2021 Virtual Symposium

Inter-Individual Differences in Nutrition Responses

Tuesday, November 16, 2021 | 8:30 AM to 1:00 PM CT

Personalized Nutrition Initiative University of Illinois, Urbana-Champaign

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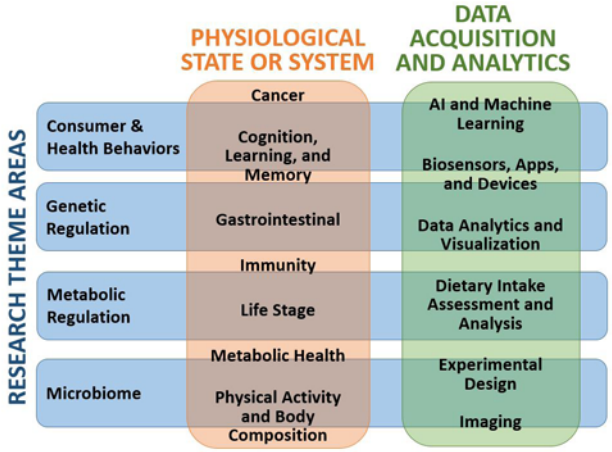
The Personalized Nutrition Initiative is a campus-wide partnership between the Office of the Vice Chancellor for Research and Innovation (OVCRI), the Carl R. Woese Institute for Genomic Biology (IGB), and the College of Agricultural, Consumer and Environmental Sciences (ACES).

Welcome

Welcome to the 2021 Symposium Inter-Individual Differences in Nutrition Responses hosted by the Personalized Nutrition Initiative at the University of Illinois Urbana-Champaign. 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.



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 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.

Sincerely,
Sharon Donovan, PhD, RD

Staff and Leadership

Sharon Donovan, PhD, RD
Director, Personalized Nutrition Initiative
Professor, Department of Food Science & Human Nutrition
sdonovan@illinois.edu

Alaina Kanfer, PhD
Director of External Relations & Strategic Partnerships, Personalized Nutrition Initiative and Carl R. Woese Institute for Genomic Biology
akanfer@illinois.edu

Anna Keck, PhD
Program Coordinator, Personalized Nutrition Initiative
akeck@illinois.edu

Personalized Nutrition Initiative
University of Illinois at Urbana-Champaign

Carl R. Woese Institute of Genomic Biology
1206 West Gregory Drive, Office 3002, MC 195
Urbana, IL 61801 USA
Email: personalizednutrition@illinois.edu
Website: https://personalizednutrition.research.illinois.edu/

Steering Committee

Sharon Donovan, PhD, RD
Director, Personalized Nutrition Initiative
Professor, Department of Food Science & Human Nutrition
sdonovan@illinois.edu

Naiman Khan, PhD, RD
Associate Professor, Department of Food Science & Human Nutrition
nakhan2@illinois.edu

Colleen Bushell, MFA
Associate Director & Associate Professor Research, National Center for Supercomputing Applications
cbushell@illinois.edu

Halil Kilicoglu, PhD
Associate Professor, School of Information Sciences
halil@illinois.edu

Brian Cunningham, PhD
Professor, Department of Electrical & Computer Engineering
bcunning@illinois.edu

Saurabh Sinha, PhD
Professor, Department of Computer Sciences
sinhas@illinois.edu

Elvira de Mejia, PhD
Professor, Department of Food Science & Human Nutrition
edemejia@illinois.edu

Kelly Swanson, PhD
Professor, Department of Animal Sciences
ksswanso@illinois.edu

John Erdman, PhD
Professor, Department of Food Science & Human Nutrition
jwerdman@illinois.edu

Jeff Woods, PhD
Professor, Department of Kinesiology and Community Health
woods1@illinois.edu

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 with each other in a non-competitive environment.

Personalized Nutrition Initiative External Partners will advise 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.

The Inaugural External Partner Program Members for FY22 are:

- Archer Daniels Midland Co
- General Mills
- Givaudan
- National Dairy Council
- Nestlé
- PepsiCo
- Pharmavite

During our inaugural year, we will refine the structure, fees, and benefits of our ongoing External Partner Program.

For more information please email: personalizednutrition@illinois.edu.

Agenda

8:30 – 8:45 A	**Welcome** Sharon Donovan, PhD, RD, *Professor and Director of the Personalized Nutrition Initiative, University of Illinois at Urbana-Champaign (UIUC)*
8:45 – 9:45 A	**Session 1: Biosensors and Biomarkers for Assessing Individual Responses** Moderator: Andrew Smith, PhD *Professor, Department of Bioengineering, UIUC*
	Brian Cunningham, PhD *Professor, Department of Electrical and Computer Engineering, UIUC* "Biosensor Approaches for Rapid, Inexpensive, and Frequent Analysis of Nutritional Biomarkers"
	Zeynep Madak-Erdogan, PhD *Associate Professor, Department of Food Science and Human Nutrition, UIUC* "Multiscale Approaches to Identify Novel Biomarkers of Metabolic and Cardiovascular Disease"
	Leila Shinn, MS, RDN, FAND *Predoctoral Fellow, Division of Nutritional Sciences, UIUC* "Machine Learning Identifies Fecal Metabolites Predictive of Whole Food Consumption"
	Q&A
9:45 – 9:55 A	**Break**
9:55 – 10:55 A	**Session 2: Individual Responses to Dietary Interventions** Moderator: Nicholas Burd, PhD *Associate Professor, Department of Kinesiology and Community Health, UIUC*
	Aron Barbey, PhD *Professor, Department of Psychology, UIUC* "Personalized Nutrition: Innovations in Nutritional Cognitive Neuroscience"
	Margarita Terán-Garcia, MD, PhD *Assistant Dean & Research Assistant Professor, Illinois Extension, UIUC* "Precision Nutrition and Implementation Science to Reach Health Equity"
	Colleen McKenna, MS, RD *Doctoral Student, Division of Nutritional Sciences, UIUC* "Resistance Exercise-Induced Apelin is not Modulated by Higher Dietary Protein Density in Overweight Adults"
	Q&A

10:55 – 11:40 A

Poster Session and Break

Moderator: Sharon Donovan, PhD, RD

Professor and Director of the Personalized Nutrition Initiative, UIUC

Poster Session 1 - Topic Areas: Metabolic Health, Metabolic Regulations, and Genetic Regulation

Catherine Applegate, PhD, RDN

Postdoctoral Fellow, Department of Animal Sciences and Department of Bioengineering, UIUC

"Sex- and Strain-Specific Responses to a PPAR Agonist Nanomedicine Targeting Adipose Inflammation"

Fatma Kadayifci, MS

Doctoral Student, Department of Food Science and Human Nutrition, UIUC

"Genetic Contributions to Child Health Outcomes in the STRONG Kids 2 Cohort Study"

Yifei Kang, MS

Doctoral Student, Division of Nutritional Sciences, UIUC

"A Targeted Nanomedicine Approach for a PPAR Agonist Improves Metabolism in Diet-Induced Obese (DIO) Mice"

Poster Session 2 - Topic Areas: Dietary Intake Assessment & Analysis and Physical Activity & Body Composition

Elizabeth Brandley, MS

Doctoral Student, Division of Nutritional Sciences, UIUC

"Xanthophyll Status and Neurocognition in a Lutein Supplementation Trial among Persons with Multiple Sclerosis: Preliminary Findings of the LuMES Trial"

Mindy Lee, MPH, RDN

Doctoral Student, Division of Nutritional Sciences, UIUC

"Differential Outcomes of Weight Maintenance During One-Year Follow-Up: Exploring Barriers to Sustainable Weight Management"

Mikaela Webb, BS, RD

Doctoral Student, Division of Nutritional Sciences, UIUC

"Exercise Training Modifies the Gut and Serum Xeno-Metabolome of Lean and Obese Adult Humans"

11:40 A - 12:45 P

Session 3: Sensory Perceptions and Individual Responses

Moderator: Nu-Chu Liang, PhD

Associate Professor, Department of Psychology, UIUC

Soo-Yeun Lee, PhD

Professor, Department of Food Science and Human Nutrition, UIUC

"Food Science Approach to Personalized Nutrition: Strategies for Sodium Reduction and Assessment Through Sensory Evaluation"

Yanina Pepino, PhD

Associate Professor, Department of Food Science and Human Nutrition, UIUC

"Individual Differences in the "Taste" of Fat"

Anqi Zhao, MS

Predoctoral Fellow, Division of Nutritional Sciences, UIUC

"Isothiocyanates in Brassica Vegetables Induce Glucagon Like Peptide-1 Secretion in Enteroendocrine Cells, Potentially Through Intestinal Bitter Taste Receptors"

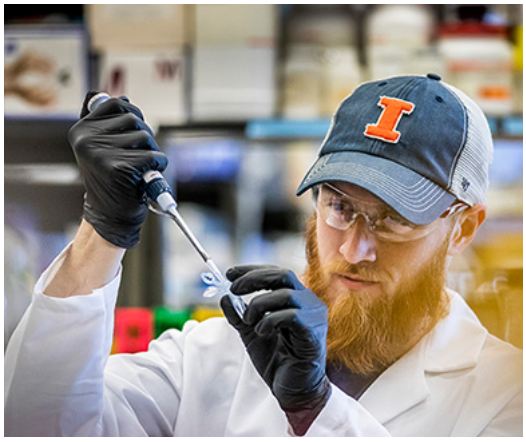
Q&A

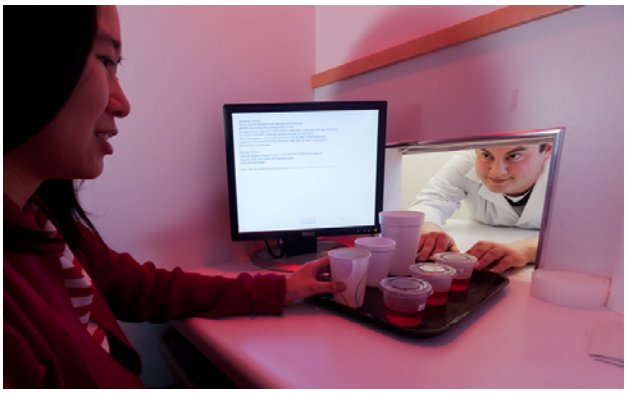
12:45 - 1:00 P

Wrap-up

Sharon Donovan, PhD, RD

Professor and Director of the Personalized Nutrition Initiative, UIUC





Sessions 1-3

Welcome and Wrap-up

Sharon Donovan, PhD, RD

Professor and Director of the Personalized Nutrition Initiative, University of Illinois at Urbana-Champaign

BIOGRAPHY

Dr. Donovan received her Ph.D. in Nutrition in the laboratory of Bo Lönnerdal at the University of California at Davis. She completed a postdoctoral fellowship at the Stanford University School of Medicine before joining the faculty in the Department of Food Science and Human Nutrition at the University of Illinois, where she is currently Professor and Melissa M. Noel Endowed Chair in Nutrition and Health. In 2020, she was named the inaugural Director of the Personalized Nutrition Initiative at the University of Illinois.

Her laboratory conducts research in the area of pediatric nutrition. On-going work is focusing on nutritional approaches to optimize the development of the gut microbiome, immune and cognitive development in infants. She also conducts multidisciplinary research on the prevention of childhood obesity and picky eating in children.

Dr. Donovan has over 240 peer-reviewed publications and has garnered over $35M in grant support from the NIH, USDA, foundations, and the food and pharmaceutical industry. She was elected to the National Academy of Medicine in 2017 and served on the 2020-2025 Dietary Guidelines Scientific Advisory Committee.

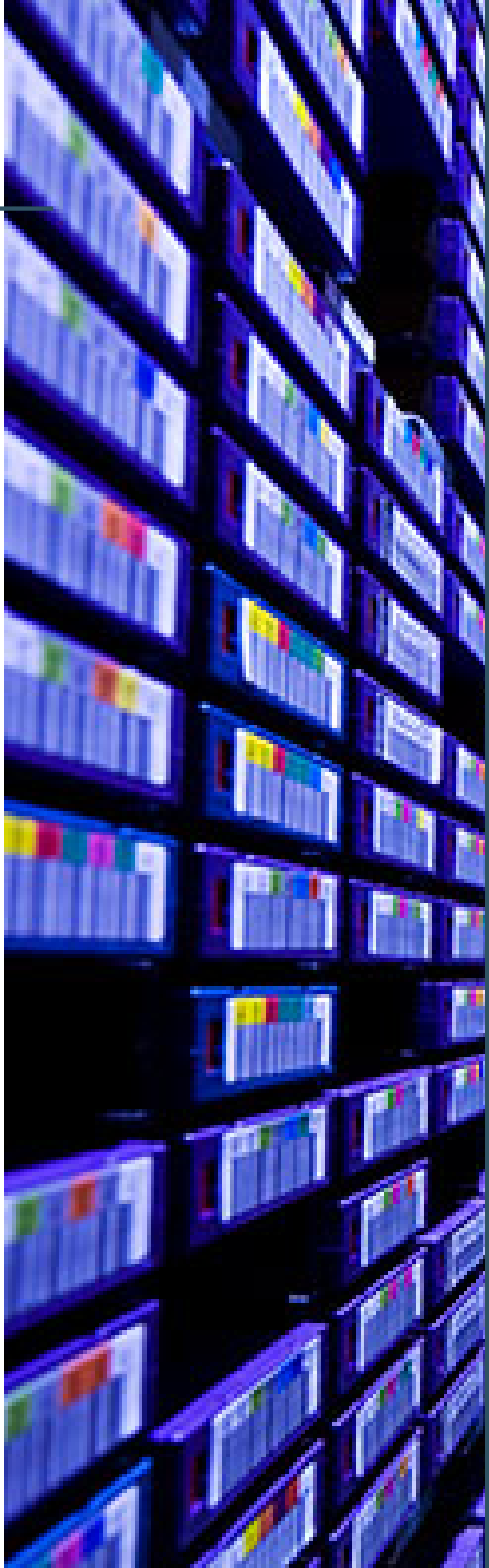
Session 1:
Biosensors and Biomarkers for Assessing Individual Responses

Moderator:
Andrew Smith, PhD
Professor, Department of Bioengineering, University of Illinois Urbana-Champaign

BIOGRAPHY

Andrew Smith is a professor of bioengineering, materials science & engineering, and technology entrepreneurship at the University of Illinois Urbana-Champaign. His laboratory specializes in molecular probes and targeted therapeutics and their applications in obesity, type 2 diabetes, and cancer, funded primarily by the National Institutes of Health.

His work in personalized nutrition focuses on cellular processes that occur in adipose tissue during weight gain and weight loss as well as therapeutic approaches to modulate the immune-metabolic axis in adipose tissue. He was a Whitaker Foundation Fellow during his doctoral training at Georgia Tech and an NIH K99 Fellow during his postdoctoral training at Emory University. He has been a faculty member at the University of Illinois Urbana-Champaign since 2012 and has managed the Illinois undergraduate bioengineering program as Associate Head since 2016. He teaches courses in quantitative pharmacology and cancer technologies.



Brian Cunningham, PhD

Professor, Department of Electrical and Computer Engineering, University of Illinois Urbana-Champaign

BIOGRAPHY

Prof. Cunningham has been a faculty member in the Department of Electrical and Computer Engineering and the department Bioengineering at the University of Illinois at Urbana-Champaign since 2004, following a 15-year career in Industry. Professor 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.

ABSTRACT

Biosensor Approaches for Rapid, Inexpensive, and Frequent Analysis of Nutritional Biomarkers

Developing a deeper understanding ofpersonalized nutrition 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. 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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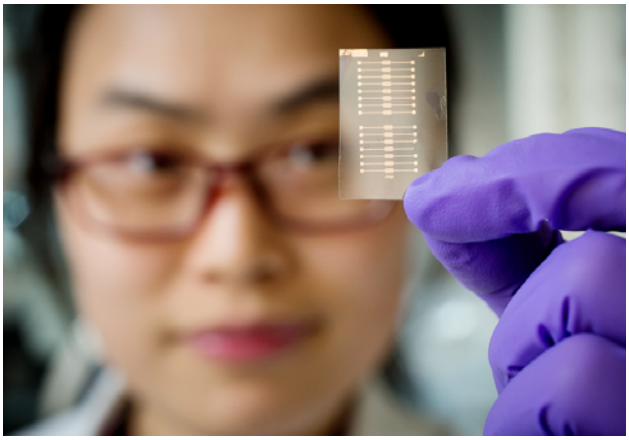

Zeynep Madak-Erdogan, PhD

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

BIOGRAPHY

Dr. Madak-Erdogan is an Associate Professor of Nutrition, Health Innovation Professor, and the Director of Women's Health, Hormones, and Metabolism lab at the University of Illinois, Urbana Champaign. She received her PhD and undertook postdoctoral studies on mechanisms of estrogen receptor action, and then joined the Department of Food Science and Human Nutrition at the University of Illinois 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. In addition to mentoring several undergraduate and graduate students, she has taught courses in Cancer Metabolism, Basic Toxicology, Diet, Nutrition and Cancer, and Nutrition and Women's Health. She has received several awards including a Pre- and Postdoctoral Research Training Program in Endocrine Developmental and Reproductive Toxicology Fellowships from the National Institute of Environmental Health Sciences, a fellowship from the National Center for Supercomputing Applications, the Women in Endocrinology Young Investigator Award from the Endocrine Society, and the Mary Swartz Rose Young Investigator Award and Bio-Serv Experimental Nutrition Award from the American Society for Nutrition. She is the incoming editor-in-chief for the *Journal of Endocrine Society*.

ABSTRACT

Multiscale Approaches to Identify Novel Biomarkers of Metabolic and Cardiovascular Disease

Currently, we lack clinical tests to assess a women's breast cancer risk, or properly diagnose cardiac events due to microvascular disease of the heart. Gold standard tests used for diagnosis of gestational diabetes are not always successful in identifying the disease in individuals from certain racial backgrounds. Liquid biopsies, based on identifying changes in circulating biomarkers of various health conditions are gaining popularity in recent years due to real time disease risk and progression monitoring. In our lab, we are developing advanced computational methods to systematically evaluate electronic health records, and molecules in blood (metabolites, exosomes, proteins etc.) to identify potential circulating biomarkers for health outcomes. I will present data from clinical and preclinical studies related to identification and validation of circulating biomarkers for diagnosis of breast cancer risk, coronary microvascular disease and gestational diabetes. Thus, multiscale approaches that utilize combination of machine learning analysis, and preclinical and clinical studies provides opportunities for further validating identified biomarkers and promises improvement in women's health by diagnosing conditions earlier before the disease onsets or progresses further.

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Leila Shinn, MS, RDN, FAND

Predoctoral Fellow, Division of Nutritional Sciences, University of Illinois Urbana-Champaign

BIOGRAPHY

Leila received her B.S. in Dietetics from the University of Illinois in 2015. She received her M.S. in Clinical Nutrition and completed her dietetic internship at Rush University Medical Center in 2017. She is currently a 4th year PhD Candidate in Nutritional Sciences, University of Illinois Urbana-Champaign under the advisement of Dr. Hannah Holscher. Leila's research focuses on diet and the gut microbiome. Specifically, she is interested in using the gut microbiota, metagenome, and metabolome to establish objective biomarkers of food intake.

ABSTRACT

Machine Learning Identifies Fecal Metabolites Predictive of Whole Food Consumption

Background and Hypothesis: Nutrition studies frequently utilize self-reported measures of food intake and compliance. However, these measures have limitations. The gut microbiome is modulated by diet. Therefore, there is rising interest in objective biomarkers that can complement self-reported measures of food intake. The objective of this work is to utilize a computationally intensive, multivariate, machine learning approach to identify fecal metabolites highly predictive of food intake.

Methods: Briefly, fecal samples from feeding trials examining almond, avocado, broccoli, walnut, and whole grain oat and barley intake were homogenized, aliquoted, flash frozen, and stored at -80°C until metabolomic analysis via GC-MS. Metabolites that were undetectable in ,~80% of samples in all study groups were excluded and remaining missing values were imputed. The differences between pre- and post-intervention relative metabolite concentrations were used for analysis. Random forest models examined the effect of whole food consumption on the fecal metabolome.

Results: Of the six foods, almond (n=32) and walnut treatment (n=36) performed best with 82% and 89% cross-validation accuracy in classifying food intake, respectively. Variable importance scores from the models were used to rank the metabolites in order of their predictive power. The top three metabolites indicative of almond intake were ornithine, stearic acid, and linoleic acid, whereas oleic acid, uric acid, and linoleic acid were the top three metabolites indicative of walnut intake.

Conclusions: Fecal metabolites unique to whole food consumption, such as fatty acids in nuts, reveal the potential for the development of fecal biomarkers of food intake.

Funding and Other Acknowledgments: This research was funded by The Foundation for Food and Agriculture Research and United States Department of Agriculture.

AUTHORS

Leila M. Shinn[1], Aditya Mansharamani[2], Ruoqing Zhu[3,4], Hannah D. Holscher[1,4,5]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Computer Science, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Department of Statistics, University of Illinois, Urbana at Urbana-Champaign, IL;

[4]National Center for Supercomputing Applications, University of Illinois at Urbana-Champaign, Urbana, IL;

[5]Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Urbana, IL

Session 2:
Individual Responses to Dietary Interventions

Moderator:
Nicholas Burd, PhD
Associate Professor, Department of Kinesiology and Community Health, University of Illinois Urbana-Champaign

BIOGRAPHY

Nicholas Burd received graduate degrees in Exercise Physiology (MSc) and Kinesiology (PhD) from the Ball State University and the McMaster University in Canada, respectively. He trained as a post- doctoral research fellow at the Maastricht University Medical Center in the Netherlands. He joined the University of Illinois faculty in 2013 as an Assistant Professor in the Department of Kinesiology and Community Health and is also a member of the Division of Nutritional Sciences. Research in his group regularly uses substrate or non-substrate specific stable isotope tracers to provide a window into the intricacies of human metabolism and its responses to nutrition, exercise, and disease. He has authored more than 70 peer-reviewed research, review articles, and book chapters related to dietary protein and its application in sports and/or clinical nutrition. He is a member of the American College of Sports Medicine (ACSM) and American Society for Nutrition. He has received grant funding from the National Pork Board, Egg Nutrition Center, ACSM, and the National Cattlemen's Beef Association.

Aron Barbey, PhD
Professor, Department of Psychology, University of Illinois Urbana-Champaign

BIOGRAPHY

Aron K. Barbey is a Professor of Psychology, Neuroscience, and Bioengineering at the University of Illinois at Urbana-Champaign. He is chair of the Intelligence Systems Major Research Theme, leader of the Intelligence, Learning, and Plasticity Initiative, and director of the Decision Neuroscience Laboratory at the Beckman Institute for Advanced Science and Technology. He received a Ph.D. in Psychology from Emory University in 2007 and completed a research fellowship in Cognitive Neuroscience at the National Institutes of Health in 2011. Professor Barbey's research investigates the neural mechanisms of human intelligence and decision making, with particular emphasis on enhancing these functions through cognitive neuroscience, physical fitness, and nutritional intervention. He has won more than $25 million in federal and private research grants since joining the University of Illinois in 2011, receiving support from the National Institutes of Health (NIH), the NIH BRAIN Initiative, the research division of the United States Director of National Intelligence (IARPA), the Department of Defense (DARPA), the National Science Foundation (NSF), and private industry. He has received multiple academic achievement awards, is co-editor of *The Cambridge Handbook of Intelligence and Cognitive Neuroscience*, and serves on the editorial boards of *Intelligence, NeuroImage, and Thinking & Reasoning*.

ABSTRACT

Personalized Nutrition: Innovations in Nutritional Cognitive Neuroscience

Purpose: Nutritional cognitive neuroscience is an emerging interdisciplinary field of research that seeks to understand nutrition's impact on cognition and brain health across the life span. Research in this burgeoning field demonstrates that many aspects of nutrition—from entire diets to specific nutrients—affect brain structure and function, and therefore have profound implications for understanding the nature of healthy brain aging. The aim of this talk is to examine recent advances in nutritional cognitive neuroscience, with an emphasis on methods that enable discovery of nutrient biomarkers that predict individual differences in healthy brain aging.

Methods: We propose an integrative framework that calls for the synthesis of research in nutritional epidemiology and cognitive neuroscience, incorporating: (i) methods for the precise characterization of nutritional health based on the analysis of nutrient biomarker patterns (NBPs), along with (ii) modern indices of brain health derived from high-resolution magnetic resonance imaging (MRI).

Conclusions: By integrating cutting-edge techniques from nutritional epidemiology and cognitive neuroscience, nutritional cognitive neuroscience will continue to advance our understanding of the beneficial effects of nutrition on the aging brain and establish effective nutritional interventions to promote healthy brain aging. Ultimately, the development of predictive nutrient patterns for healthy brain aging will provide an empirically sound foundation for developing personalized nutritional therapies that support the targeted treatment of cognitive and neurological impairments in the aging brain.

Disclosures: Abbott Nutrition (funding).

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Margarita Terán-Garcia, MD, PhD

Assistant Dean & Research Assistant Professor, Illinois Extension, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Terán is the Assistant Dean and Program Leader for Integrated Health Disparities, University of Illinois Extension. She is a faculty member of the Carle Illinois College of Medicine, the Division of Nutritional Sciences and Affiliate to the Personalized Nutrition Initiative, the Family Resiliency Center, and the Center for Latin American Affairs at the University of Illinois Urbana-Champaign. Dr. Terán obtained her Medical Degree from the Universidad Nacional Autónoma de México and did her Pediatric fellowship at the National Institute of Pediatrics in Mexico. Her Ph.D. focused on nutrient-gene interactions and lipogenesis at the University of Texas. She acquired expertise in genetic epidemiology at the Pennington Biomedical Research Center during her postdoctoral training. Dr. Terán works on multi-disciplinary projects relevant to children (STRONG KIDS), college-age individuals (UP AMIGOS), and families of Hispanic-Heritage (ABRIENDO CAMINOS) on weight status and weight-related health outcomes. The *Abriendo Caminos* program includes educational goals to train future professionals. It delivers an education curriculum entwined with community programming, provides new meaningful experiential learning opportunities for disadvantaged students, and increases the recruitment and retention of underrepresented minorities in higher education. Dr. Teran's projects seek to expand knowledge of gene-environment interactions (dietary and exercise patterns) and psychosocial processes relevant to improving weight management, obesity, and obesity-related diseases.

Dr. Terán's vision of leadership seeks to synergize the capabilities of basic and clinical members of the scientific community to disseminate evidence-based science and comprehensive approaches to health education, prevention, and access. Many health problems are unjustly rooted in unequal access to high-quality healthcare systems. Encouraging the next generation of professionals to build and strengthen networks will inform, educate, and disseminate accurate, current research and public policies to combat the ominous outcomes of health inequities. She seeks to increase the involvement of underrepresented groups to facilitate academic exchange and increase cultural humility among all involved in the healthcare continuum. Combating health disparities need advocacy, leadership, and teamwork to increase awareness, promote new systems and policies for integrated, sustainable solutions from micro- to macro-environments.

ABSTRACT

Precision Nutrition and Implementation Science to Reach Health Equity

The COVID-19 pandemic revealed the dysfunction of healthcare systems across the world. Concurrently, the burden of childhood obesity increased disproportionally; it could worsen as pre-pandemic prevalence was already ~25% for Hispanic children. In a new modeling study, one U.S. child loses a parent or caregiver for every four COVID-19-associated deaths –with a higher ratio on vulnerable populations. Health disparities are the "differences in the incidence, prevalence, mortality, and burden of diseases among specific population groups," and health inequities are "those differences in population health that can be traced to unequal economic and social conditions and are systemic and avoidable; thus being inherently unjust and unfair." Implementation science seeks to understand how scientific evidence translates into practice for health improvement, systematically developing study designs, frameworks and closing the "know-do gap." Many evidence-based interventions (EBI) need re-design, testing, adaptation, and re-evaluation in underrepresented populations. Addressing health disparities and inequities with implementation science could respond to the urgent need to achieve health equity and, in the end, to reach health justice. Results of a multi-site RCT intervention, "Abriendo Caminos - Improving the health of Hispanic children and their families," will be discussed as a culturally-tailored community-based curriculum designed to prevent childhood obesity. The curriculum addresses the importance of family activities

such as meal preparation, choosing healthy eating alternatives, facilitating active living, and improving family functioning. All programmatic components aim to empower family units to develop healthy eating, active lifestyles. The integration of community-, cultural-, and linguistically focused competency strategies was critical for this intervention's uptake and sustainability. Still, there is much room for improvement in the field. It is a public health and moral imperative to direct efficient and effective implementation actions to reduce health disparities and protect children and families from the harms of malnutrition (under and over) with personalized, preventive EBI.

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Colleen McKenna, MS, RD

Doctoral Student, Division of Nutritional Sciences, University of Illinois Urbana-Champaign

BIOGRAPHY

Colleen McKenna is a registered dietitian and PhD candidate under the advisement of Dr. Nicholas Burd in the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign. She completed her BS in Dietetics at the University of Dayton, and MS and dietetic internship at the University of Texas Medical Branch. Colleen's doctoral dissertation focuses on the interaction of dietary protein and resistance exercise on muscular adaptations that relate healthy aging. She hopes to become an independent researcher investigating the contributions of skeletal muscle physiology to health outcomes of chronic disease with the goal of mitigating disease severity and prolonging the healthspan.

ABSTRACT

Resistance Exercise-Induced Apelin is not Modulated by Higher Dietary Protein Density in Overweight Adults

Background and Hypothesis: Apelin is an endogenous peptide related to chronic metabolic disease. Recently, it has been demonstrated as an exercise-sensitive myokine associated with physical independence during aging. Physical performance is highly dependent on muscle strength, with a clear role of elevated dietary protein intake for the maintenance of age-related muscle strength. However, the influence of protein intake on exercise-induced apelin remains unknown. We hypothesize that higher protein intake will potentiate exercise-induced upregulation of muscle and plasma apelin concentrations during progressive resistance training.

Methods: 41 middle-aged adults (50 ± 2 y, BMI 28 ± 1 $kg \cdot m^{-2}$, M = 19, F = 22) were stratified and randomized to consume either higher (1.68 ± 0.06 $g \cdot kg^{-1} \cdot d^{-1}$) or moderate (1.16 ± 0.04 $g \cdot kg^{-1} \cdot d^{-1}$) protein during a 10-week diet counseling-controlled resistance training program. Body composition, muscle strength, insulin resistance, plasma apelin, and muscle apelin (Apln) and apelin receptor (Aplnr) mRNA expression were assessed by dual-energy x-ray absorptiometry, one-repetition maximum (1RM), HOMA-IR, ELISA, and RT-qPCR, respectively.

Results: Main effects of time were observed for increases in lean body mass (P=0.003), lower body 1RM (all $P \leq 0.001$), plasma apelin concentrations (P=0.007), and muscle Apln ($P < 0.001$) concentrations and Aplnr (P=0.021) mRNA expression. There were no changes in body adiposity or HOMA-IR after the intervention (all $P \geq 0.152$). Increases in plasma apelin (r=0.527, P=0.002) and muscle Apln (r=0.428, P=0.016) were associated with leg extension 1RM gains, and Aplnr with leg press 1RM (r=0.440, P=0.015).

Conclusions: Our results show that resistance training increases muscle and circulating apelin which is related to strength gain. While resistance exercise has the capacity to increase lean mass, muscle strength, and apelin, our results show that higher protein intake does not potentiate these adaptations.

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AUTHORS

Colleen F. McKenna[1], Amadeo F. Salvado [2], Kevin J.M. Paulussen[2], Andrew T. Askow[2], Scott A. Paluska[3], Naiman A. Khan[1,2], Michael De Lisio[4], Nicholas A. Burd[1,2]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Department of Family Medicine, University of Illinois at Urbana-Champaign, Urbana, IL;

[4]School of Human Kinetics and Cellular and Molecular Medicine, University of Ottawa, ON, CAN

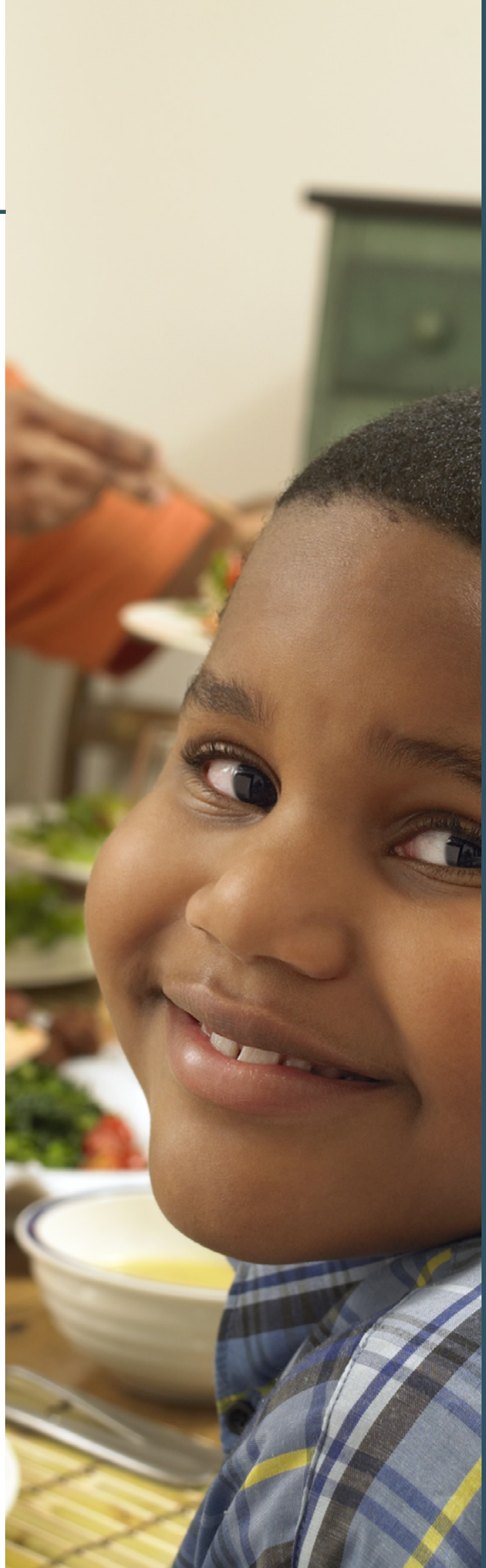
Session 3:
Sensory Perceptions and Individual Responses

Moderator:
Nu-Chu Liang, PhD
Associate Professor, Department of Psychology, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Liang studied the central taste pathways and received her Ph.D. in Neural and Behavioral Sciences in the laboratory of Dr. Ralph Norgren at the Pennsylvania State University. She performed postdoctoral research on feeding under the mentorship of Dr. Timothy Moran at the Johns Hopkins University. In January of 2014, she joined the Department of Psychology as a tenure-track faculty at the University of Illinois Urbana-Champaign.

In the past few years, her laboratory used rat models to study metabolic and cognitive function relating to feeding, cannabis and alcohol co-use, and exercise. Her laboratory revealed sex-dependent effects of exercise on high fat diet preference, metabolic profiles, brain insulin signaling, and cognitive behaviors. Together with graduate students, they established rat models of voluntary co-use of alcohol and THC, the main psychoactive constituent of cannabis, and received funding from the NIDA to investigate the metabolic and cognitive consequences of drug co-use during adolescence. Dr. Liang is promoted to the rank of Associate Professor on Indefinite Tenure in August of 2021. Currently, she is expanding her research program to investigate underlying mechanisms of APOE4 related risk for developing Alzheimer's disease and dementia.



Soo-Yeun Lee, PhD
Professor, Department of Food Science and Human Nutrition, University of Illinois Urbana-Champaign

BIOGRAPHY

Soo-Yeun Lee (Soo) is a Professor in the Department of Food Science and Human Nutrition at the University of Illinois, Urbana-Champaign. She is an accomplished scholar whose work in the area of Sensory Science has achieved national and international stature, as recognized by IFT with the Samuel Cate Prescott Award in 2011. Her research focuses on utilizing innovative sensory methodology to develop health-targeted new product alternatives to promote lifelong healthful eating habits. She has over 95 publications and garnered about $9 Million as PI and co-PI. Soo has also been recognized as an educator with many national teaching awards, such as the North American Colleges and Teachers of Agriculture (NACTA) Teacher Fellow Award, NIFA/USDA Food and Agricultural Sciences Excellence in College and University Regional Teaching Award, and IFT William V. Cruess Award. She is an active member of IFT, having served as the Chair of the Sensory and Consumer Sciences Division, a member of the Annual Meeting Scientific Programming Advisory Panel, and a Director of the Board. She is currently serving as one of the Associate Editors for the Journal of Food Science. Soo received her doctorate from the University of California Davis and her bachelor's degree from the Yonsei University in Korea. She is married to a Food Engineer, who is also a faculty at the University of Illinois, and they have two beautiful children and four lovable cats making their home a party of eight.

ABSTRACT

Food Science Approach to Personalized Nutrition: Strategies for Sodium Reduction and Assessment Through Sensory Evaluation

Extensive debate continues around the best approach for lowering population sodium intake, particularly given that public health campaigns related to labeling and education have had minimal impact. As such, experts have more recently suggested that reducing sodium in the nation's food supply may be the most appropriate solution. The US Food and Drug Administration has adopted this approach through developing voluntary sodium reduction guidelines for a variety of food categories. To that end, sodium reduction technologies have proliferated, and progress has been made, despite the complex role of sodium in food safety, technical function, and taste. In this presentation, an overview of this progress, available tools, and the potential for commonly used tools to impact intake of sodium will be presented. This presentation will review evidence-based tools available for sodium reduction to date, with considerations for specific food categories. Assessment of the sodium reduction strategies will be discussed based on sensory evaluation. Challenges and opportunities for further progress will be also outlined.

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Yanina Pepino, PhD
Associate Professor, Department of Food Science and Human Nutrition, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Pepino is currently an Associate Professor of Ingestive Behavior at the Department of Food Science and Human Nutrition and at the Division of Nutritional Sciences, University of Illinois at Urbana Champaign and a Health Innovation Professor in Carle Illinois College of Medicine. She received a BS degree in Pharmaceutical Chemistry, from the Faculty of Chemical Sciences, National University of Córdoba, Argentina, in 1995 and a Ph.D. in Chemistry from the same university in 2001. After completing her graduate degree, she was a post-doctoral research fellow at Monell Center in Philadelphia (a Research Center dedicated to the study of taste and smell). Before joining the University of Illinois, she was a Research Assistant Professor at the Center for Human Nutrition, Washington University School of Medicine in St. Louis. Her research focuses on the emerging field of "Sensory Nutrition". Her overall research goal is to better understand how individual differences in taste perception and nutrient metabolism shape dietary choices and in turn affect human health.

ABSTRACT

Individual Differences in the "Taste" of Fat

Dietary fat is the most energy-dense macronutrient, and the overconsumption of fat is a major factor linked to obesity. Fatty substances increase food palatability, and this can stimulate food consumption overriding inhibitory signals associated with digestion. Therefore, understanding how fats are precisely sensed is of physiological and clinical importance. Mounting evidence suggests that, in addition to smell and texture, taste plays an important role in fat perception. My laboratory uses validated sensory techniques to explore individual differences in taste perception. In my talk, I will discuss the progress that we have made in demonstrating that CD36, a glycoprotein involved in fatty acid trafficking, is a fat taste receptor, how genetic variations in CD36 gene that affect its protein expression (i.e., CD36 SNP rs1761667) are associated with oral detection thresholds to perceive fat (i.e., decreased oral fat sensitivity), and discuss evidence on the potential importance of salivary lipase in human fat oral perception. We will also discuss evidence of a novel unexpected function of an odorant-binding protein (OBP) in the gustatory system. Although OBP was originally described in insects, recent research identified a human OBP, i.e., OBPIIa, that is expressed in olfactory mucus and can bind numerous odorants, particularly large fatty acids. I will share how by serendipity we found that a variant in OBPIIa gene was associated with bitterness perception in fatty milkshakes and in propylthiouracil, a prototypical bitterant. I hope the presentation motivates new research and increases the awareness of the importance of individual differences in human flavor perception, which can assist in the development of personalized nutrition guidelines to promote the consumption of a healthier diet.

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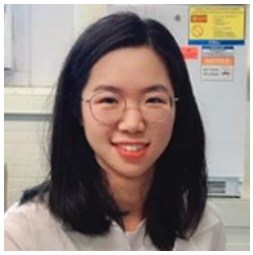

Anqi Zhao, MS

Predoctoral Fellow, Division of Nutritional Sciences, University of Illinois Urbana-Champaign

BIOGRAPHY

Anqi Zhao is a third-year PhD student in the Division of Nutritional Science at the University of Illinois Urbana-Champaign. She is a USDA National Needs Predoctoral Fellowships in the Nutrition & the Gut-Brain Axis training program (2019-38420-28973). Prior to joining Dr. Michael Miller's laboratory as a doctoral student, she completed her Master's degree in Food Science and Technology at the Illinois Institute of Technology. Her research focuses on the interaction between the gut microbiota and phytochemicals in vegetables and fruit, the microbial metabolites of phytochemicals, and their associations with obesity and obesity-related metabolic disorders.

ABSTRACT

Isothiocyanates in Brassica Vegetables Induce Glucagon Like Peptide-1 Secretion in Enteroendocrine Cells, Potentially Through Intestinal Bitter Taste Receptors

Background and Hypothesis: Bitter taste receptors (T2Rs) have been found in the gastrointestinal tract and their activation has been linked with improving glucose homeostasis, mainly through inducing the secretion of gut hormones. Brassica vegetables are rich in glucosinolates (GSLs), which upon hydrolysis, produce bioactive isothiocyanates (ITCs) that contribute to the characteristic bitter and pungent flavor of brassica vegetables. It is known that consumption of brassica can ameliorate insulin resistance. We hypothesized that GSLs and/or ITCs may interact with the intestinal T2Rs and induce the secretion of glucagon-like peptide-1 (GLP-1), and thus providing a putative mechanism for how brassica vegetables improve glucose homeostasis.

Methods: The murine enteroendocrine cell line STC-1 cells were treated with various ITCs including allyl isothiocyanate (AITC), the GSL sinigrin (SN; parental GSL for AITC) or vehicle (0.1% DMSO) for 1 hour at 6.25, 12.5, and 25.0 μM for active GLP-1 measurement. Various T2R pathway inhibitors including 2-APB (IP3 receptor antagonist, 50 μM), A967079 (TRPA1 channel inhibitor, 30 μM), U73122 (Phospholipase C inhibitor, 1 μM), and EGTA (extracellular Ca2+ chelator, 1 mM) were added with AITC or vehicle to cells for intracellular calcium flux and active GLP-1 measurement. Student's t-test was used to compare two treatments.

Results: All tested ITCs at 6.25, 12.5, and 25.0 μ0M increased GLP-1 secretion compared to the vehicle ($p < 0.05$), whereas SN showed no impact ($p > 0.05$). 2-APB, A967079, U73122 and EGTA significantly reduced intracellular calcium flux and GLP-1 secretion in AITC co-treated cells compared to AITC only ($p < 0.05$).

Conclusions: AITC is more potent at inducing GLP-1 secretion compared to its parent GSL, SN. The GLP-1 secretion induced by AITC is mediated by IP3, PLC and TRPA1, suggesting the activation of T2R pathways by AITC. This study may provide evidence for a novel therapeutic mechanism explaining how brassica vegetable consumption improves glucose homeostasis.

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AUTHORS

Anqi Zhao[1], Michael Miller [1,2]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Urbana, IL

Poster Session 1 - Topic Areas:
Metabolic Health, Metabolic Regulations, and Genetic Regulation

Catherine Applegate, PhD, RDN

Postdoctoral Fellow, Department of Animal Sciences and Department of Bioengineering, University of Illinois Urbana-Champaign

BIOGRAPHY

Dr. Catherine Applegate received her Bachelor of Science in Clinical Nutrition at the University of California Davis in 2011. She earned her Master of Science in Human Nutrition and Registered Dietitian Nutritionist (RDN) certification at the Texas State University in 2016. In 2020, she completed her Ph.D. in Nutrition Sciences at the University of Illinois at Urbana-Champaign, where she now works as a Beckman Institute postdoctoral research fellow in Bioengineering. Dr. Applegate has expertise in biological sciences and nutrition. Currently, she is learning synthesis and fabrication techniques to be able to synthesize some of the compounds tested, and some histology training allows her to work with a histologist on evaluating tissues. She hopes to apply these skills to a career as a cancer drug discovery scientist.

ABSTRACT

Sex- and Strain-Specific Responses to a PPAR Agonist Nanomedicine Targeting Adipose Inflammation

Background and Hypothesis: Over 40% of the population in the United States is living with obesity. Obesity is associated with chronic inflammation, which is the hypothesized cause of metabolic dysregulation. In these studies, an agonist of peroxisome proliferator-activated receptor alpha and gamma (PPAR -α and -γ) was conjugated to a ~30 nanometer dextran nanocarrier (D) to form a nanomedicine (D-agPPAR) capable of targeting pro-inflammatory macrophages in adipose tissue. Previous results demonstrated weight loss and changes in gene expression related to lipid and glucose metabolism in C57Bl/6J wild-type (wt) male (M) mice. We hypothesized that M, female (F), and ovariectomized F (OVX) animals would demonstrate sex-specific responses to drug treatment.

Methods: M, F, and OVX wt and M and F ob/ob mice were fed either a low-fat diet (LFD; 10% kcal from fat) or a high-fat diet (HFD; 60% kcal from fat) and received intraperitoneal injections every 3 days as follows (n=7-10/group): 1) LFD + saline; 2) HFD + saline; 3) HFD + D-agPPAR. Metabolic endpoints were assessed by glucose tolerance test (GTT), EchoMRI measurements, liver and adipose histological outcomes, and gene expression.

Results: D-agPPAR led to improvements in GTT among obese wt M and OVX within 2 weeks of treatment. Body weight, body fat, and food intake were significantly reduced in obese wt M, F, and OVX treated with D-agPPAR by the end of the 4-week treatment period. D-agPPAR significantly improved wt M liver triglycerides (TG) and mildly reduced liver TG in wt F but had no effect on wt OVX liver TG. Despite sex-dependent inconsistencies in TG accumulation, D-agPPAR led to almost complete resolution of hepatic steatosis in M, F, and OVX animals. In ob/ob mice, D-agPPAR led to minor improvements in M GTT after 4 weeks of treatment, but results were otherwise inconsistent between the two models, suggesting a leptin-mediated mechanism for D-agPPAR.

Conclusions: These results highlight sex-specific responses that may affect therapeutic management of obesity as well as demonstrate the feasibility of using a nanomedicine to target obesity-associated inflammatory macrophages for the treatment of related metabolic disorders.

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AUTHORS

Catherine C. Applegate[1,2], Hongping Deng[2,3], Muhammad Fayyaz[2,3], Yifei Kang[4], Matthew A. Wallig[4,5], Erik R. Nelson[4,6,7,8,9], Andrew M. Smith[2,3,7,10,11], Kelly S. Swanson[1,4,12]

[1]Department of Animal Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Bioengineering, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Micro and Nanotechnology Laboratory, University of Illinois at Urbana-Champaign, Urbana, IL;

[4]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[5]Department of Pathology, College of Veterinary Medicine, University of Illinois at Urbana-Champaign, Urbana, IL;

[6]Department of Molecular and Integrative Physiology, University of Illinois at Urbana-Champaign, Urbana, IL;

[7]Cancer Center at Illinois, University of Illinois at Urbana-Champaign, Urbana, IL;

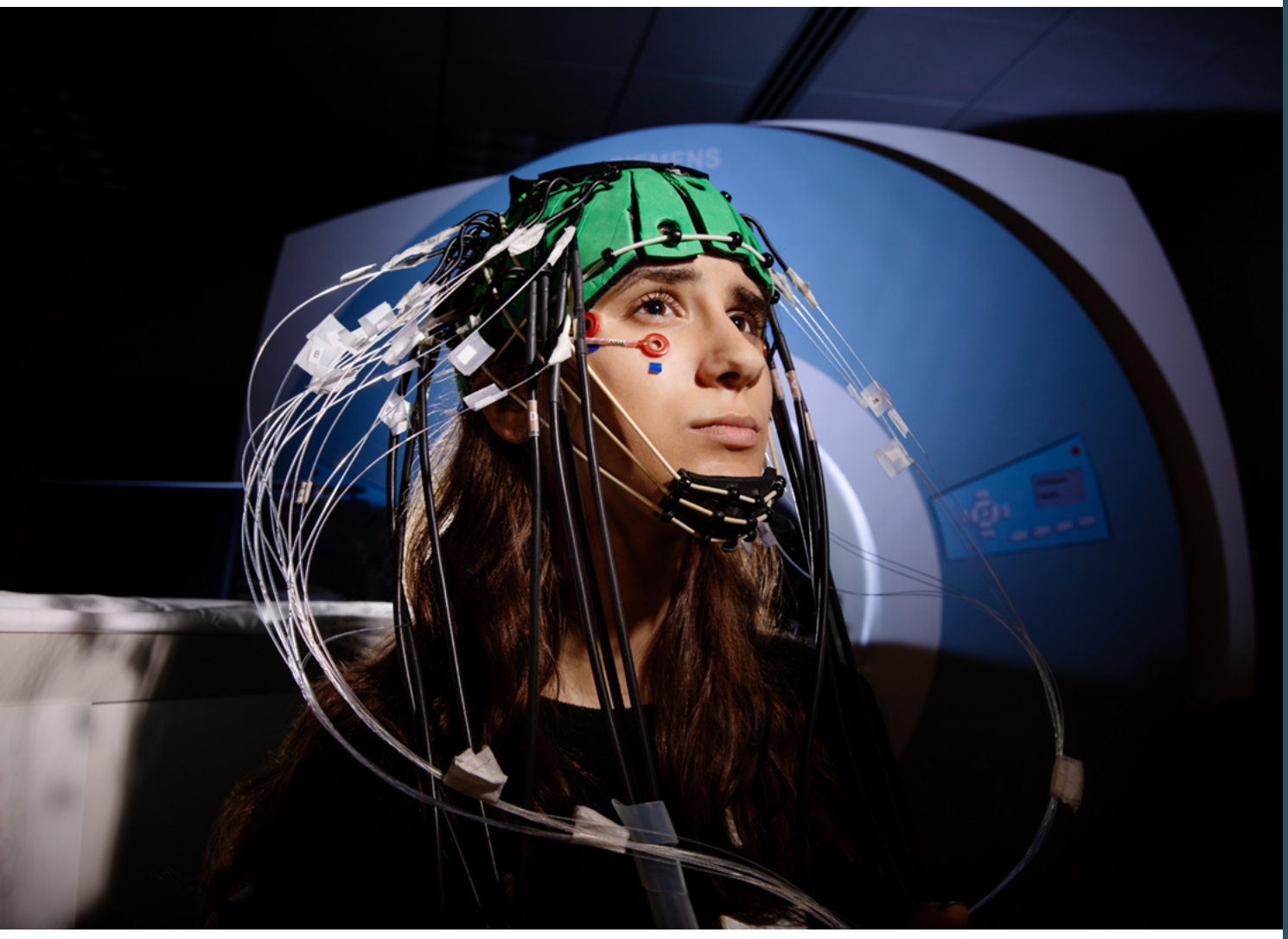
[8]University of Illinois Cancer Center, University of Illinois at Chicago, Chicago, IL;

[9]Carl R. Woese Institute for Genomic Biology, Anticancer Discovery from Pets to People Theme, University of Illinois at Urbana-Champaign, Urbana, IL;

[10]Department of Materials Science and Engineering, University of Illinois at Urbana-Champaign, Urbana, IL;

[11]Carle Illinois College of Medicine, University of Illinois at Urbana-Champaign, Urbana, IL;

[12]Department of Veterinary Clinical Medicine, University of Illinois at Urbana-Champaign, Urbana, IL;



Fatma Kadayifci, MS
Doctoral Student, Department of Food Science and Human Nutrition, University of Illinois Urbana-Champaign

BIOGRAPHY

Fatma Kadayifci received her BSc and MSc in Nutrition and Dietetics from the Gazi University, Turkey. In 2018, she was admitted to the PhD program in the Department of Food Science and Human Nutrition at the University of Illinois Urbana-Champaign under the mentoring of Dr. Yuan-Xiang Pan. Her research focuses on identifying the impact of environmental factors, specifically nutritional intake, on genetic outcomes. Currently, she is participating in a collaborative cohort study STRONG kids2 as part of Dr. Margarita Teran-Garcia's research team.

ABSTRACT

Genetic Contributions to Child Health Outcomes in the STRONG Kids 2 Cohort Study

Background and Hypothesis: Childhood obesity affects >20% of 2-19-year-old. However, obesity trajectories begin before age two, and genetic variation contributes to obesity susceptibility. Herein, genome-wide signatures (GWAS) of weight-for-length z-scores (WFLZ) were investigated at multiple time points in the first four years of life. We hypothesized that associations between genetic variation and WFLZ scores would differ over the first four years of life.

Methods: Height and weight of children in the SKP2 cohort (n=426) were measured at 6-weeks, 3, 12, 18 months, and 2, 3, 4 years, and WFLZ was calculated. Saliva samples were collected at 6-weeks of age, DNA was extracted, and 96 samples were chosen for genotyping. GWAS analysis was carried out using Omnium Express-Illumina Systems. GenomeStudio 2.05 was used for genome analysis, and Python and Rstudio for statistical analysis.

Results: Over 700,000 SNPs were identified, of which 366,428 remained after quality control. FTO, FOXO, TMEM, MCHR genes, previously associated with obesity risk, were associated with WFLZ. Several genes were consistently linked to elevated WFLZ scores over time (MYO16, ZPFM1). Other genes (FAIM2, TFA2B) were associated with higher WFLZ at the earlier time points. After 12 months, a more diverse group of genes emerged, which were consistently expressed at older ages. Several novel genes (LIPC, WWOX, ROBO), implicated in the regulation of glucose and lipid metabolism, were associated with higher WFLZ.

Conclusions: These findings demonstrate that risk alleles in specific genes are associated with higher WFLZ as early as 6-weeks of age. Further, we identified both known and novel gene variants that demonstrate temporal relationships with longitudinal growth patterns providing insight into potential genetic underpinnings of obesity risk in infants and toddlers.

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AUTHORS

Fatma Z Kadayifci[1], Margarita Teran-Garcia[2,3], Sharon M Donovan[1,2], Yuan-Xiang Pan[1,2,4]

[1]Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]UI Extension, University of Illinois at Urbana-Champaign, Urbana, IL;

[4]Illinois Informatics Institute, University of Illinois at Urbana-Champaign, Urbana, IL

Yifei Kang, MS
Doctoral Student,
Division of Nutritional Sciences,
University of Illinois Urbana-Champaign

BIOGRAPHY

Ms. Kang is currently a 3rd PhD student in the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign. She has several years of experiences in conducting rodent model studies. Her previous research experiences include dietary treatment on the interventions of type 1 and type 2 diabetes, inflammatory bowel diseases, and other autoimmune diseases. Currently, her research focuses on a novel nanomedicine treatment on obesity and type 2 diabetes, as well as dietary treatment of alternative protein sources on metabolic disorders.

ABSTRACT

A Targeted Nanomedicine Approach for a PPAR Agonist Improves Metabolism in Diet-Induced Obese (DIO) Mice

Background and Hypothesis: Obesity is associated with chronic inflammation, in part due to macrophage accumulation in adipose tissue (AT). Therapies targeting AT macrophages may provide benefits, but current pharmacological interventions are associated with undesirable side effects. We developed a nanocarrier dextran-conjugated prodrug that targets pro-inflammatory macrophages and is an agonist of peroxisome proliferator-activated receptor alpha and gamma (PPAR -α and -γ). This prodrug exhibited promising effects in vitro and in a short-term, single-dose in vivo study. In this study, we evaluated repeated doses, hypothesizing that chronic treatment would induce weight loss and improve metabolism of DIO mice.

Methods: Male C57BL/6J mice were fed a high-fat diet (HFD; 60% kcal from fat) to induce obesity. Metabolic syndrome was confirmed by glucose tolerance tests (GTT). Obese mice were then randomly assigned to treatments by intraperitoneal injection (n=8/group): saline (controls; OB), dextran (Dex), free drug (Free), and dextran-conjugated drug (Conj). Lean controls (n=8) were injected with saline. Treatments were injected every 2 d for 4 wk. BW was measured every 2 d and GTT was performed every 2 wk. After 4 wk, serum was collected and AT depots and liver were collected for histopathology and triglyceride analysis.

Results: Over 4 wk, mice in OB and Dex groups gained weight, whereas drug treatments reduced BW. Improved glucose tolerance was observed in Conj mice after 2 wk (before weight loss) and 4 wk, being similar to lean mice after 4 wk. At sacrifice, AT depot weights were lower in Conj than OB mice. Liver histopathology scores indicated reduced steatosis in Free and Conj mice.

Conclusions: Nanocarrier dextran-conjugated drug induced weight loss and improved metabolism in DIO mice, demonstrating a promising strategy for the treatment of obesity and type 2 diabetes.

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AUTHORS

Yifei Kang[1], Catherine C. Applegate[2], Hongping Deng[3], Natalia Gonzalez Medina[3], Erik R. Nelson[1,4,5], Andrew M. Smith[3,5], Kelly S. Swanson[1,2]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Animal Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Department of Bioengineering, University of Illinois at Urbana-Champaign, Urbana, IL;

[4]Department of Molecular and Integrative Physiology, University of Illinois at Urbana-Champaign, Urbana, IL;

[5]Cancer Center at Illinois, University of Illinois at Urbana-Champaign, Urbana, IL

Poster Session 2 - Topic Areas:
Dietary Intake Assessment & Analysis and Physical Activity & Body Composition

Elizabeth Brandley, MS
Doctoral Student,
Division of Nutritional Sciences,
University of Illinois Urbana-Champaign

BIOGRAPHY

Elizabeth Brandley is a doctoral student in the Division of Nutritional Sciences at the University of Illinois at Urbana-Champaign. She currently conducts research in the Body Composition and Nutritional Neuroscience Lab under Dr. Naiman Khan. Elizabeth's research includes examining the effects of dietary xanthophyll intake on changes in visual and cognitive health outcomes in patients with Multiple Sclerosis. She is also very interested in the effects of micronutrients and overall dietary intake on neurological function and psychiatric symptoms and hopes to contribute to prevention and treatment strategies to improve health outcomes in these areas.

ABSTRACT

Xanthophyll Status and Neurocognition in a Lutein Supplementation Trial among Persons with Multiple Sclerosis: Preliminary Findings of the LuMES Trial

Background and Hypothesis: Macular Pigment Optical Density (MPOD), a measure of xanthophyll accumulation in the retina, has been linked to benefits in visual and cognitive function. Multiple sclerosis (MS) is a progressive demyelinating neurodegenerative disease that often results in both visual and cognitive deficits; however, no previous research has examined the effects of dietary xanthophyll intake on changes in MPOD, or visual and cognitive health outcomes in persons with MS. Accordingly, the ongoing study is evaluating the effects of 4-month daily lutein consumption on carotenoid status in different tissues (macular and skin) as well as visual and cognitive outcomes in persons with MS.

Methods: A two-group parallel design experiment is being employed whereby participants are assigned to one of two groups (placebo vs. treatment/20mg/day lutein) for four months. Macular and skin carotenoid accumulation is assessed by heterochromatic flicker photometry and skin reflection spectroscopy, respectively. Visual attention, processing speed, and attentional control are assessed using a checkerboard pattern reversal task and a modified Eriksen Flanker task with event-related potentials.

Results: While the trial is ongoing, preliminary results among 13 study participants (placebo n=6, treatment n=7) suggest a significant difference ($p<0.01$) in skin carotenoid changes between placebo (-13.67 ± 31.46) and treatment (142.3 ± 88.0) groups and a trend level difference ($p=0.07$) in MPOD changes between the placebo (0.037 ± 0.10) and treatment (0.27 ± 0.34) groups. Collection and analyses of intervention effects are ongoing.

Conclusions: Preliminary results thus far indicate that the lutein intervention is successfully increasing carotenoid levels in the skin and has potential to increase macular pigmentation. Final analyses of the LuMES trial are expected to be completed by August 2022.

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AUTHORS

Elizabeth T. Brandley[1], Twinkle D. Mehta[2], Jeongwoon Kim[2], Shelby G. Martell[3], Laura M. Rosok[3], Connor M. Robbs[4], John W. Erdman, Jr.[1,5], Brynn C. Adamson[6,8], Robert W. Motl[7], Naiman A. Khan[1,2,3,8]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Neuroscience Program, University of Illinois at Urbana-Champaign, Urbana, IL;

[4]Illinois College of Optometry, Chicago, IL;

[5]Department of Food Science and Human Nutrition, Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[6]Department of Health Sciences, University of Colorado, Colorado Springs, CO;

[7]Department of Kinesiology and Nutrition, University of Illinois at Chicago, Chicago, IL;

[8]Multiple Sclerosis Research Collaborative, University of Illinois, Urbana, IL

Mindy Lee, MPH, RDN
Doctoral Student, Division of Nutritional Sciences, University of Illinois Urbana-Champaign

BIOGRAPHY

Mindy Lee received her MPH in Nutritional Sciences in 2016 and completed her Dietetic Internship in 2017 at the University of Michigan at Ann Arbor. She worked as a Field Consultant Dietitian at Nutritious Lifestyles in Orlando in 2017- 2018. She has spent the last three years as a Graduate Research Assistant in Nutritional Sciences at the University of Illinois at Urbana-Champaign where her focus is developing a weight loss program for people with overweight or obesity.

ABSTRACT

Differential Outcomes of Weight Maintenance During One-Year Follow-Up: Exploring Barriers to Sustainable Weight Management

Background and Hypothesis: The Individualized Diet Improvement Program was developed for sustainable weight management that emphasizes self-experimentation to increase protein and fiber density while reducing caloric intake, and daily self-weighing. After completion of the 12-month intervention, the objective of the 12-month follow-up study was to investigate weight maintenance outcomes and explore issues that hinder weight maintenance.

Methods: Twenty-two participants who completed the intervention entered the follow-up. Participants received weekly weight charts as visual feedback along with short messages provided. Body composition and daily self-weighing via Wi-Fi scales were collected. Successful weight maintenance was defined by an initial weight loss of at least 3% bodyweight at 24 months with weight stability from 18-24 months defined as weight regains of <3% bodyweight.

Results: Out of 22 participants, 20 (90%) completed the 12-month follow-up. Mean body weight loss at 12 months from baseline was -5.8% (1.1) (mean(SEM)) (n=20). Nine participants achieved weight loss >5% of initial body weight at 12 months. Although a significant increase of 1.8% (0.9; p = 0.049) in mean body weight (n=20) at 24 months from 12 months was observed, mean body weight loss of -4.2% (1.3) at 24 months from baseline was achieved with a mean BMI change of -1.5kg/m2 (0.5). Nine participants (45%) successfully maintained their weight loss (-9.3% (1.4)) at 24 months with minimal weight regain or showed continual weight loss (-0.7% (0.6)) in the last 6 months. Six participants lost weight in the first 12 months of the program, but loss was not sustained. Contributors to weight regain included non-dietary factors such as pandemic-related stress, employment, family caregiving, and cravings for certain foods.

Conclusions: Nearly half the participants demonstrated weight loss without regain over 24 months, whereas the remaining participants were unable to lose weight or regained weight. Non-dietary challenges were likely barriers to sustainable weight loss. More study is needed to improve the success rate and sustainability of weight loss.

AUTHORS

Mindy H. Lee[1], Annabelle L. Shaffer[1], Nouf W. Alfouzan[2], Jin Yu[2], Jennie Hsu-Lumetta[1,3], Janet M. Liechty[1,3,4], Manabu T. Nakamura[1,2]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Carle Illinois College of Medicine, University of Illinois at Urbana-Champaign, Urbana, IL;

[4]School of Social Work, University of Illinois at Urbana-Champaign, Urbana, IL

Mikaela Webb, BS, RD
Doctoral Student,
Division of Nutritional Sciences,
University of Illinois Urbana-Champaign

BIOGRAPHY

Mikaela Webb is a first year PhD student in the Division of Nutritional Sciences at the University of Illinois Urbana-Champaign. She is a member of Dr. Jacob Allen's Integrative Microbiota and Physiology Laboratory. Her research focuses on the combinatorial effects of exercise and diet on human immune function. Prior to arriving at the University of Illinois, she received her Registered Dietitian licensure after completing a dietetic internship and BS in nutrition and dietetics at Dominican University.

ABSTRACT

Exercise Training Modifies the Gut and Serum Xeno-Metabolome of Lean and Obese Adult Humans

Background and Hypothesis: Participation in regular, moderate exercise has shown to modify the gut microbiome and contribute to human metabolic and immune health. Through the production and modification of bioactive metabolites, the microbiome influences host physiology. Here, we hypothesized that aerobic exercise training in previously sedentary lean and obese humans will modify global xeno-metabolome in the gut and circulation.

Methods: Serum and fecal biospecimens from a previously published 6-week exercise training study were analyzed by untargeted liquid chromatography/mass spectrometry (LC/MS). The exercise intervention consisted of three supervised 30-60 minute, moderate-to-vigorous intensity aerobic exercise sessions per week. Participants followed individualized and consistent 3-day diets prior to specimen collection visits both pre- and post-intervention. Serum and whole stool samples were shipped to Arkansas Children's Nutrition Center (ACNC) for untargeted metabolomics analysis.

Results: Results indicated that exercise training modifies fecal and serum metabolome indicative of a shift to microbial amino acid metabolism. Linear mixed models identified 13 fecal metabolites responsive to exercise training. When analysis was collapsed across BMI groups, exercise training increased three serum metabolites, two of which have known microbial origin: indole-3-lactic acid (ILA) and 4-hydroxyphenyllactic acid (4-HPLA). These metabolites exhibit immunomodulatory properties, signifying physiologically relevant microbial metabolism-induced shifts during exercise training.

Conclusions: Aerobic exercise training moderately shifts both fecal and serum metabolome in previously sedentary lean and obese adults. These data highlight the importance of understanding the microbiome and xeno-metabolome when investigating responses to exercise training and nutrition. Future studies will examine whether fermented food diets high in ILA and 4-HPLA can synergize with exercise to promote immune function.

AUTHORS

Mikaela Webb[1], Lucy Mailing[1], Brian Piccolo[3], Becky Moody[3], Jeffery Woods[1,2], Sean Adams[3], and Jacob M. Allen[1,2]

[1]Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL;

[2]Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Urbana, IL;

[3]Arkansas Children's Nutrition Center, Little Rock, AR