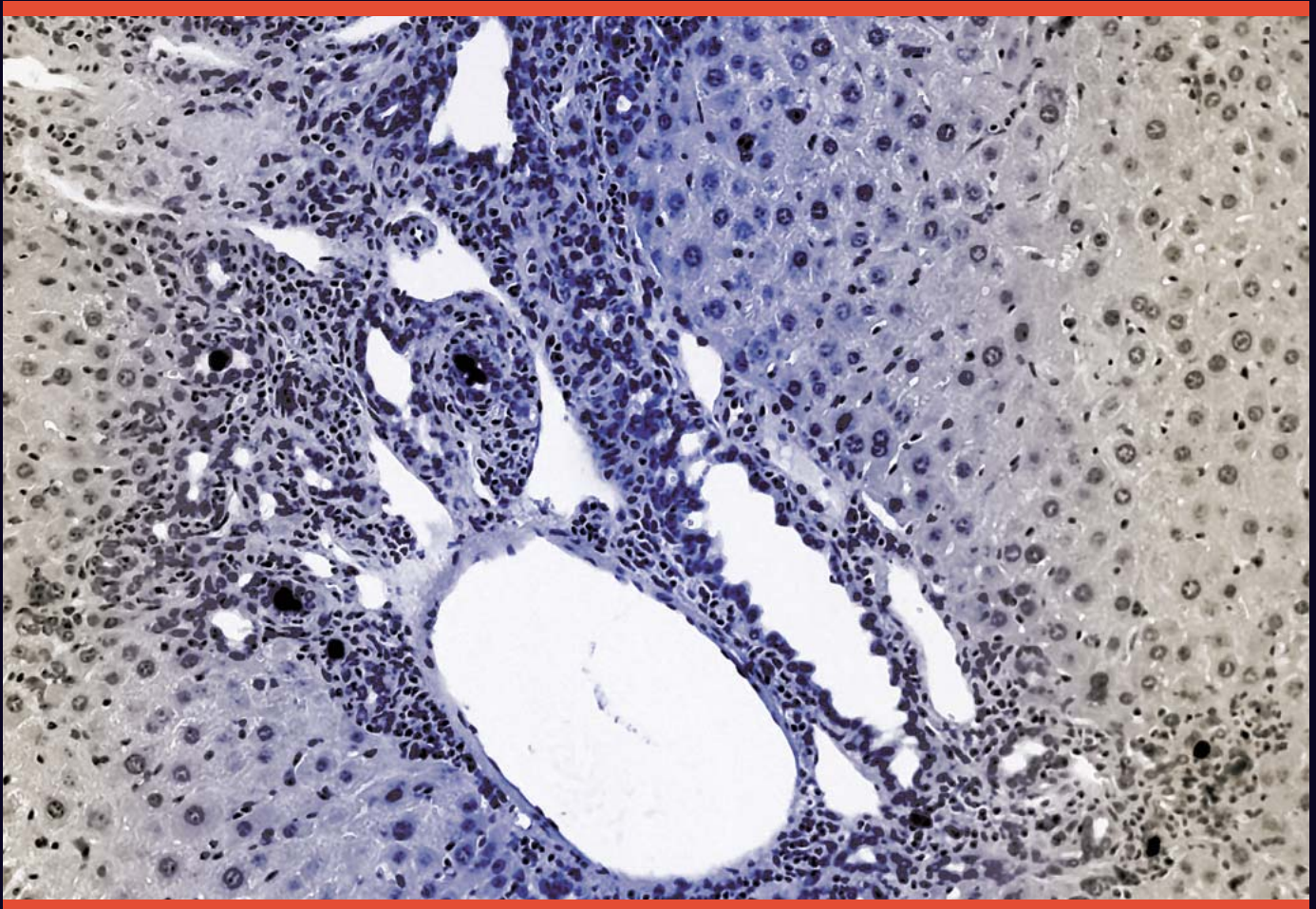


APRIL 21, 2021

2021

# Nutrition Symposium

UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN | DIVISION OF NUTRITIONAL SCIENCES



**I** ILLINOIS

Nutritional Sciences

COLLEGE OF AGRICULTURAL, CONSUMER  
& ENVIRONMENTAL SCIENCES



**N·S·G·S·A**

Nutritional Sciences  
Graduate Student Association



## Special Note about Nutrition Symposium 2021

Due to the impact of COVID-19, the Nutritional Sciences Symposium Planning Committee made the difficult decision to cancel the in-person 2021 Nutrition Symposium. While we are disappointed not to have a physical opportunity to get together this year, we are excited to host this tradition in a virtual format for the first time. Thank you to all of our sponsors who continue to support this vital research event. We look forward to the possibility of seeing you in person at the 2022 Nutrition Symposium.

## Welcome

On behalf of the Nutritional Sciences Graduate Student Association (NSGSA), the Division of Nutritional Sciences (DNS), and all participating presenters, we would like to welcome you to the 2021 Nutrition Symposium at the University of Illinois!

The Nutrition Symposium is an important event for sharing ideas across disciplines and with the community. Started in 1994 by NSGSA, the symposium offers students within DNS and related disciplines on campus an opportunity to present their nutrition research prior to national meetings held annually in the spring. This symposium offers a first glance at exciting research in areas including metabolic regulation, cancer, gastrointestinal physiology, immunology, physical activity, public health, and bioactive plant compounds. Students will be traveling to present their work at a variety of national and international conferences.

This year, we are honored to have Dr. Catherine J. Field deliver the keynote address, “Improving immune development in the infant by altering the content of docosahexaenoic acid and form

of choline in the maternal diet.” Additionally, NSGSA is proud to highlight the work of world-class faculty members through a mini-symposium. This year’s presentations highlight the field of personalized nutrition and will feature Drs. Manabu Nakamura, Margarita Teran-Garcia, Yuan-Xiang Pan, and Zeynep Madak-Erdogan.

We are grateful to the many people involved with this meeting and program. We would first like to thank our keynote speaker, Catherine J. Field. Thank you also to our sponsors – their support is essential to the success and quality of the program. We would also like to recognize the NSGSA executive board and the symposium planning committee, whose members have worked long and hard to organize an excellent program. Most of all, we would like to thank our session chairs, judges, presenters, and attendees for participating in this year’s event and making them a success.

*The Nutritional Sciences Graduate Student Association Steering Committee*

<http://www.nutritionalsciences.illinois.edu>

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*(Stylized cover image) Ductular reaction, characterized by bile duct proliferation, porphyrin build-up, and inflammatory cell accumulation, in the liver of wild-type female mice after two weeks treated with a diet containing 3,5-diethoxycarbonyl-1,4-dihydrocollidine. Submitted by Angela E. Dean.*

## 2021 Nutrition Symposium Schedule of Events

**April 21, 2021** All events are listed in Central Standard Time Zone

- \*8:25 a.m. - 8:30 a.m.**..... **Welcome**  
Leila Shinn | NSGSA Chair
- \*8:30 a.m. - 9:00 a.m.**..... **Personalized Nutrition Initiative**  
Sharon Donovan, PhD, RD
- \*9:00 a.m. - 10:00 a.m.**..... **Graduate Student Oral Presentations 1**
- 10:00 a.m. - 10:15 a.m.**..... **Break**
- \*10:15 a.m. - 11:15 a.m.**..... **Graduate Student Oral Presentations 2**
- 11:15 a.m. - 11:30 a.m.**..... **Break**  
On campus DNS students, presenters, and sponsors may pick up box lunches from Bevier Café at this time, RSVP required
- 11:30 a.m. - 12:30 p.m.**..... **Lunch**  
DNS students, presenters, and sponsors are invited, RSVP required.
- \*12:30 p.m. - 2:30 p.m.**..... **Faculty Mini-Symposium**  
**12:30-1:00:** Zeynep Madak-Erdogan, PhD  
**1:00-1:30:** Manabu Nakamura, PhD, DVM  
**1:30-2:00:** Margarita Teran-Garcia, MD, PhD, FTOS  
**2:00-2:30:** Yuan-Xiang Pan, MS, PhD
- 2:30 p.m. - 2:40 p.m.**..... **Outstanding Faculty Award Presentation**  
2020 and 2021 Recipients
- 2:45 p.m. - 3:45 p.m.**..... **Industry Panel & Discussion**  
Sponsors, presenters, DNS students, faculty, and staff are invited.
- \*4:00 p.m. - 5:00 p.m.**..... **Keynote Address by Dr. Catherine Field**
- 5:00 p.m. - 5:15 p.m.**..... **Break**
- \*5:15 p.m. - 6:00 p.m.**..... **Graduate Student Poster Session 1**
- \*6:00 p.m. - 6:45 p.m.**..... **Graduate Student Poster Session 2**
- \*6:45 p.m. - 7:00 p.m.**..... **Student Presentation Award Announcements**

*\*Open to the public*

All events will be hosted virtually via Zoom. Links will be emailed to all registrants.



## Nutritional Sciences Graduate Student Association

The Nutritional Sciences Graduate Student Association (NSGSA) was founded in the spring of 1973 by students in the program. The mission of the organization is to provide a means of communication among graduate students, faculty, and alumni of the Division of Nutritional Sciences (DNS), which spans multiple colleges and departments.

NSGSA serves as a forum for student opinion and input and provides students the opportunity to expand their experiences as graduate students. Our activities reflect our desire to enrich our experiences as graduate students and promote the importance of the nutritional sciences discipline both within the university and among the surrounding communities of Champaign and Urbana.

### NSGSA Board



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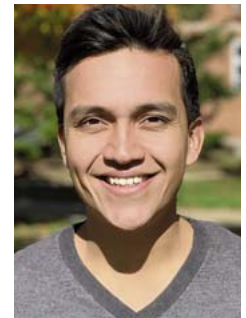
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## 2021 Nutrition Symposium Committee

Leila Shinn

*Nutrition Symposium Chair*

Colleen McKenna

*Nutrition Symposium Chair-Elect*

### Planning Committee

Miriam Aguilar Lopez

Karen Chiu

Angela Dean

Olufemi Fabusoro

Steven Krauklis

Clara Salame

Ashlie Santaliz Casiano

## Session Judges and Officials

### Oral Session 1

MC: Dr. Michael Miller

Judge: Dr. John Erdman

Judge: Dr. Melissa Prescott

Judge: Dr. Ken Wilund

### Oral Session 2

MC: Dr. Jacob Allen

Judge: Dr. Jaume Amengual Terrasa

Judge: Dr. Sayeepriyadarshini Anakk

Judge: Dr. Elvira de Mejia

### Poster Session 1

#### **Group 1** (Last names A-Ba)

Judge: Dr. Pooja Acharya

Judge: Dr. Marcia Monaco Siegel

Judge: Dr. Weinan Zhou

#### **Group 2** (Last names Bar-L)

Judge: Dr. Maria Cattai de Godoy

Judge: Dr. Juan Loor

Judge: Dr. Roland Ofori

### Poster Session 2

#### **Group 3** (Last names M-N)

Judge: Dr. Pooja Acharya

Judge: Dr. Riley Hughes

Judge: Dr. Neda Seyedsadjadi

#### **Group 4** (Last names S-W)

Judge: Dr. Jacob Allen

Judge: Dr. Catherine Applegate

Judge: Dr. Katie Ranard

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#### Graduate Student Association

<https://nutrsci.illinois.edu/students/gsa>

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## Graduate Student Oral Presentations Session 1

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**9:00 – 9:15 a.m.**
- Subacute exposure to di-isononyl phthalate affects colonic health in adult female mice  
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## Faculty Mini-Symposium: “Personalized Nutrition: Putting the “U” in Nutrition”

- Multiscale approaches to identify novel biomarkers of metabolic and cardiovascular disease  
**Dr. Zeynep Madak-Erdogan**..... 13  
**12:30-1:00 p.m.**
- Assisting sustainable dietary weight loss one at a time  
**Dr. Manabu Nakamura** .....14  
**1:00-1:30 p.m.**
- Genetic variation in pathways of lipid and lipoprotein metabolism are associated with lipid profiles of young Mexicans  
**Dr. Margarita Teran-Garcia** ..... 15  
**1:30-2:00 p.m.**
- Role of epigenetics in development of personalized cancer management  
**Dr. Yuan-Xiang Pan** ..... 16  
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**Victoria C. Daniels** ..... 31

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*Ana Mitchell (symposium steering committee member) is conducting an evaluation of the new satellite food pantry on campus using implementation science metrics. This food assistance program was created in response to COVID-19 and is located at the campus recreation center. Pantry staff is measuring implementation costs, food waste, student usage, and student satisfaction/acceptability. Evaluation results will inform campus leadership with an effort to make this pantry more sustainable for students and the environment.*

## Symposium Contributors

The University of Illinois Division of Nutritional Sciences and the Nutritional Sciences Graduate Student Association would like to acknowledge the generosity of the sponsors and friends of our 2021 Nutrition Symposium.

### Sponsors of the Symposium

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University of Illinois Department of Kinesiology and Community Health

## Keynote Speaker

### Dr. Catherine Jane Field, PhD, RD

*CRC Tier 1 Chair in Human Nutrition and Metabolism, Department of Agricultural, Food and Nutritional Science, Faculty of Agriculture, Life and Environmental Science, University of Alberta*

Catherine Field holds a Tier I Canada Research Chair in Human Nutrition and Metabolism and is an Adjunct professorship in the Faculty of Medicine and Dentistry at the University of Alberta. Her research program centers on the effect of nutrition on the immune system. Current areas of research are: the role of polyunsaturated fats and breast milk bioactives on the development of the infant's immune system, the use of specific fatty acids in the prevention and treatment of breast cancer and identifying the association between nutritional status and maternal mental health and infant neuro-physical development. She is a co-PI of a large maternal infant cohort, APrON (Alberta Pregnancy Outcomes and Nutrition). She has published more than 280 peer reviewed publications, been invited to speak more than 220 times nationally and internationally and has trained over 150 students, from high school to post-doctoral levels, in research. Dr. Field received the McCalla and Killam Professorships from the University of Alberta, the Earl Willard McHenry Award for Leadership in Nutrition from the Canadian Nutrition Society and the Mary Mitchell Award for service to the Dietetic Profession in Alberta. Dr. Field is a Past-President of, and only the second non-American, of the American Society for Nutrition. She currently serves as a member and Vice-Chair of the CIHR Institute for Nutrition, Metabolism and Diabetes Advisory Board, an Associate Editor for *Advances in Nutrition* and as a scientific advisor for the Lipids Committee of IAFNS (formally the International Life Science Institute North America) and Dairy Farmers of Canada. She was one of the co-founding Directors of the Cancer Research Institute of Northern Alberta that in 2012 that brought together cancer researchers from 10 different Faculties at the University of Alberta.

#### **Keynote Address**

**4:00 p.m. – 5:00 p.m**



### ***“Improving immune development in the infant by altering the content of docosahexaenoic acid and form of choline in the maternal diet”***

The early postnatal period is critical for the development of the infant's immune system. One of the important immune function that develops is that of 'oral tolerance', the ability to respond appropriately to dietary antigens. The failure to develop oral tolerance results in atopic diseases such as allergy. Our work and others has established that the intake of essential fatty acids, particularly docosahexaenoic acid (DHA), and choline alter immune development in infants. Breast milk is the optimal food for infants in the postnatal period but the composition of these two nutrients is influenced by the maternal diet. Using a large maternal infant cohort, our group has established that the intake of DHA and choline by healthy women is not optimal at 3-month post-partum when all mothers reported to be 'exclusively' breast feeding their infants. We have identified the major sources of DHA and both the sources and forms of choline in the maternal diet. We have used these intakes to design maternal diets in pre-clinical studies in rodents (healthy and allergy sensitive). This alters the amount of DHA and the amount and form of choline in breast milk. Changing breast milk composition and the content of these two nutrients in the weaning diet resulted in differences in immune development and 'programming' of the offspring's immune system, including the ability to successfully develop oral tolerance.



## Faculty Mini-Symposium: Personalized Nutrition: Putting the ‘U’ in Nutrition”

### Abstracts and Biographies

#### Multiscale approaches to identify novel biomarkers of metabolic and cardiovascular disease

##### Dr. Zeynep Madak-Erdogan

*Department of Food Science and Human Nutrition, Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL*

**ABSTRACT:** 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.



**BIOGRAPHY:** Dr. Zeynep Madak-Erdogan is an Associate Professor of Nutrition and the Director of Women’s Health and Metabolism lab at University of Illinois, Urbana Champaign. She received her B.S. degree in Molecular Biology and Genetics from Bilkent University in 2002. After completing her PhD and Postdoctoral studies on Mechanisms of Estrogen Receptor Action, she joined Department of Food Science and Human Nutrition at UIUC, in 2014. Her lab uses “Systems Biology” approaches to understand how nutrients and hormones impact metabolic health and breast cancer outcomes. In addition to mentoring several undergraduate and graduate students she has taught courses in the areas of Diet, Nutrition and Cancer, Nutrition and Women’s health, Cancer Metabolism, and Toxicology. She has received several awards including NIEHS, Pre- and Postdoctoral Research Training Program in Endocrine Developmental and Reproductive Toxicology Fellowship, Women in Endocrinology Young Investigator Award from Endocrine Society, National Center for Supercomputing Applications Fellowship, and Mary Swartz Rose Young investigator Award and Bio-serv Experimental Nutrition Award from American Society of Nutrition. She is the basic science editor-in-chief for Endocrine and Metabolic Science Journal and she serves as editorial board member for Journal of Endocrinology, Steroids, Journal of Functional Foods and Scientific Reports.



**Assisting sustainable dietary weight loss one at a time****Dr. Manabu Nakamura**

*Department of Food Science and Human Nutrition, Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL*

**ABSTRACT:** Obese individuals often develop chronic diseases such as diabetes, cardiovascular and musculoskeletal diseases. Although dietary weight loss is an effective treatment of obesity, a dietary weight loss program that can produce sustainable weight loss is yet to be developed. In the past years our lab has been developing a dietary weight loss program, *Individualized Diet Improvement Program (iDip)*. Our long-term goal is to establish iDip as a reliable, affordable and widely accessible weight management program to improve health and quality of life of many. The approach of iDip is to help participants experiment and discover dietary changes they can sustain for a lifetime, instead of providing dieting products or strict dietary instructions. A core innovation to support this approach is the protein-fiber plot (PF plot), a two-dimensional display of protein and fiber per energy values for easy comparison of food properties to make an informed decision in food selection. We also replaced calorie counting with daily weighing for monitoring of daily energy balance. The iDip consists of 19 lecture sessions and 3 individual advising sessions over one year. iDip 1 (n=14) demonstrated feasibility of our approach. An ongoing trial, iDip 2 (n=30) succeeded in increasing the magnitude of weight loss. However, we observed large differences in weight loss outcome among participants. We have been analyzing our data to identify factors that affect participants' outcome so that we can develop a treatment algorithm. Also, we are moving the on-site iDip to online platform, the EMPOWER weight loss program to increase efficacy, accessibility and affordability. In conclusion, we have developed and tested an innovative dietary weight loss program. With further refinement of program delivery and individualized treatment plan, we expect the EMPOWER becomes a reliable dietary weight loss program in the near future.



**BIOGRAPHY:** After receiving a degree in Veterinary Medicine from the University of Tokyo, Japan, Dr. Nakamura worked as a veterinarian for several years specializing in dairy cows. This experience helped him recognize the importance of nutrition in disease prevention, and led him to starting his graduate study in nutrition at the University of California, Davis. There, he was attracted to biochemical nutrition, which could explain nutrient metabolism in chemical terms, and has been studying it since then. His main research areas have been regulation of macronutrient metabolism and function of polyunsaturated fatty acids. Although research in biochemical and molecular nutrition was exciting, devastating effects of obesity epidemic and lack of an effective dietary weight loss program were a lingering concern to him. Thus, he switched his research focus to developing a weight loss program, and started a novel program, *Individualized Diet Improvement Program (iDip)* in 2018. The project has been making a rapid progress thanks to a dedicated team of graduate students and collaborators. In addition to his research, he enjoys teaching three graduate courses every year.

## Genetic variation in pathways of lipid and lipoprotein metabolism are associated with lipid profiles of young Mexicans

**Dr. Margarita Teran-Garcia**

*Division of Nutritional Sciences, University of Illinois Extension, Department of Biomedical and Translational Sciences, Carle Illinois College of Medicine, University of Illinois Urbana-Champaign, Urbana, IL*

**ABSTRACT:** Obesity and other nutrition-related diseases, including non-communicable chronic diseases, are significant causes of morbidity and mortality worldwide. The adverse impacts of obesity and associated comorbidities on health remain a major concern due to the lack of effective interventions for prevention and management. Specifically, there is a need for well-tolerated and effective therapies.

In Mexico, 65% of the adult population has low high-density lipoprotein cholesterol (HDL-C), and 43.6% have hypercholesterolemia, clinical markers of metabolic syndrome and risk factors for cardiovascular disease. Similar patterns are present among young Mexicans, aged 20 to 29 years old, with 62% having low HDL-C and 22% high levels of triglycerides (TG). The rapid increase in the prevalence of overweight and obesity, coupled with dyslipidemia, highlights the need to understand risk factors amenable to intervention in this population. In European groups, research on the genetic predisposition to the development of dyslipidemia has identified over 95 loci to be associated with either low-HDL-C, high LDL-C, high TG, or high TC. Most of the genetic association research has been conducted in populations of European descent. Recent genome-wide association studies in Mexicans have identified several genetic loci associated with blood lipid levels in adults. Despite reports of genetic association with lipid profiles in other ethnicities, there is no data on the fatty acid desaturase (FADS) gene cluster in this population. The FADS gene cluster includes 3 genes FADS1, FADS2, and FADS3. The role of the FADS gene cluster is the elongation and formation of long-chain fatty acids from both dietary and endogenous precursors. Thus, its role in plasma fatty acid concentration is essential. Our data indicate that a genetic variant in the fatty acid cluster gene (FADS1-rs174546) is associated with TG and very-low-density lipoprotein cholesterol (VLDL) concentrations in healthy young Mexicans. New findings of genetic associations in pathways of lipid and lipoprotein metabolism with blood lipid concentrations and dietary interactions will be presented.



**BIOGRAPHY:** Dr. Terán is an Extension Specialist for Hispanic Health Programs, faculty of the Department of Human Development and Family Studies, the Carle Illinois College of Medicine, member of the Division of Nutritional Sciences and Affiliate to the Family Resiliency Center, the Department of Psychology and the Center for Latin American Affairs at the University of Illinois Urbana-Champaign. She obtained her Medical Degree by the Universidad Nacional Autónoma de México (U.N.A.M.) 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 at Austin. During her postdoctoral training, she acquired expertise in genetic epidemiology methods and tools while she investigated the role of individual genotype in cardiovascular and metabolic responses to exercise. Dr. Terán participates and leads multi-disciplinary projects that are collecting primary longitudinal data relevant to children (STRONG KIDS), college-age individuals (UP AMIGOS), and families of Hispanic-Heritage (ABRIENDO CAMINOS USDA-NIFA, multi-state Grant # 2015-68001-23248) on weight status and weight-related health outcomes. Dr. Teran's primary research focuses on the joint influence of genetics (nature) and the environment (nurture, culture, family) on the development of unhealthy behaviors in dietary intake, physical (in)activity, or family dynamics. She has published more than 70 peer-review articles. Her scholarly work applies a competent multicultural and transdisciplinary perspective towards family health and wellness in the community.

**Role of epigenetics in development of personalized cancer management****Dr. Yuan-Xiang Pan***Department of Food Science and Human Nutrition, Division of Nutritional Sciences, Illinois Informatics Institute (I<sup>3</sup>), University of Illinois at Urbana-Champaign, Urbana, IL*

**ABSTRACT:** Cancer is a heterogeneous group of diseases whose causes, pathogenesis, metastatic potential, and responses to treatment can be very different among individuals. These differences make cancer an ideal target for the application of personalized cancer management (PCM). Constituting some of this PCM are screening, diagnosis, prognosis, prediction of treatment efficacy, patient follow-up after surgery for early detection of recurrence, and the stratification of patients into specific smaller subgroups, thus allowing for individualization of treatment. Epigenetic patterns, such as DNA methylation, histone modifications, and non-coding RNAs, can be both driver factors and characteristic features of cancer. Multiple patterns of these epigenetic factors occur specifically in certain cancers, which allows their potential use as biomarkers for PCM. Each group of epigenetic factors that are currently available or in development can be used in early cancer detection, prediction, prognosis, and response to treatment. Alteration of DNA methylation, histone modifications, and miRNAs often helps to differentiate tumor subtypes better and bring new prognostic information related to patient survival in relation to age, sex, etc. On the other hand, there are also a few epigenetic biomarkers that predict response to chemotherapeutic agents. The availability of blood-based biomarkers also allows sampling invasiveness to be reduced and the sampling procedure to be simplified. The reversal of epigenetic changes represents a potential target for novel preventive and therapeutic strategies, as well as medication design as PCM. Epigenetic drugs represent authentic 'genomic medicines' and will almost certainly exhibit the most significant efficacy when used in combination and when used jointly with other therapies such as standard chemotherapy or immunotherapy.



**BIOGRAPHY:** Dr. Pan is an Associate Professor in the Department of Food Science and Human Nutrition (FSHN), a member of the Division of Nutritional Sciences (DNS) and Illinois Informatics Institute (I<sup>3</sup>) at University of Illinois at Urbana-Champaign (UIUC). Dr. Pan's research is to understand the adaptation of epigenetic modifications in mammalian gene regulation to the environment, with a focus on the impact of these adaptive processes in health and disease. His lab uses experimental, statistical, and computational analyses to explore the epigenome, to integrate comparative and high-throughput epigenomics data. Dr. Pan is an investigator in NIEHS/EPA Children's Environmental Health Research Center at Illinois and receives grant support from the National Institutes of Health (NIH), the United States Department of Agriculture, and industry. Dr. Pan received the 2012 Norman Kretchmer Memorial Award in Nutrition and Development with potential relevance to improving children's health from the American Society of Nutrition.

## Graduate Student Oral Session Abstracts

### Oral Session 1

#### **$\beta$ -carotene enhances atherosclerosis resolution in a reversible murine model of atherosclerosis**

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**INTRODUCTION:** Despite the beneficial effects of the current treatments, cardiovascular diseases (CVDs) remain the number one cause of death worldwide. In the United States, one death takes place every 40 seconds from CVDs. Atherosclerosis is the principal underlying cause of ischemic heart disease and stroke, the two most common CVDs. Plasma lipoproteins levels and inflammation are key players in atherosclerosis pathogenesis. Our laboratory has recently shown that  $\beta$ -carotene conversion to vitamin A is associated with reducing circulating cholesterol levels in mice and humans and shown that  $\beta$ -carotene delays atherosclerosis progression in mice by reducing hepatic lipid secretion. However, the role of  $\beta$ -carotene in atherosclerosis regression has not yet been investigated. In the current study, we hypothesize that  $\beta$ -carotene promotes atherosclerosis regression.

**METHODS:** Wild-type mice fed a Western diet (0.3% cholesterol + 41% fat) deficient in vitamin A (WD-VAD) were injected weekly with an antisense oligonucleotide targeting the low-density lipoprotein receptor (LDLR ASO) for 16 weeks. LDLR ASO is a generous gift from Ionis Pharmaceuticals. As a result, we transiently blocked LDLR expression to facilitate the development of atherosclerotic lesions. After this period, we harvested a subset of mice (baseline group), while the remaining mice underwent atherosclerosis regression by interrupting LDLR ASO injections. To study the role of  $\beta$ -carotene on atherosclerosis regression, we maintained a subset of mice on WD-VAD while the remaining mice were fed WD-VAD supplemented with 50 mg/kg of  $\beta$ -carotene (WD- $\beta$ -carotene) for 3 weeks before sacrifice. Plasma and aortic roots were collected and analyzed to study the size and composition of atherosclerotic lesions.

**RESULTS:** Baseline mice showed a 96% ( $p < 0.0005$ ) reduction in LDLR hepatic expression accompanied by a 3-fold ( $p < 0.0001$ ) increase in plasma total cholesterol in comparison to both regression groups. Histological analyses of aortic roots failed to show differences in atherosclerotic lesion area between groups, although we observed a reduction in macrophage content in both regression groups that was more pronounced in WD- $\beta$ -carotene-fed mice; baseline vs WD-VAD ( $\sim 30\%$ ,  $p < 0.05$ ), and baseline vs WD- $\beta$ -carotene ( $\sim 42\%$ ,  $p < 0.005$ ). Collagen content in plaques, an indicator of plaque stability in humans, showed an increase in both regression groups; baseline vs WD-VAD ( $\sim 217\%$ ,  $p < 0.005$ ), and baseline vs WD- $\beta$ -carotene ( $\sim 308\%$ ,  $p < 0.0001$ ).

**CONCLUSION:**  $\beta$ -carotene enhances atherosclerosis resolution by decreasing the inflammation and increasing the plaque stability in mice.

**Subacute exposure to di-isononyl phthalate affects colonic health in adult female mice****Karen Chiu**<sup>1,2</sup>, S.T. Bashir<sup>3,4</sup>, A.M. Abdel-Hamid<sup>4,5</sup>, I. Cann<sup>4,5</sup>, R.A. Nowak<sup>4,5</sup>, and J.A. Flaws<sup>1,2,4</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Comparative Biosciences, University of Illinois, Urbana, IL*<sup>3</sup> *Department of Molecular and Integrative Physiology, University of Illinois, Urbana, IL*<sup>4</sup> *Department of Animal Sciences, University of Illinois, Urbana, IL*<sup>5</sup> *Carl R. Woese Institute of Biology, University of Illinois, Urbana, IL*

**INTRODUCTION:** Phthalates are used in hundreds of products including toys, faux leather, and building materials. Di-isononyl phthalate (DiNP) is a common phthalate that is used to make polyvinyl chloride flexible. The most common exposure to DiNP is through ingestion; however, inhalation, dermal absorption, and intravenous absorption can also occur. Exposure to DiNP has been shown to disrupt the female and male reproductive systems. However, little is known about the effects of DiNP on the gastrointestinal tract. Thus, this study tested the hypothesis that subacute exposure to DiNP alters colon histology, hormone levels, gene expression, and protein levels related to inflammation and cell cycle regulation and that the colon contains microbes that degrade DiNP.

**METHODS:** To test this hypothesis, CD-1 mice (female, two months old) were orally dosed with corn oil vehicle or varying doses of DiNP ranging from 0.02 – 200 mg/kg/day (n=6 mice/treatment group) for 10-14 days and then euthanized during diestrus immediately after dosing. Distal colons were collected for histological examination, hormone analyses, and gene expression and protein analyses of various immune and cell health markers. Colonic contents were collected to identify bacteria that degrade DiNP.

**RESULTS:** Histological analysis showed that DiNP exposure (0.02, 0.2, 2, and 200 mg/kg) significantly increased colonic damage compared to control. Furthermore, DiNP exposure significantly altered the gene expression of several cell cycle regulators (*Ccnb1*, *Aifm1*, and *Bcl2/110*). DiNP exposure also altered gene expression and protein levels of several cytokines compared to control ( $p < 0.05$ ). Further, DiNP exposure significantly downregulated the expression of a tight junction (*Zo-3*) compared to control. DiNP exposure at the two highest doses significantly increased MUC2, a goblet cell marker, compared to control. Lipid extractions from the distal colon revealed that several DiNP treatment groups had significantly decreased estradiol concentrations compared to control. Finally, bacterial species isolated from colon contents show that they can use DiNP as a carbon source.

**CONCLUSION:** These data suggest that DiNP exposure causes colonic damage and interferes with the colonic immune and endocrine microenvironment. The changes in the colon may be partly mediated by DiNP-degrading bacteria.



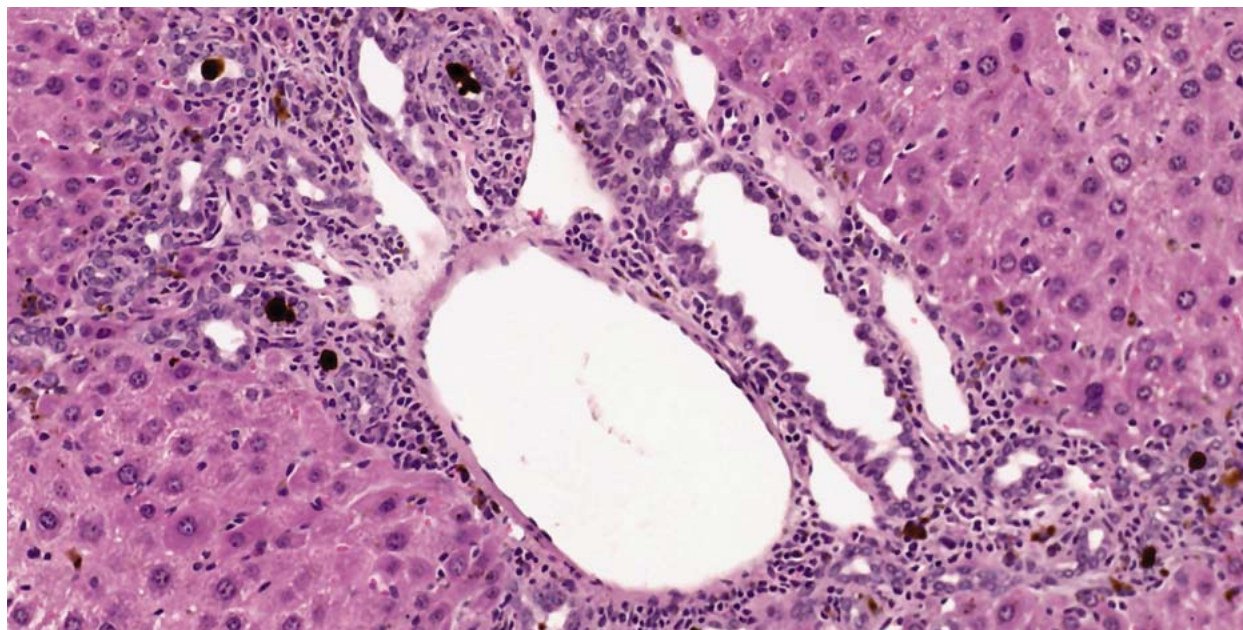
**Investigating the role of farnesoid X receptor in heme biosynthesis and ductular reaction**Angela E. Dean<sup>1</sup>, E. Jungwirth<sup>2</sup>, K. Panzitt<sup>2</sup>, M. Wagner<sup>2</sup>, and S. Anakk<sup>1,3</sup><sup>1</sup> Division of Nutritional Sciences, University of Illinois, Urbana, IL<sup>2</sup> Division of Gastroenterology and Hepatology, Medical University of Graz, Graz, Austria<sup>3</sup> Molecular and Integrative Physiology, University of Illinois, Urbana, IL

**INTRODUCTION:** Bile acids (BAs) have gained traction not just as emulsifiers of fat, but also as hormones. Nuclear receptor Farnesoid X receptor (FXR) is the master regulator of BAs and can also control glucose and lipid metabolism. We examined if FXR contributed towards heme biosynthesis and induction of a ductular reaction.

**METHODS:** Male and female whole body *Fxr* knockout (*FxrKO*) mice, as well as liver- and intestine-specific knockouts (*LFxrKO* and *IFxrKO*, respectively) were treated with 3, 5-diethoxycarbonyl-1, 4-dihydrocollidine (DDC, a ferrochelatase inhibitor) for two weeks. At the end of the two weeks, mice were fasted for four hours and euthanized.

**RESULTS:** All groups of mice had a lost similar percentage of body weight when fed the DDC diet. However, female *FxrKO* mice had significantly increased liver to body weight ratio, while male *FxrKO* mice had significantly decreased liver to body weight ratio when fed the DDC diet compared with their wild type counterparts. Serum liver injury markers were analyzed and liver histology and changes in genes involved in the heme biosynthesis pathway were examined. Both male and female whole body *FxrKO* livers had decreased ductular reaction with minimal bile plugs (porphyrin accumulation) compared with their wild type counterparts. *LFxrKO* mice mimicked diminished ductular reaction, while *IFxrKO* mice exhibited severe ductular reaction similar to that of wild type mice, indicating that the ductular reaction is dependent on hepatic FXR. ChIP-Seq for FXR revealed binding peaks in the heme biosynthesis genes, *Alas1*, *Alad*, *Uros*, and *Fech*, suggesting that FXR may act as a transcription factor for these genes. Further investigation revealed that *Pbgd* gene expression was increased, while *Fech* gene expression was decreased in female *FxrKO* mice compared to wild type mice. In male mice, *Pbgd*, *Uros*, *Urod*, and *Cpox* gene expression was increased in the absence of *Fxr*.

**CONCLUSION:** *Fxr* is necessary to mount a ductular reaction and plays a key role in heme biosynthesis in the liver.



Ductular reaction, characterized by bile duct proliferation, porphyrin build-up, and inflammatory cell accumulation, in the liver of wild-type female mice after two weeks treated with a diet containing 3,5-diethoxycarbonyl-1,4-dihydrocollidine. Submitted by Angela E. Dean.

**Predictors of food and water stockpiling during the COVID-19 pandemic****Olufemi Fabusoro**<sup>1</sup>, C. Singleton<sup>2</sup>, M. Teran-Garcia<sup>1,3</sup>, and S. Lara-Cinisomo<sup>1,2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL*<sup>2</sup> *Department of Kinesiology and Community Health, University of Illinois at Urbana-Champaign, Champaign, IL*<sup>3</sup> *Department of Biomedical and Translational Sciences, Carle Illinois College of Medicine, University of Illinois at Urbana-Champaign, Champaign IL*

**INTRODUCTION:** The early months of the COVID-19 pandemic brought about significant disruptions in food supply chains, which increased consumers' concerns about possible food shortages and price gouging. To ensure personal food security, many consumers began stockpiling food and water in unusually large amounts. The goal of this study was to investigate individual- and household-level predictors of food and water stockpiling (FWS) in the early months of the COVID-19 pandemic among Non-Latino Black and Latino adults.

**METHODS:** This study was a secondary analysis of cross-sectional survey data. Participants were Non-Latino Black (66.4%) and Latino (33.6%) adults residing in a Midwestern state (N=2,174), who completed the survey in either May or June/July 2020. Participants were asked to self-report (yes or no) if they stockpiled food and/or water in the prior seven days in response to the pandemic. A variety of variables was examined, including education level, annual income, employment status, concerns about COVID-19, and self-quarantine status. Crude and adjusted logistic regressions were used to identify variables associated with FWS.

**RESULTS:** Non-Latino Black participants had lower odds of reporting FWS compared to Latinos (OR 0.64; 95% CI, 0.51-0.79). Similarly, participants who were not concerned about COVID-19 had lower odds of FWS compared with those extremely concerned (OR 0.37; 95% CI, 0.20 - 0.71). In contrast, odds of FWS were higher among participants who were self-quarantining all the time compared to those who were not (OR 2.16; 95% CI, 1.31 - 3.59).

**CONCLUSIONS:** Results showed that Latinos, adults concerned about COVID-19, and self-quarantine status had significantly higher odds of FWS during the pandemic.

## Graduate Student Oral Session Abstracts

### Oral Session 2

#### Higher protein intake does not potentiate skeletal muscle vitamin D receptor

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**INTRODUCTION:** The loss of muscle mass with age increases not only risk of functional impairment, but also development and exacerbation of cardiometabolic disease. While dietary protein intake and habitual resistance exercise are traditional strategies to offset age-related decrements in lean mass, it is important to define the role of other regulatory nutrients in this process. Dietary vitamin D (VD) has received particular interest as muscle vitamin D receptor (VDR) is associated with hypertrophy. Importantly, beyond being a significant source of high-quality protein, animal-based protein foods are also rich in VD. While previous efforts have investigated the provision of protein and/or VD supplements during a resistance training program, the influence of dietary protein composition and diet-derived VD on resistance exercise adaptations remains unknown.

**METHODS:** Forty-one middle-aged adults (mean  $\pm$  SD: age  $50 \pm 8$  y, BMI  $27 \pm 4$  kg/m<sup>2</sup>, M = 19, F = 22) were stratified and randomized to consume either high ( $1.68 \pm 0.26$  g/kg/d) or moderate ( $1.16 \pm 0.19$  g/kg/d) amounts of animal-based protein during a 10-week dietary counseling-controlled resistance training program. Dietary intake was monitored by biweekly 3d diet records (ASA24). Dual-energy x-ray absorptiometry and muscle biopsies were performed pre- and post-intervention. Total RNA was extracted and reverse-transcribed for muscle gene expression by quantitative polymerase chain reaction. Intervention outcomes and their relationships were analyzed using linear mixed effects models and repeated measures correlation, respectively, by R.

**RESULTS:** VDR gene expression increased regardless of condition ( $P = 0.007$ ; 95% CI: 0.13, 0.84). Upregulation of VDR expression was correlated with gains in appendicular lean mass ( $r = 0.44$ ;  $P = 0.01$ ; CI: 0.10, 0.68). While protein intake did not affect VDR expression, animal-based protein diet density (servings/1000 kcal) was modestly correlated with VDR expression ( $r = 0.42$ ;  $P = 0.014$ ; CI: 0.08, 0.67). There was no relationship between dietary VD and VDR expression.

**CONCLUSION:** Our results suggests that moderate dietary protein intake is sufficient to support resistance exercise-induced VDR upregulation and lean mass gain in middle-aged adults.

**Violent crime, physical inactivity, and obesity: examining spatial relationships by racial/ethnic composition of community residents**

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**INTRODUCTION:** Violent crime is a major public health issue that disproportionately affects communities of color in large urban centers. There is limited understanding of how violent crime influences physical inactivity and obesity at the community level given the racial/ethnic composition of residents. We aimed to address this gap by using geo-spatial modeling to assess census tract-level associations in Chicago, IL, a large urban center with high levels of racial/ethnic segregation.

**METHODS:** In 2020, we analyzed 2017 and 2018 census-tract level data acquired from the City of Chicago, CDC, and Environmental Protection Agency. Violent crime rate represented the number of police reported incidents of homicide, aggravated assault, and robbery per 1,000 residents. Physical inactivity and obesity measures represented the percentage of residents who do not meet CDC recommendations for physical activity and are obese according to their BMI, respectively. We used spatial error and ordinary least squares regression modeling to determine if violent crime rate was significantly associated with % physical inactivity and % obesity among all Chicago census tracts (N = 801), majority non-Hispanic (NH) White tracts (n = 240), majority NH Black tracts (n = 280), and majority Hispanic tracts (n = 169). Majority was defined as  $\geq 50\%$  representation.

**RESULTS:** The median violent crime rate among NH Black tracts was higher than Hispanic and NH White tracts. After adjusting for covariates (e.g., median household income, grocery store availability, walkability index, etc.), violent crime rate was significantly associated with % physical inactivity ( $\beta = 0.32, p < 0.001$ ) and % obesity ( $\beta = 0.34, p < 0.001$ ) at the census tract level in Chicago, IL. Furthermore, we observed significant associations among majority NH Black and Hispanic tracts but not majority NH White tracts.

**CONCLUSION:** Violent crime rate appears to influence physical inactivity and obesity but only in Chicago census tracts where the racial/ethnic composition of residents is mostly minority.

## Effects of eating isolated versus incorporated nutrients in their whole-food matrix on post-exercise muscle protein synthesis and leucine oxidation

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**INTRODUCTION:** Healthy eating patterns consist of eating whole foods as opposed to single nutrients. There is a need to underpin the role of eating nutrients within their natural whole-food matrix versus isolated nutrients on the regulation of postprandial muscle protein synthesis. This study assessed the effects of eating salmon on the stimulation of post-exercise muscle protein synthesis and whole-body leucine oxidation rates versus eating these same nutrients in isolation in healthy young adults.

**METHODS:** In a crossover design, 10 recreationally active adults (24±4 y; 5 M, 5 F) performed an acute bout of resistance exercise followed by the ingestion of salmon (SAL) (20.5 g protein and 7.5 g fat) or its matched constituents in the form of crystalline amino acids and fish oil (ISO). Blood, breath, and muscle biopsies were collected at rest and after exercise at 2 and 5 h during primed continuous infusions of L-[ring-<sup>2</sup>H<sub>5</sub>]phenylalanine and L-[1-<sup>13</sup>C<sub>6</sub>]Leucine.

**RESULTS:** Postprandial leucine oxidation rates were elevated from baseline at  $t = 30$  min to  $t = 120$  min in ISO and  $t = 60$  min to  $t = 180$  min in SAL ( $P < 0.001$ ) with no total differences between group ( $P = 0.129$ ). Time to peak leucine oxidation occurred sooner in ISO (66±22 min; 1.358±0.699 nmol·kg<sup>-1</sup>·min<sup>-1</sup>) when compared to the SAL condition (105±20 min; 1.067±0.3076 nmol·kg<sup>-1</sup>·min<sup>-1</sup>;  $P = 0.002$ ). The post-exercise myofibrillar protein synthetic responses were similarly stimulated in both nutrition conditions early (0-2 h; 0.079±0.039 %/h (SAL) compared to 0.071±0.078 %/h (ISO);  $P = 0.64$ ) and returned to baseline later (2-5 h; 0.046±0.020 %/h (SAL) compared to 0.038±0.025 %/h (ISO);  $P = 0.90$ ). Similarly, there were no differences in the stimulation of myofibrillar protein synthesis rates between SAL and ISO during the entire 0-5 h recovery period (0.058±0.024 %/h compared to 0.045±0.027%/h, respectively;  $P = 0.66$ ).

**CONCLUSION:** We show that the ingestion of salmon or its isolated nutrients enhances the stimulation of post-exercise muscle protein synthesis rates with a similar net increase in oxidation in healthy young adults. The ingestion of salmon resulted in a delayed stimulation of leucine oxidation when compared to free amino acid ingestion.



**The impact of almond and walnut consumption on the human fecal metabolome****Leila M. Shinn**<sup>1</sup>, A. Mansharamani<sup>2</sup>, Y. Li<sup>3,4</sup>, R. Zhu<sup>3,4</sup>, J. Novotny<sup>5</sup>, D. Baer<sup>5</sup>, H. Holscher<sup>1,4,6</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Computer Science, University of Illinois, Urbana, IL*<sup>3</sup> *Department of Statistics, University of Illinois, Urbana, IL*<sup>4</sup> *National Center for Supercomputing Applications, University of Illinois, Urbana, IL*<sup>5</sup> *USDA, Agricultural Research Service, Beltsville Human Nutrition Research Center, Beltsville MD*<sup>6</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*

**INTRODUCTION:** Metabolomic studies can be utilized to generate biomarkers of food intake. Undigested food components affect the fecal microbiota and metabolome. Accordingly, we aimed to identify fecal metabolites unique to almond and walnut consumption.

**METHODS:** Untargeted metabolomic analyses were completed on 66 endpoint fecal samples from two separate 3-week randomized, controlled-feeding, crossover studies examining almond (n=30) and walnut (n=36) consumption in adults (25-75 yr). Control diets, representative of the typical American diet, were fed at weight maintenance with 0 g/day of nuts. During the treatment arms, the base diet was scaled down to allow isocaloric inclusion of 42 g/day of almonds or walnuts. The Kruskal-Wallis H test was used to determine statistically significant metabolites between treatment and control groups with Benjamini-Hochberg false discovery rate adjustments (reported as q-values).

**RESULTS:** Of the 318 quantifiable fecal metabolites, 42 were significantly different when comparing the treatment groups to their respective controls after adjustment (q<0.05). Of these 42 metabolites, 9 were significantly different in both the almond and walnut treatment samples. Two metabolites, palmitoleic acid and p-cresol, were unique to almonds—the relative concentration of palmitoleic acid was higher in the almond group compared to control and p-cresol was lower in almond compared to control. Walnut treatment samples contained 31 unique metabolites, including 15 fatty acyls, the majority of which were higher in the walnut group compared to control.

**CONCLUSIONS:** Higher concentrations of fecal fatty acyls in the almond and walnut groups compared to their respective controls support previous findings that the plant cell walls of nuts reduce digestibility, therefore, limiting accessibility of intact lipids. Overall, these results reveal promise in identifying fecal biomarkers of food intake for eventual use in personalized dietary recommendations. Ongoing analyses include utilizing machine learning models to further biomarker panel development through incorporation of baseline data and metagenomic analyses.

## Graduate Student Poster Session Abstracts

### Associations between acculturation, nutrient intake, and diet quality among Non-Hispanic Black adults in the U.S.

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**INTRODUCTION:** Consuming a nutrient poor diet can negatively affect the health status of an individual. Recent increases in African immigration into the U.S. has called for more research on the health and health behaviors of this growing population. Little is known about how acculturation (as measured by place of birth and length of time in the country) affects nutrient intake and diet quality among Non-Hispanic Blacks in the U.S. We aim to address this gap in knowledge by studying the association between acculturation, nutrient intake, and diet quality among a large sample of Non-Hispanic Black adults.

**METHODS:** We analyzed cross-sectional data from the 2005-2016 cycles of the National Health and Nutrition Examination Survey (NHANES). The analytical sample comprised 7,073 Non-Hispanic Blacks who we categorized into three groups: FB Blacks less than 10 years (3.35%), FB Blacks greater than 10 years (7.42%), and U.S. born Blacks (89.23%). We analyzed each participant's 24-hour recall data to determine if they met 2015-2020 Dietary Guidelines for Americans (DGA) recommendations for intake of specific nutrients (e.g., saturated fat, fiber, sugar, cholesterol, sodium, etc.). We used logistic regression to assess differences across the three groups in regard to odds of meeting DGA recommendations for nutrient intake.

**RESULTS:** Compared to U.S. born blacks and FB Blacks ( $\geq 10$  years), FB Blacks ( $< 10$  years) had significantly higher odds of meeting DGA recommendations for most nutrients after adjusting for all covariates (e.g., age, gender, education level, poverty level, etc.). Specifically, FB Blacks ( $< 10$  years) had significantly higher odds of meeting recommendations for saturated fat (OR: 2.7; 95% CI: 1.6-4.6), cholesterol (OR: 1.7; 95% CI: 1.2-2.5) and sodium intake (OR: 2.2; 95% CI: 1.2-4.3) compared to U.S. born Blacks. FB Blacks ( $\geq 10$  years) had significantly higher odds of meeting recommendations for total fat and dietary fibre compared to U.S. born Blacks.

**CONCLUSIONS:** FB Blacks ( $< 10$  years) had higher odds of meeting DGA guidelines for nutrient intake compared FB Blacks ( $\geq 10$  years) and U.S. born Blacks. These findings further highlight the importance of acculturation and its impact on dietary intake among immigrant populations. Future studies should evaluate how acculturation influences overall health status and chronic disease risk across the African diaspora in the U.S.

**Exploring the dietary behaviors and perceptions of African immigrants - a qualitative study of Nigerian and Congolese immigrants****Oluwatosin Akingbule**<sup>1</sup>, M. Teran- Garcia<sup>2,3</sup>, O. Panumpabi<sup>4</sup>, R. Alston<sup>1</sup><sup>1</sup> *Department of Kinesiology and Community Health, University of Illinois, Champaign, IL*<sup>2</sup> *University of Illinois Extension, University of Illinois, Urbana, IL*<sup>3</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>4</sup> *Department of Interdisciplinary Psychology, University of Illinois, Champaign, IL*

**INTRODUCTION:** Studies examining the prevalence of cardiometabolic diseases in African immigrants show that they are healthier on arrival to the U.S., but develop worse risk profiles closer to that of the general population when they live 10 years or longer in the country. This change has been attributed to dietary acculturation. Therefore, this project aims to explore contextual factors associated with changes in dietary behaviors of recent immigrant families.

**METHODS:** Five online focus group interviews were conducted with recent Nigerian and Congolese immigrant adults (N=20; Female= 19, Male=1). Three focus groups were conducted in English and two were conducted in French. Most of participants (70%, N=14) completed the voluntary demographics survey. On average, participants were 42 years old and had four children. Educationally, most had at least a bachelor's degree (72%). Participants were recruited from churches with large population of African immigrants and through leaders of the immigrant communities from the Midwest. Participants discussed dietary practices for their families, including the challenges of maintaining a healthy diet after immigration to the U.S. Preliminary findings from the ongoing thematic analysis are reported.

**RESULTS:** Participants had high level of awareness of the influence of healthy food choices on risk factors for cardiometabolic diseases. The majority had the perception of "American food" as unhealthy, characterizing them as containing a high amount of sugar and salt. All participants preferred and mostly consumed foods they were familiar with before migration, including traditional African meals. Participants had several misconceptions regarding the nutritional value of certain food products. They reported that their school-age kids preferred Americanized over the traditional African meals. Participants and community leaders demonstrated high level of interest in receiving educational resources to make healthier food choices.

**CONCLUSIONS:** The findings will help to develop culturally tailored interventions to reduce diet-related risks associated with cardiometabolic diseases.

**Smell identification dysfunction in Wolfram syndrome can affect retro nasal smell enhancement of taste intensity****Raul Alfaro**<sup>1</sup>, T. Doty<sup>2</sup>, T. Hershey<sup>2,3</sup>, M.Y. Pepino<sup>1,4</sup><sup>1</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Psychiatry, Washington University, St. Louis, MO*<sup>3</sup> *Department of Radiology, Washington University, St. Louis, MO*<sup>4</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*

**INTRODUCTION:** Wolfram syndrome (WFS) is a rare genetic disease with symptoms that include loss of vision, audition, and smell function. Recently, we found that the sense of taste was overall well conserved in WFS and that the olfactory dysfunction was related to smell identification and not due to olfactory insensitivity. Here we tested the hypothesis that retro nasal smell perception is affected in WFS and interferes with central integration processes that result in odor-induced taste enhancement.

**METHODS:** We evaluated participants with WFS (n=36, 18±7 years) and a healthy control group (HC n=22, 40±14 years). We assessed whole mouth taste intensity perception using the general Labeled Magnitude Scale and used solutions of sucrose with strawberry extract, citric acid with lemon extract, sodium chloride in a vegetable broth, and caffeine in coffee. Participants taste these solutions and rate taste intensities in two conditions: with and without nose clips.

**RESULTS:** Partially supporting our hypothesis, we found a trend of an interaction between group and nose condition for the sucrose/strawberry extract solutions (P=0.06). That is, when using nose clips (i.e. retro nasal off), taste intensity ratings were similar between the groups. However, when tasting these solutions without nose clips (i.e. retro nasal on), participants in the HC group perceived an enhancement of sweetness that was totally blunted in participants with WFS. There were no other differences in taste intensity ratings between the groups for any of the other solutions.

**CONCLUSIONS:** Because odor-taste congruency plays a key role in odor-induced taste enhancement, these preliminary findings suggest that the lack of enhancement of sweetness in sucrose by strawberry extract in participants with WFS might be due to an impairment in the quality of some retro nasal smells.

**Impact of carotenoid cleaving enzymes on lycopene accumulation in transgenic mice****Joseph R. Arballo**<sup>1</sup>, J. Amengual<sup>1,2</sup>, M. Black<sup>2</sup>, J.W. Erdman Jr.<sup>1,2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*

**INTRODUCTION:** To evaluate the role of  $\beta$ -carotene oxygenase 1 (BCO1) and BCO2 on lycopene tissue distribution.

**METHODS:** Three-week old C57BL/6 male and female mice (wild type [WT], *Bco1*<sup>-/-</sup>, *Bco2*<sup>-/-</sup>, *Bco1*<sup>-/-</sup> x *Bco2*<sup>-/-</sup> double knock out [DKO]) were divided into groups based on genotype (n=16 per group split evenly by sex) and fed a powdered AIN 93G control diet for 2 weeks. After this period, mice were gavaged daily for 2 weeks with 1mg of lycopene dissolved in cottonseed oil. 12 h-fasted mice were then sacrificed and liver, serum, heart, kidney, intestine, gonadal adipose, prostate, spleen, and testes were harvested. Tissues were preserved in liquid nitrogen and stored at -80 until analyses. We measured lycopene levels in all samples by using high-performance liquid chromatography. Data analyses were performed using two-way ANOVA, followed by the Sidaks test with a statistical significance threshold of P<0.05.

**RESULTS:** Female mice showed higher lycopene levels in the intestine (P<0.045) and liver (P<0.007) irrespective of genotype, while male mice had higher lycopene levels in serum (P<0.004). Intestine, serum, and kidneys exhibited higher lycopene levels in *DKO* mice compared to all other genotypes (P<.0001), while having higher lycopene levels in testes (P<0.0001) compared to *Bco2*<sup>-/-</sup> and WT mice and adipose (P<0.005) only in comparison to *Bco2*<sup>-/-</sup> mice. *DKO* exhibited higher lycopene levels in the spleen compared to *Bco1*<sup>-/-</sup> mice (P<0.02). Lycopene levels in the liver (P<0.0001) were higher in *Bco2*<sup>-/-</sup> mice compared to *Bco1*<sup>-/-</sup> and *DKO* mice, while *Bco1*<sup>-/-</sup> mice had lower hepatic lycopene levels compared to all other genotypes.

**CONCLUSIONS:** Female mice accumulated higher lycopene levels in most tissues compared to males. These results were consistent when data were corrected by total tissue weight. The data suggest the absence of BCO2 favors carotenoid accumulation in many extrahepatic tissues, an effect that is enhanced in the absence of both carotenoid cleaving enzymes.



**Diet quality and the fecal microbiota in healthy adults in the American Gut Project****Alexis D. Baldeon**<sup>1</sup>, J. Lovett<sup>2</sup>, Z. Pan<sup>3</sup>, H.D. Holscher<sup>1,4</sup><sup>1</sup> Division of Nutritional Sciences, University of Illinois, Urbana, IL<sup>2</sup> Department of Mathematics, University of Illinois, Urbana, IL<sup>3</sup> Department of Statistics, University of Illinois, Urbana, IL<sup>4</sup> Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL

**INTRODUCTION:** The human gastrointestinal microbiota contributes to the relationship between diet and health via microbial metabolism of undigested food components. Thus, it is valuable to understand the relations between gut microorganisms and diet quality. Herein, we examined the associations between the Healthy Eating Index (HEI)-2015 and the fecal microbiota in a subset of healthy adults in the American Gut Project (AGP) cohort.

**METHODS:** This was a cross-sectional study of healthy adults ( $n=1,162$ , 759 females); BMI: 18.5-29.9 kg/m<sup>2</sup>; 18-65 years of age) from the AGP cohort who provided a stool sample and a time-matched food frequency questionnaire (FFQ; VioScreen). Fecal samples were processed by the AGP lab. Briefly, DNA was extracted from the stool samples, and the V4 region of the 16S rRNA gene was amplified and sequenced. HEI-2015 scores were calculated using VioScreen's report of HEI-2010 scores and nutrient component percentages. The cohort was divided into tertiles based on total score, and components whole grains, dairy, fatty acids, sodium, and saturated fats. Differential abundance analysis was conducted using ANCOM-BC, comparing the high (T3) tertile to the low (T1) tertile for all categories. Comparisons that were statistically significant following FDR corrections are reported ( $q < 0.05$ ).

**RESULTS:** Comparing T3 to T1, there were greater abundances of *Bifidobacterium* across all HEI-2015 categories. Similarly, *Dialister*, *Haemophilus*, and *Veillonella* were greater across total score, whole grains, and dairy; *Streptococcus* was greater across total score and dairy; and *Lachnospira*, and *Coprococcus* were greater in total score. There was a lower abundance of *Ruminococcus* from the Lachnospiraceae family in the T3 group for total score and whole grains; and of Peptococcaceae rc4-4, and an unknown genus of the Mogibacteriaceae family in saturated fats.

**CONCLUSIONS:** These results reveal that individuals that consume a higher quality diet, as evidenced by higher HEI-2015 total score, and whole grains, dairy, and saturated fats component scores, have greater abundances of bacteria linked with carbohydrate fermentation and lower abundances of bacteria related to inflammation and a Western dietary pattern.



*This vial contains a beautiful golden extract of microbial metabolites from arguably the ugliest of biological samples: fecal matter. Submitted by Alexis D. Baldeon.*

## Reducing obesogenic behaviors through a culturally-tailored family-based program: “Abriendo Caminos”

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**INTRODUCTION:** Hispanic children in the U.S. exhibit the highest rates of obesity compared to other racial/ethnic groups. Effective interventions to reduce the burden of this growing epidemic are needed. Obesity prevention interventions can improve weight outcomes by targeting modifiable lifestyle factors such as dietary patterns and physical activity. Furthermore, there is evidence that culturally-tailored interventions increase fruit and vegetable consumption and decrease sugar-sweetened beverage (SSB) consumption among Hispanic children. The objective of this study was to evaluate the effect of Abriendo Caminos 2 (AC2) on Hispanic children’s dietary behaviors.

**METHODS:** AC2 is a multi-state randomized-control trial that aims to prevent childhood obesity among Hispanic families by providing culturally-tailored nutrition, physical activity, and family wellness education. Families of Mexican or Puerto Rican origin with a child between the ages of 6 – 18 years were recruited from Illinois, California, Iowa, and Texas. Parents’ reported their child’s dietary intake of SSB, fruit juice, fruits, French fries, vegetables, fast food, sweets, and salty snacks using items from the U.S. Department of Education’s Early Childhood Longitudinal Study, Birth Cohort protocol. Pre/post dietary changes were evaluated using Generalized Estimating Equation models adjusted for site, child sex, age, and mother’s education using SAS 9.4 (SAS Institute, Cary, NC, USA).

**RESULTS:** Children randomized to the intervention arm reduced their consumption of SSB (OR 0.35, 95% CI 0.15, 0.84, P=0.003), fast food (OR 0.53, 95%CI 0.30, 0.92, P=0.03), and increased consumption of vegetables (OR 1.95, 95% CI 1.13, 3.36, P=0.02) after six weeks of participating in the program. Children in the control group reportedly decreased SSB consumption frequency (OR 0.40, 95% CI 0.17, 0.97, P=0.04). There were no changes in the frequency of consumption of the other food items for either group.

**CONCLUSIONS:** Culturally-tailored family-based interventions can help improve dietary behaviors among Hispanic children. Future research should address methods to help Hispanic children transition short-term changes into lifestyle habits.



*An Abriendo Caminos researcher educates Hispanic children on the importance of consuming fruit as part of a healthy diet. Throughout the program, children are exposed to various nutrient-dense foods and are encouraged to incorporate them into their diet. Submitted by Maribel Barragan.*

## 2'fucosyllactose and *Bifidobacterium longum* subsp. *infantis* supplementation modulates immune development of piglets

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**INTRODUCTION:** Probiotics and 2'fucosyllactose (2'FL) have been shown to affect immune development in infants, but less is known about their synbiotic administration. Herein, the effects of 2'FL and *Bifidobacterium longum* subsp. *infantis* (Bi-26) on immune development was investigated in the young pig.

**METHODS:** Male piglets (N=53) were provided *ad libitum* access to milk replacer without (CON) or with 1g/L 2'FL (FL) from postnatal day 2 to 34/35. Pigs were then stratified to receive Bi-26 prepared in glycerol stock ( $10^9$  CFU) or glycerol stock alone (BI and FLBI). Blood, mesenteric lymph nodes (MLN), and ascending colon (AC) and rectal (RC) contents were collected. MLN and peripheral blood mononuclear cells (PBMC) immune cells were quantified by flow cytometry. Immunoglobulins (Igs) were measured by ELISA. PBMC and MLN cells were stimulated *ex vivo* with phytohemagglutinin (PHA) or lipopolysaccharide (LPS) for 72h. Cytokines in serum and *ex vivo* cell supernatants were measured by multiplex assay. Cytokine data were analyzed by multivariate LCA-model. All other data were analyzed by a 2-way ANOVA with fixed effects of prebiotic and probiotic.

**RESULTS:** sIgA tended ( $P=0.07$ ) to be higher in RC than AC, with no treatment effect. Serum IgG and IgM and MLN and PBMC immune cells were unaffected by treatment. Serum, IL-1 $\alpha$ , IL-1 $\beta$ , IL-1 receptor antagonist (IL-1RA), IL-2, IL-4, IL-6, IL-10, IL-12 and IL-18 were all higher in FL than CON ( $p<0.05$ ). In unstimulated PBMC, IL-18 was lower in FL, BI and FLBI than CON ( $p<0.05$ ). In LPS-stimulated PBMCs, IFN $\gamma$  was higher in FL and IL-1RA was higher in FLBI than CON ( $p<0.05$ ). LPS had no effect on MLN cytokines; but, PHA increased IL-17 in FL and FLBI versus CON ( $p<0.05$ ).

**CONCLUSION:** Compared to CON, serum cytokines involved in Th1 T-cell differentiation, IL-2, IL-12 and IL-18 were higher in FL piglets. This was countered by the increased production of IL-4 and IL-10. IL-1RA also increased, potentially balancing higher IL-1 $\alpha$  and IL-1 $\beta$  in FL piglets. These differences were not observed in FLBI. LPS stimulated IFN $\gamma$  secretion by PBMC from FL, whereas cells from FLBI secreted more IL-1RA. These findings suggest that dietary 2'FL primes T-cells for proinflammatory cytokine secretion, which is modulated by co-administration of Bi-26.

### Nanocarriers targeting adipose tissue macrophages increase saroglitazar potency and improve metabolism in diet-induced obese (DIO) mice

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**INTRODUCTION:** The rising incidence of obesity is a burden on the healthcare system due to comorbidities such as cardiovascular disease and diabetes. Because obesity leads to systemic inflammation, due in part to macrophage accumulation in adipose tissue, therapies targeting adipose tissue macrophages may provide benefits. The diet-induced obesity (DIO) mouse model is used to study treatment effects on obesity and insulin resistance. When fed a high-fat diet (HFD), DIO mice have low-grade inflammation, with increased pro-inflammatory macrophage infiltration in adipose tissue similar to humans. A variety of dietary and drug interventions may be used to reduce body weight (BW) and/or improve metabolism, but some have side effects. We have recently developed a nanocarrier dextran-conjugated prodrug saroglitazar, which is a novel peroxisome proliferator activated receptor (PPAR) agonist that specifically targets macrophages in adipose tissue. This prodrug has led to promising effects in vitro and was shown to be non-toxic effect in a short-term, single-dose in vivo study. In the current study, we evaluated the effects of chronic (4 wk) saroglitazar nanocarrier treatment effects in DIO mice.

**METHODS:** Male C57BL/6J mice were fed a HFD (60% kcal ME from fat) to induce obesity. Metabolic syndrome was confirmed by conducting an intraperitoneal glucose tolerance tests (IPGTT) prior to the study. Once metabolic syndrome was confirmed, obese mice were randomly assigned to 4 groups receiving treatments by intraperitoneal injections (n=8/group): saline (controls; OB), dextran (Dex), free saroglitazar (Free), and dextran-conjugated saroglitazar (Conj). Lean control mice (Lean; n=8) were injected with saline. Treatments lasted for 4 wk, with IP injections every other day. BW and food intake were recorded. IPGTT were performed every 2 wk. At the end of the study, major organs were weighed, and serum was collected for metabolites and liver enzymes. Adipose depots, liver and kidney tissues were collected for histopathology and gene expressions analysis.

**RESULTS:** Over 4 wk, mice in OB (6.57%) and Dex (5.77%) groups gained BW. Saroglitazar treatment, however, reduced (P<0.05) BW, whether it was Free (-0.68%) or Conj (-4.26%). BW loss in the Conj group was linked with improved metabolism, with Conj mice having lower (P<0.05) IPGTT area under the curve than other obese groups and similar to Lean. At sacrifice, subcutaneous and perirenal adipose depot weights were lower in Conj than OB mice. Serum ALT was lower (P<0.05) in the Free group than the Dex group, but AST and AST:ALT ratio were not changed in obese groups. Serum triglyceride concentrations were similar among all groups.

**CONCLUSIONS:** Nanocarrier dextran-conjugated saroglitazar improved weight loss and metabolism in DIO mice, serving as a promising drug candidate in treating obesity and type 2 diabetes.

**Offering weekly weight loss charts with short messages decreases attrition rate during follow-up study****Mindy H. Lee**<sup>1</sup>, A.L. Shaffer<sup>1</sup>, N.W. Alfouzan<sup>2</sup>, J. Yu<sup>2</sup>, J. Hsu-Lumetta<sup>1,3</sup>, J.M. Liechty<sup>1,3,4</sup>, M.T. Nakamura<sup>1,2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*<sup>3</sup> *Carle Illinois College of Medicine, University of Illinois, Urbana, IL*<sup>4</sup> *School of Social Work, University of Illinois, Urbana, IL*

**INTRODUCTION:** The Individualized Diet Improvement Program (iDip) was developed for sustainable weight management that emphasizes self-experimentation to increase protein and fiber density while reducing caloric intake, and daily weighing. At 12 months, participants in the first trial (iDip 1) lost 5.4% (1.7) (mean (SEM)); however 6 out of 12 enrollees dropped out and two participants regained weight. In iDip 2, we hypothesized that providing weekly messages on weight charts would result in decreased attrition and improved maintenance of weight loss compared to iDip 1.

**METHODS:** Twenty-two participants who completed the 1-year intervention entered the 12 months follow-up phase (iDip 2) while twelve completers in iDip 1 entered the 6 months follow-up phase. Participants receive weekly weight charts as visual feedback along with short messages provided by dietitians in iDip 2 while iDip 1 participants received only monthly weight charts. Anthropometric measures include daily self-weights, waist circumference, and body composition every 6 months. At least 5% of the initial body weight is considered medically significant. No monetary compensation was made.

**RESULTS:** The attrition rate during follow-up phase was 9% in iDip 2 and 50% in iDip 1. In iDip 2 (n=20), mean body weight loss at 12 months from baseline was -5.8% (1.1). Nine participants achieved weight loss >5% of initial body weight at 12 months. Although a significant increase (p<0.05) by 1.5% (0.7) in mean body weight (n=20) at 21 months from 12 months was observed, eleven participants (55%) maintained their lost weight. Seven participants achieved weight loss >5% and maintained the lost weight successfully; one continued to maintain at a BMI <25 kg/m<sup>2</sup>. Two participants regained the lost weight at 21 months. Skeletal muscle mass was maintained with a mean change of -1.1kg (0.3) (n=14) at 15 months. Waist circumference at 15 months significantly decreased (p<0.05) from baseline by -8.9 cm (1.0) (n=14).

**CONCLUSIONS:** Offering weekly weight charts along with short messages yielded a lower attrition rate over the previous study. Our study demonstrated a minimal weight gain during follow-up, indicating participants well-maintained the lost weight.



**Meeting nutrition and physical activity guidelines at 24-months-of-age is associated with executive function****Arden L. McMath**<sup>1</sup>, N.A. Khan<sup>1,2</sup> & S.M. Donovan<sup>1,3</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Kinesiology and Community Health, University of Illinois, Urbana, IL*<sup>3</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*

**INTRODUCTION:** Executive function (EF) and its constructs, cognitive flexibility (F), inhibitory self-control (ISC), emergent metacognition (EM), have been linked to overweight in older children. However, few studies have investigated toddler-aged children, when rapid neurophysiological development occurs. We hypothesized that the American Academy of Pediatrics (AAP) obesity prevention guidelines for toddlers would provide a useful framework for optimizing EF. Herein, the relationships between weight status, adherence to AAP guidelines and EF at 24 mo was examined.

**METHODS:** Parents and 24-mo-old children (N=246) were recruited from the STRONG Kids 2 cohort study. Weight-for-length z-scores (WFLz) were computed and weight status classified per WHO standards. Parents completed the Behavioral Rating Inventory of Executive Function for Preschoolers (BRIEF-P) to assess EF and reported physical activities per week (Sports, Play, and Active Recreation for Kids Survey), dietary intake (Block Food Frequency Questionnaires), and screen time (Common Sense Media Survey). Toddlers met AAP recommendations if they consumed at least 5 servings of fruits and vegetables (FV), were physically active (PA), refrained from sugar-sweetened beverages (SSB) and limited screen time (ST) to less than 60 min per day.

**RESULTS:** Using age- and sex-standardized scores, toddlers ranged between the 43rd and 46th percentile of EF, ISC, F and EM. 43% of toddlers were at risk of overweight or overweight/obese. Most toddlers met recommendations for PA (66%), ST (50%) and SSB (62%), but only 4% met FV recommendations. There was no significant difference in BRIEF-P based on weight status or FV recommendation adherence. Toddlers that met guidelines for limiting SSB had higher EF (mean difference= -0.329, p= 0.013), ISC (-0.206, p= 0.015) and EM (-0.406, p= 0.018) than those not meeting the guidelines. Toddlers who were physically active had higher EM (-0.235, p= 0.027) than those who were not physically active every day of the week.

**CONCLUSION:** Being physically active every day and abstaining from SSB may be of significance for improving EF in toddlers.



**Finasteride reduces total cholesterol in LDLR-deficient mice****Patrick McQueen**<sup>1</sup>, I. Pinos<sup>1</sup>, J. Amengual<sup>1,2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL*<sup>2</sup> *Department of Food Science and Human Nutrition, University of Illinois at Urbana-Champaign, Urbana, IL*

**INTRODUCTION:** Androgen imbalance is associated with cardiovascular disease risk, but the exact impact on lipid and glucose profile is unknown. Finasteride (FIN) prevents the conversion of testosterone to its active metabolite dihydrotestosterone (DHT) by inhibiting the type II 5 $\alpha$ -reductase. Our objective is to examine the impact of FIN on cardiovascular disease risk. We hypothesize that FIN delays the progression of atherosclerosis by ameliorating hyperglycemia and dyslipidemia.

**METHODS:** We used the low-density lipoprotein receptor (LDLR)-deficient (*Ldlr*<sup>-/-</sup>) mouse model as a widely regarded model of atherosclerotic plaque development in rodents. Four-week-old male mice (n = 9-15/group) were fed a Western-diet containing 41% fat + 0.3% cholesterol with increasing doses of FIN (10mg/kg, 100mg/kg, and 1000mg/kg diet) for 12 weeks. Littermates fed Western-diet without FIN were used as a control group. A week before tissue harvest, mice were subjected to a glucose tolerance test (GTT). At the end of the experiment, mice were sacrificed, and their tissue and body weights were analyzed. A total cholesterol assay was performed at 0, 4, 8, and 12 weeks.

**RESULTS:** We examined prostate size, whose growth is DHT dependent, as an indicator of the effect of finasteride in our experimental model. We observed a dose-dependent effect of FIN on prostate size for all the doses (P<0.0001), indicating FIN had a physiological impact on these mice. No changes in food intake or circulating transaminase levels were observed, discarding any evidence of food intolerance or hepatic toxicity. FIN did not alter GTT among experimental groups or any other biometric parameter. However, we observed a significant reduction in body weight gain in the high dose group (P=0.0027) in comparison to the other experimental groups. Total cholesterol levels at the time of the sacrifice were significantly reduced in the high dose group (P<0.0001) in comparison to the other experimental groups. Future experiments will include atherosclerotic plaque characterization of both size and composition.

**CONCLUSIONS:** Our findings suggest that a high dose of FIN is associated with a reduction of total plasma cholesterol and body weight in *Ldlr*<sup>-/-</sup> mice.

**Investigating the intestinal-specific role of SHP in bile acid metabolism****James T. Nguyen**<sup>1</sup>, R.R. Riessen<sup>1</sup>, T. Zhang<sup>1</sup>, C. Kieffer<sup>1</sup>, and S. Anakk<sup>1,2</sup><sup>1</sup> Department of Molecular and Integrative Physiology, University of Illinois at Urbana-Champaign, Urbana, IL<sup>2</sup> Division of Nutritional Sciences, University of Illinois at Urbana-Champaign, Urbana, IL

**INTRODUCTION:** Bile Acid (BA) is an essential physiological detergent synthesized in the liver and secreted into the intestine to help digest and absorb dietary lipids and nutrients. After aiding in digestion, BAs are reabsorbed and recycled back to the liver in a process called enterohepatic recirculation. Nuclear receptor called Small Heterodimer Partner (SHP) plays a fundamental role in coordinating this process. Although extensively studied in the liver, the role for SHP has not been elucidated in the intestine. Therefore, we generated and characterized the intestinal-specific *Shp* knockout (*IShpKO*) mice.

**METHODS:** We challenged the control Floxed *Shp* (*f/f Shp*) and *IShpKO* with 1% Cholic Acid (CA) diet for 5 days, fasted the mice for 6 hours, and then collected the liver and the intestine. Total RNA and protein were extracted from the tissues to undergo qRT-PCR and western blot analyses to assess essential BA transporters and regulators. BA assay was done to assess BA concentration, and tissues were stained with alcian blue to observe intestinal structural integrity and measure goblet cell numbers. 3-D imaging was also done by tissue clearing ileal samples and staining them for Wheat Germ Agglutinin (WGA) and Mucin-2 (MUC2).

**RESULTS:** The gross phenotype (i.e. body weight change, liver-to-body weight ratio, intestinal length) was not altered with the loss of SHP have but higher intestinal BA levels than the *f/f Shp* control group and no difference in hepatic and serum BAs. Deletion of *Shp* altered ileal BA transporters ASBT and OST $\alpha/\beta$  both at the mRNA and protein level. Interestingly, although hepatic BA transporter genes were not altered, BA synthetic genes, *Cyp7a1* and *Cyp8b1*, were not repressed to the same extent as the *f/f Shp* group. Alcian blue staining revealed heterogeneity in ileal villi length and crypt depth. Goblet cell markers, *Tff3* and *Muc2*, were also altered, which correlated to the change in goblet numbers in *IShpKO* mice. 3D imaging showed lower WGA(+) cells per villus which also supports that goblet cell numbers are altering when intestinal SHP is not present.

**CONCLUSIONS:** *IShpKO* male mice under excess CA diet showed heterogeneity in their villi morphology despite no difference in overall gross phenotype. Goblet cell numbers were altered as shown in both 2D and 3D imaging, which suggests SHP may play a role in barrier function. Essential ileal BA transporters were altered under CA diet, which may contribute to the increased BA concentration in the intestine. The mRNA expression of *Fgf15*, an ileal enterokine, was significantly downregulated in *IShpKO*, which indicates that intestinal SHP may have a role in liver metabolic regulation.

**Long-term eating behavior in metabolic surgery****Jessica Nicanor Carreon**<sup>1</sup>, M. B. Acevedo<sup>2</sup>, J. Zeng<sup>2</sup>, B. Rowitz<sup>1,3,4</sup>, M. Y. Pepino<sup>2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Food Science and Human Nutrition, University of Illinois, Urbana, IL*<sup>3</sup> *Carle Illinois College of Medicine, Urbana, IL*<sup>4</sup> *Department of Surgery, Carle Foundation Hospital, Urbana, IL*

**INTRODUCTION:** Metabolic surgeries, such as Sleeve Gastrectomy (SG) and Roux-Y-Gastric Bypass (RYGB), are the most effective treatment for severe obesity. Both SG and RYGB surgeries are associated with decreased food cravings, reduced influence of emotions and external food cues on eating behavior, and remission of food addiction signs during the first months post-surgery. However, it remains unclear whether these changes in eating behavior last beyond one year after surgery.

**METHODS:** Using a cross-sectional study design, we assessed food cravings and behavioral aspects of food consumption (restraint, emotional and external eating, and food addiction) in 23 participants before metabolic surgery (PRE-surgery; 43.6 ± 11.3 years) and 36 participants after the first postoperative year (3.5 ± 1.6 years; range 1.1-6.9 years) (> 1-year POST-surgery; 43.3 ± 9 years). Participants completed three validated questionnaires: 1) Food Craving Inventory, 2) Dutch Eating Behavior Questionnaire, and 3) Yale Food Addiction Scale, and we compared their responses to those of a historical group evaluated before and after a few months from surgery.

**RESULTS:** Although the influence of external food cues on eating behavior was decreased in the > 1-year POST-surgery (2.8 ± 0.6) compared to the PRE-surgery (3.2 ± 0.7) group (p=0.02), the frequency of food cravings (high fat PRE: 1.8 ± 0.6, high fat POST: 1.9 ± 0.5, carbohydrates PRE: 1.9 ± 0.7, carbohydrates POST: 1.9 ± 0.6, sweets PRE: 2.5 ± 0.9, sweets POST: 2.4 ± 0.8, fast food PRE: 2.6 ± 0.7, fast food POST: 2.4 ± 0.8; p=0.83), the influence of emotions on eating behavior (PRE: 2.8 ± 1, POST: 2.5 ± 0.9; p=0.27), and the percentage of participants with food addiction signs (PRE: 17%, POST: 22%; p=0.75) were similar between these two groups (and comparable to our historical values obtained before surgery).

**CONCLUSIONS:** The findings of this pilot study suggest that the improvements in eating behavior observed in the first year after metabolic surgery are not long-lasting. However, longitudinal studies are needed to confirm these results.

**Sweetness perception in habitual and non-habitual users of low-calorie sweeteners – a pilot study****Clara Salame**<sup>1</sup>, S. Petty<sup>2</sup>, A. Albareedi<sup>2</sup>, G. Balto<sup>2</sup>, Y. Yang<sup>2</sup>, B. Rowitz<sup>3</sup>, M.Y. Pepino<sup>1,2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*<sup>3</sup> *Carle Foundation Hospital, Urbana, IL*

**INTRODUCTION:** Although previously considered to be metabolically inert, growing evidence suggest that low-calorie sweeteners (LCS) have potential detrimental effects on glucose control. A possible mechanism by which LCS might do so is by altering sweetness perception since taste perception can affect glucose metabolism. The objective of this study was to test the hypothesis that habitual LCS consumption is associated with decreased sweetness sensitivity and decreased intake of added sugars.

**METHODS:** Habitual (n=8) and non-habitual (n=16) consumers (i.e. >5 or <1 diet soda or LCS equivalent product per week) completed a battery of tests. We assessed glucose detection thresholds using a 2-alternative forced-choice staircase procedure, sweet taste intensities of suprathreshold concentrations using the general labelled magnitude scale, sweet preferences using the Monell 2-series, forced choice tracking procedure, and cravings for sweet foods and sugar intake using validate questionnaires.

**RESULTS:** Compared to non-habitual, habitual LCS consumers had a higher glucose detection threshold (33.9±7.1 vs 61.4±9.9 mM, p<0.04) and tended to consume more added sugars, particularly sucrose (p=0.05) in the past month. However, groups did not differ in their frequency of food cravings, sweetness intensity perception or most preferred glucose or sucralose concentrations.

**CONCLUSIONS:** These preliminary data partially support our hypothesis of a reduced sweetness sensitivity in habitual LCS consumers: on average, they required an 80% increase in glucose concentration to detect a taste compared to non-habitual consumers. However, sweetness intensity perception at suprathreshold concentrations was not different between the groups. Far from displacing caloric sweeteners in the diet, habitual LCS consumption was associated with higher added sugar intake.

## Scaffolding protein IQ motif containing GTPase activating protein 2 regulates liver metabolic homeostasis

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**INTRODUCTION:** The liver maintains energy homeostasis by regulating metabolic signaling pathways. Scaffold proteins are well known to coordinate many signaling cascades. IQ Motif Containing GTPase Activating Protein 2 (IQGAP2) is a scaffold protein predominantly expressed in the liver and its role in metabolism has been implicated. SNP variants in IQGAP2 gene are associated with diabetes and IQGAP2 depleted mice have perturbed metabolic homeostasis. We thus examined IQGAP2's role in hepatic metabolism.

**METHODS:** Adult wild type and *Iqgap2*<sup>-/-</sup> mice were fed ad libitum or fasted for 24 hours (9.00 am, or ZT4) and both sexes were used in this study to determine for sex differences in metabolism. Livers were harvested and their gross morphology was examined using histological staining. Enzymatic assays were used to measure hepatic triglyceride and glycogen content. Liver tissues were analyzed with qRT-PCR and western blots to quantify mRNA and protein expression of key enzymes regulating metabolic pathways. To further investigate the role of IQGAP2 in regulating metabolism, we modulated IQGAP2 expression in liver cell lines and examined kinases involved in insulin signaling response.

**RESULTS:** We found the deficiency of IQGAP2 did not alter gross morphological features, liver-to-body weight ratio, or white adipose tissue (WAT) weight in males. However, female *Iqgap2*<sup>-/-</sup> mice had reduced hepatosomatic index compared to their wild-type counterparts. Furthermore, male *Iqgap2*<sup>-/-</sup> mice did not show pronounced differences in metabolic gene expression or fuel accumulation. In contrast, female *Iqgap2*<sup>-/-</sup> mice had decreased expression of genes involved in lipogenesis and glycogen synthesis. Our preliminary data suggest female *Iqgap2*<sup>-/-</sup> mice have defective nutrient storage. The two main hepatic fuel stores are glycogen and triglycerides. These hepatic stores were reduced in female *Iqgap2*<sup>-/-</sup> mice. Histological analysis of hepatic glycogen accumulation in the fed state showed distinct pericentral zonation. Consistent with this result, female *Iqgap2*<sup>-/-</sup> livers displayed reduced protein expression of glycogen synthesis regulators, GSK3 and GYS2. Knockdown of IQGAP2 in vitro also decreased GYS2 expression with a blunted insulin signaling response upon IQGAP2 depletion.

**CONCLUSIONS:** Taken together, these data suggest a novel role for IQGAP2 in regulating hepatic fuel storage in the fed state, especially glycogen levels. Our data also indicate IQGAP2 can modulate hepatic metabolism in a sex-dimorphic manner.

**Minority and Immigrant Nutrition Education (MINE) program: an online and cooking-focused approach to nutrition education****Annabelle Shaffer**<sup>1</sup>, S. Flesch<sup>2</sup>, K. Miller<sup>2</sup>, A. Oliveira<sup>1</sup>, B. Mueller<sup>3</sup>, MT. Nakamura<sup>1,2</sup><sup>1</sup> *Division of Nutritional Sciences, University of Illinois, Urbana, IL*<sup>2</sup> *Department of Food Science and Human Nutrition, University of Illinois, Urbana, IL*<sup>3</sup> *Immigrant Services of Champaign-Urbana*

**INTRODUCTION:** People who immigrate to the United States frequently arrive with a lower body mass index and better health. Still, with time, immigrants suffer from overweight and obesity and the related co-morbidities such as diabetes. Change in eating habits is the primary driver in this weight increase as immigrants likely followed a healthy diet in their home country but are now exposed to the high sugar and fat diets typical of high-income countries. The Minority and Immigrant Nutrition Education Program (MINE) seeks to provide early nutrition education via cooking classes to local families that immigrated from Guatemala.

**METHODS:** MINE is a six week, before and after pilot study that will occur March-April 2021. With assistance from Immigrant Services Champaign-Urbana, we will recruit up to 50 parent-child dyads from the Shadow Wood mobile home park, where many target families live. Parents and their children will be provided online bilingual cooking videos and nutrition information and the corresponding food items via the private Facebook page and food deliveries, respectively. Parents and children will each complete a survey at baseline and week six. Outcome measures are overall liking of MINE and changes in food patterns, attitudes, cooking, and eating behaviors.

**RESULTS:** Results are forthcoming. We anticipate small, positive shifts in dietary quality and attitudes towards cooking.

**CONCLUSIONS:** We anticipate these results will guide future virtual outreach programs to underserved communities and provide an early intervention that promotes maintaining a healthy diet and in turn, a healthy weight.



## Assessing the spatial reach of a nutrition incentive program in a large urban center

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**INTRODUCTION:** Low-income communities throughout the U.S. continue to experience limited access to affordable healthy foods. Nutrition incentive programs exist to provide low-income families a monetary resource to make healthy food more affordable and accessible. Many of these programs target participants of federal nutrition assistance programs (e.g. SNAP, WIC) and operate at farmers' markets. This study aimed to use geo-spatial analysis to evaluate availability of a nutrition incentive program in Chicago, IL (Link Match) to determine if nutritionally at-risk communities have adequate access.

**METHODS:** Link Match is the largest nutrition incentive program in Illinois; it provides SNAP recipients a one-to-one dollar match (up to \$25) if they redeem their benefits at a participating retailer. We obtained 2018 spatial data on census tract-level socio-demographic characteristics and Link Match locations in Chicago, IL from a variety of sources including the City of Chicago, U.S. Census Bureau, and the Environmental Protection Agency. We found 57 retailers (e.g., farmers markets, food cooperatives) that offered Link Match across the city's 801 census tracts. We examined spatial lag and ordinary least squares (OLS) regression models to identify tract-level measures associated with distance (in miles) from the nearest Link Match retailer. Measures of interest included % non-Hispanic Black, % Hispanic, median household income, violent crime rate, per capita grocery store availability, and walk score.

**RESULTS:** Most of the retailers that offered Link Match were located on Chicago's south and west sides. OLS regression models indicated that census tracts with a higher walk score or median household income below the city's median in 2018 were on average closer in distance to a Link Match retailer (both  $p < 0.001$ ). However, census tracts in the highest quartile of violent crime rate were also significantly closer to a Link Match retailer ( $p < 0.001$ ). After accounting for spatial dependency of census tracts, only violent crime rate was significantly associated with distance to the nearest Link Match retailer.

**CONCLUSIONS:** Link Match retailers in Chicago, IL appear to be located in areas of need with large populations of nutritionally at-risk families. However, these areas have high violent crime rates, which may deter program usage.





