnut consumption will lead to beneficial shifts in the intestinal microbiome, contributing to reduced systemic inflammation and improvements in metabolic status.

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Nate Willis is a fourth-year PhD candidate in the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign. As a research assistant in the Neurocognitive Health Behaviors Laboratory under the tutelage of Dr. Naiman Khan, he is investigating the impact of nutritional intake on cognitive functioning with a specific focus on water intake and hydration status. His research on the relationships between hydration markers, gut microbiota, and inflammation won the Early Career Research Award at the Hydration for Health international conference in 2022 and he is currently analyzing data for his dissertation project investigating the impact of a water intake intervention on the gut microbiota, markers of gastrointestinal inflammation, and cognitive functioning in adults.

Areas of Personalized Nutrition: Cognition, Learning, & Memory | Consumer & Health Behaviors | Experimental Design

ABSTRACT

Biomarker Validation and Participant Compliance During a Water-Intake Intervention

Background and Hypotheses: Deficits in hydration status can contribute to cardiovascular and metabolic diseases, but the impacts of hydration status on gut health and cognitive functioning have not been fully explored. A proof-of-concept pilot trial was conducted, hypothesizing that increased water intake would improve executive functions and markers of gut health. We present preliminary data including biomarker validation and descriptive changes from the study.

Methods: Adult participants were screened for pre-existing conditions, antibiotic and diuretic use, and urinary hydration status. Participants completed three laboratory visits for venous blood draw and to collect measures of total body water (TBW) and cognitive functioning. Following the second appointment, participants completed a 3-week intervention where they consumed 80% of the adequate intake (AI) for water, tracked with a Bluetooth water bottle (HidrateSpark, Minneapolis MN). Participants provided 3-day diet records (ASA24), 24-hr urine, and two stool samples prior-to (baseline) and following (follow-up) this period.

Results: Participants (n = 23, 14 female, 19-48 yo) self-identified as White (n = 10), Asian (n = 12), and African American (n = 1), most with normal weight BMI (n = 15). The intervention significantly reduced urine osmolality (Δ=-326 ± 281, $p<0.001$) and plasma copeptin (Δ=-3.59 ± 4.50, $p<0.001$), increased urine volume (Δ=755 ± 681 mL, $p<0.001$), but had no effect on stool characteristics or TBW. Intervention compliance was 99 ± 19% and was correlated with urine volume (rho=0.48, p=0.02), plasma copeptin (rho=-0.40, p=0.06), and urine osmolality (rho=-0.38, p=0.08) at follow-up in a one-tailed model.

Conclusions: This intervention was effective at improving hydration status. Daily consumption of the AI of water reduced urine concentration to < 500 mOsm/kg, a threshold supportive of optimal health. Self-reported intake correlated with physiological hydration markers suggesting that app-based intake tracking may improve validity of self-report measures.

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Areas of Personalized Nutrition: Cancer | Dietary Intake Assessment & Analysis

ABSTRACT

A Scoping Review of Information & Communication Technologies and Nutrition Among Individuals Diagnosed with Breast Cancer

Background and Hypothesis: Nutrition intervention is a vital component of breast cancer (BC) care. Various types of information and communication technology (ICT) have been used in nutritional interventions regarding their effectiveness, usability, and feasibility to promote positive health outcomes among people with a history of BC.

Methods: A scoping review was conducted and structured based on the Preferred Reporting Items for Systematic reviews and Meta-Analysis extension for Scoping Reviews Checklist. PubMed, CINAHL, Web of Science, and SPORTDiscus were searched for potentially eligible studies from inception to 2022. Selection discrepancies were then discussed and resolved. A comprehensive review of the full texts of the included literature was further conducted for data extraction and analysis. The quality and risk of the evidence will be assessed using corresponding tools. A descriptive analysis will summarize the information on ICTs used concerning nutritional intervention for the BC population.

Results: 16 interventional studies were included. Extracted data indicate the potential ICT use in nutritional interventions to achieve desired outcomes among individuals with a history of BC. Significant changes include improved social cognitive theory variables (e.g., self-efficacy in healthy eating), favorable changes in dietary behaviors and quality (e.g., increased fruit intake), better anthropometric outcomes (e.g., weight loss), improved nutrition-related biochemical profile (e.g., plasma carotenoids) and overall quality of life.

Conclusions: Despite the heterogeneity of the analyzed studies, research findings showed a common agreement in greater positive health outcomes if ICTs (e.g., telephone counseling, smartphone apps, web-based programs) were applied in nutritional interventions. Although a few included studies supported their usability and feasibility for delivering some nutritional interventions, more studies should be done to inform a tailored intervention for BCPS of different disease and treatment stages. Besides, future research could explore how to maintain long-term adherence to an ICT-based program that benefits the population.

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Technology Showcase

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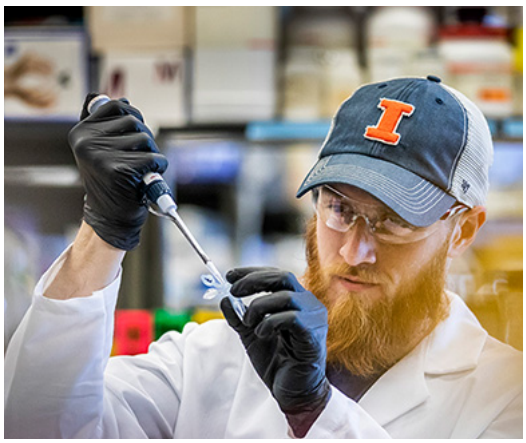

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We help food & beverage companies leverage data and accelerate innovation. Our systematic review framework leverages the literature to create living evidence. With our reviews, you can substantiate claims, evaluate sustainability, identify key opinion leaders, and drive decision-making with up-to-date evidence.

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