University of Illinois Urbana-Champaign
College of Agricultural, Consumer & Environmental Sciences | Division of Nutritional Sciences

2025 NUTRITION SYMPOSIUM

THE POWER OF EVERY PLATE

APRIL 16, 2025

UNIVERSITY OF ILLINOIS URBANA-CHAMPAIGN

College of Agricultural, Consumer and Environmental Sciences

Nutritional Sciences

NSGSA
Nutritional Sciences Graduate Student Association

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 2025 Nutrition Symposium at the University of Illinois Urbana-Champaign!

The Nutrition Symposium is an important event for sharing ideas across disciplines and with the community. Started in 1994 by NSGSA, the symposium offers graduate students with nutrition-related research on campus an opportunity to present prior to annual national and international scientific meetings and conferences. 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. Angela Odoms-Young deliver the keynote address. Additionally, NSGSA is proud to highlight the work of the University's faculty members through a mini-symposium. This year's presentations focus on the theme of "The Power of Every Plate" and will include Dr. Krystal Hodge from Food Science & Human Nutrition; Dr. Saima Hasnin from Food Science & Human Nutrition; and Dr. Paul McNamara from Agricultural & Consumer Economics.

We are grateful to the many people involved with this meeting and program. We would first like to thank our keynote speaker, Dr. Odoms-Young. 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 Steering Committee 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 it a success.

The Nutritional Sciences Graduate Student Association Chair and Chair-Elect

nutritionalsciences.illinois.edu

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2025 NUTRITION SYMPOSIUM SCHEDULE

Wednesday, April 16, 2025 | Student Dining and Residential Programs Building (SDRP)

8:15 - 8:50 AM — **Welcome Breakfast**
2025A, SDRP
Sponsors, presenters, DNS students/faculty/staff invited

8:50 - 9:00 AM — **Break**

9:00 - 10:00 AM** — **Oral Session 1: *Nutrient Metabolism and Dietary Patterns
2025C, SDRP
9:00 – 9:15 AM: Amparo Blanco Cirer
9:15 – 9:30 AM: Benjamin Levine
9:30 – 9:45 AM: Marahi Perez-Tamayo
9:45 – 10:00 AM: Nadine Veasley

10:00 - 10:15 AM — **Break**

10:15 - 11:15 AM** — **Oral Session 2: *Feeding the Mind
2025C, SDRP
10:15 – 10:30 AM: Jordan Rindels
10:35 – 10: 50 AM: David Alvarado
10:55 – 11: 10 AM: Tori Holthaus

11:15 - 11:45 AM — **Outstanding Faculty Award Presentation**

11:45 AM - 12:45 PM — **Sponsor Network Lunch**
2025A, SDRP- Sponsors, presenters, DNS students invited; RSVP required

12:45 - 2:45 PM** — **Faculty Symposium: *The Power of Every Plate
2025C, SDRP

2:45 - 3:00 PM — **Break**

3:00 - 3:45 PM — **Speed Mentoring**
2025C, SDRP - Sponsors, DNS students/faculty/staff invited

3:45 - 4:00 PM — **Break**

***4:00 - 5:00 PM** — **Keynote Address - Dr. Angela Odoms-Young, Cornell University**
2025C, SDRP

5:00 - 5:15 PM — **Break**

***5:15 - 6:45 PM** — **Graduate Student Poster Session**
2025B, SDRP - Sponsors, presenters, DNS students/faculty/staff invited
Evening Reception; Award Announcements

* Open to general public

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 at the University of Illinois Urbana-Champaign.

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.

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NSGSA Steering Committee photographs by Andrea Paola Mallea Ortiz

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SESSION JUDGES

Oral Session 1: Nutrient Metabolism & Dietary Patterns

MC: Stephanie Okoye

Judge: Dr. Michael Miller
Judge: Dr. Diego Hernandez-Saavedra

Oral Session 2: Feeding the Mind

MC: Jessica Paola Acosta Medellin

Judge: Dr. Ornella Camiletti
Judge: Dr. Diego Hernandez-Saavedra

POSTER SESSION

Judge: Dr. Christopher Kinder
Judge: Dr. Shelby Keye
Judge: Dr. Matthew Dean
Judge: Dr. Jacob Allen
Judge: Dr. Su A Lee
Judge: Dr. Brett Loman

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STUDENT ORAL SESSION 1:

NUTRIENT METABOLISM AND DIETARY PATTERNS

9:00 - 10:00 AM

2025C, SDRP

STUDENT ORAL SESSION 2:

FEEDING THE MIND

10:15 - 11:15 AM

2025C, SDRP

FACULTY MINI SYMPOSIUM:

THE POWER OF EVERY PLATE

12:45 - 2:45 PM

2025C, SDRP

Saima Hasnin; MS, PhD
Krystal Hodge; MPH, PhD
Paul E. McNamara; MPP, PhD

GRADUATE STUDENT POSTER SESSION

5:15 - 6:45 pm

2025B, SDRP

See poster session Floor plan map on page 34

PRESENTING AUTHORS

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 2025 Nutrition Symposium.

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KEYNOTE SPEAKER

Angela Odoms-Young, PhD

Cornell University, Associate Professor, Department of Anthropology

Angela Odoms-Young, PhD (she/her/hers) is The Nancy Schlegel Meinig Associate Professor of Maternal and Child Nutrition, Director of the Food and Nutrition Education in Communities Program (FNEC) and New York State Expanded Food and Nutrition Education Program (EFNEP). Her research centers on understanding the social and structural determinants of dietary behaviors in low-income populations and black, indigenous, and people of color and identifying culturally appropriate programs and policies that promote health equity, food justice, and community resilience. Dr. Odoms-Young has over 20 years' experience partnering with communities to improve nutrition and health and she has served on numerous advisory committees and boards including the Institute of Medicine committees to revise the food packages provided for WIC, and the Council on Black Health. Dr. Odoms-Young also currently serves as the inaugural Equity Visiting Scholar at Feeding America.

ABSTRACT

Dietary behaviors are a major contributor to the chronic disease burden in the United States and play a vital role in shaping population health outcomes. Promoting healthy eating patterns requires more than individual-level interventions but policy approaches that address the social, economic, and environmental conditions influencing food choice. Although strong evidence links healthy eating to the prevention of chronic disease and improved quality of life, structural barriers—particularly among historically marginalized and under-resourced communities—continue to limit access to affordable, nutritious foods. Policy supports are critical for translating dietary guidance into population-level impact by shaping food environments, strengthening food and nutrition assistance programs, regulating food marketing, and guiding institutional practices across schools, workplaces, and healthcare settings. Realizing the goal of "nutrition for all" demands an equity-driven policy framework that addresses the structural determinants of health and ensures equitable access to healthy food across all communities, regardless of race, income, or geography. This presentation will examine the critical role of policy in aligning national dietary goals with the lived realities of diverse populations and will explore how the application of targeted universalism can advance nutrition equity. By tailoring universal goals with targeted strategies, this approach offers a pathway to building a healthier, more just, and inclusive food system.

FACULTY MINI-SYMPOSIUM
THE POWER OF EVERY PLATE

Abstracts and Biographies

Nutrition Programs at Food Pantries to Increase Access to Nutritious Foods

Krystal Hodge, MPH, PhD

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

ABSTRACT: In 2023, 13.5% of U.S. households faced food insecurity in the previous year. Lack of consistent access to quality food is associated with increased risks for obesity, hypertension, and other nutrition-related health issues. When food resources are limited, emergency food systems such as food banks and food pantries are a vital resource, proving foods that can supplement overall dietary intake. In 2020, 6.7% of U.S. households reported using a food pantry in the past year, and estimated use may vary within regions. Food pantries receive donations that mainly consist of shelf-stable items; however, more and more food pantries are broadening efforts to include fresh food items to increase access to healthy food and to decrease nutrition-related health risks. This presentation will describe strategies used in two studies to promote healthy choices at food pantries. First, a randomized parallel group educational study (N=613) was implemented to provide on-site product nutritional information through a ranking system to food pantry clients. Multiple linear regression models estimated the effect of the intervention on food choices made that day, accounting for potential confounders. The second strategy to be described is an ongoing effort to increase access to fruits and vegetables during the growing season in food pantries. These strategies represent two different approaches to encourage nutritious food choices and to increase access to healthy foods.

BIOGRAPHY: Dr. Krystal Hodge is an Assistant Professor in the Department of Food Science and Human Nutrition and Division of Nutritional Sciences. She is also an Extension Specialist with outreach activities involving the development and dissemination of evidence-based educational programs and materials tailored to audience needs and preferences. Her educational background includes a Master of Public Health in Health Education from Emory University and a PhD in Human Nutrition from Johns Hopkins Bloomberg School of Public Health. Her research interests include dietary patterns and disease prevention, nutrition education and community nutrition programs to improve food environments and nutrition security for low-income people in rural and urban areas on health. Through her work, she strives to increase the understanding the impact of community and policy-level initiatives to increase access to healthy foods on dietary intake and health.

Does a Poverty Graduation Program provide a protective effect on food security in the face of rainfall shocks and climate variations? Evidence from Northern Zam

Paul E. McNamara; MPP, PhD

Department of Agricultural and Consumer Economics and the Division of Nutritional Sciences at the University of Illinois at Urbana-Champaign

ABSTRACT: We study the quasi-experimental rollout of a poverty graduation program in Northern Zambia (Manyinga and Mufumbwe Districts) to ascertain the effect on food insecurity and dietary diversity of the program in the context of an agricultural season where rains were insufficient. Working with our NGO partner, World Vision, we follow their program intended to help lift vulnerable poor families out of deep poverty through a mix of interventions. We have four arms in our study: 1. A control arm receiving no program treatment; 2. A treatment arm receiving a Water, Sanitation, and Hygiene intervention combined with an intervention for improving livelihoods, and an psychosocial intervention intended to promote actions associated with moving out of poverty; 3. A treatment arm receiving the intervention for improving livelihoods, and an psychosocial intervention intended to promote actions associated with moving out of poverty; and, 4. A treatment arm receiving the intervention for improving livelihoods. A baseline survey was fielded before the program was launched in these communities. A survey fielded two years later allows us to determine the impact of the different treatment arms of the poverty graduation program on a dietary diversity measure, a food insecurity measure, and annual food spending. We find a statistically significant improvement in dietary diversity and a reduction in food insecurity attributable to the treatment arm including the WASH, Livelihoods, and Worldview intervention. Weak or no impacts were found for the other two program arms.

BIOGRAPHY: Paul E. McNamara is a Professor in the Department of Agricultural and Consumer Economics and the Division of Nutritional Sciences at the University of Illinois at Urbana-Champaign. He also serves as an Adjunct Professor at Njala University in Sierra Leone (Department of Agribusiness). He directs the AgReach Program (www.agreach.illinois.edu), a program of development action and research aimed at reducing gaps in agrisystems in order to promote smallholder farmers. Dr. McNamara also serves as Director for the ADM Institute for the Prevention of Postharvest Losses (https://postharvestinstitute.illinois.edu/). His research, outreach, and teaching efforts are in the areas of extension, rural development, sustainability, agricultural development, nutrition and food security. McNamara holds a PhD from the Department of Applied Economics at the University of Minnesota and an MPP from the Harvard Kennedy School. McNamara has extensive experience working to strengthen private sector, NGO, public sector, and other extension programs and partnerships. He has served as an Extension Specialist with University of Illinois Extension. He has directed more than five significant awards (USAID-funded) that work to improve extension (understood pluralistically) and have had activities in more than 50 countries and benefiting more than 14 million farmers through strengthenedservices. With the ADMI and AgReach team, he conducts research and outreach activities at the present time in Indonesia, Honduras, Zambia, Angola, Cameroon, Sierra Leone, and Honduras. McNamara has published research in leading agricultural economics and extension journals including the American Journal of Agricultural Economics, Food Policy, Ecological Economics, the Journal of Agricultural Education and Extension, the Journal of International Agricultural and Extension Education and others.

The Power of Every Plate

Saima Hasnin; MS, PhD

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

ABSTRACT: Early childhood is a critical period for establishing healthy and sustainable dietary behaviors with lifelong benefits. Childcare settings play a pivotal role in shaping children's nutrition, as more than 66% of U.S. preschoolers attend childcare daily, consuming up to three meals and snacks in these environments. To support young children's nutritional health and enhance diet quality, the USDA's Child and Adult Care Food Program (CACFP) provides childcare nutrition guidelines and reimburses meal costs to childcare providers serving eligible children from low-income households. My research focuses on strengthening the effectiveness and sustainability of CACFP while developing evidence-based strategies to improve children's diet quality in childcare settings. As part of my ongoing research and Extension activities, I am developing a toolkit to educate childcare providers about plate waste in CACFP-participating settings and strategies to reduce it using a community-based participatory method. After the toolkit development and dissemination, I will assess plate waste in childcare environments and evaluate alternative milk-serving strategies to assess their effectiveness in minimizing milk waste in childcare settings.

BIOGRAPHY: Dr. Saima Hasnin is an Assistant Professor and Extension Specialist in the Department of Food Science and Human Nutrition at the University of Illinois Urbana-Champaign. Before joining the University of Illinois, she has completed her PhD in Human Sciences with a specialization in Early Childhood Development. She also has a master's in nutrition and food science. Dr. Hasnin is a dedicated researcher focused on promoting childhood nutrition and evaluating policy, system, and environment affecting the nutrition environment in early childcare settings. Her research expertise includes novel dietary assessment validation, psychometric survey evaluation, and systematic reviews and meta-analyses. Her work bridges research and practice to improve early childhood nutrition security and prevent childhood obesity through evidence-based interventions, interdisciplinary collaboration, and community-based approaches.

GRADUATE STUDENTS ORAL SESSION ABSTRACTS

ORAL SESSION 1: NUTRIENT METABOLISM & DIETARY PATTERNS

Dietary beta-carotene promotes atherosclerosis resolution and reduces liver inflammation in mice

Amparo Blanco[1], Paula Mapelli[1], Sanjana Tamane[2], Asma'a Albakri[1], Ivan Pinos[1], Walter C. Monroy[2], Jaume Amengual[1,2]

[1]Division of Nutritional Sciences, University of Illinois Urbana-Champaign, Urbana, IL
[2]Department of Food Science and Human Nutrition, University of Illinois Urbana-Champaign, Urbana, IL

INTRODUCTION: Atherosclerosis is the underlying cause of cardiovascular disease, contributing to millions of deaths globally. Recent studies suggest that beta-carotene may promote atherosclerosis resolution by reducing macrophage infiltration and local inflammation in atherosclerotic lesions. Based on these findings, we hypothesize that beta-carotene supplementation during atherosclerosis resolution could also mitigate liver steatosis and inflammation.

METHODS: In this study, we performed a secondary analysis examining liver samples from two experimental models of atherosclerosis resolution. Mice were fed a vitamin A-deficient Western diet (41% fat, 0.3% cholesterol). After 12 or 16 weeks on the diet, we harvested a subset of mice (Baseline). The remaining mice were divided into a Control group (continuing on the original diet) or a beta-carotene group (supplemented with 50 mg/kg of beta-carotene).

RESULTS: Beta-carotene supplementation resulted in reduced fat and macrophage content in the liver compared to the Baseline and Control groups. These effects were abolished in mice lacking beta-carotene oxygenase 1 (BCO1), indicating that the observed effects are dependent on vitamin A formation. No significant changes were observed in adipose tissue lipid or macrophage contents.

CONCLUSIONS: Our findings suggest that dietary beta-carotene may have a dual effect in alleviating both atherosclerotic plaque and liver inflammation during atherosclerosis resolution in mice.

Individual gastrointestinal motility responses to acute whole-grain ingestion mediate post-prandial nutrient metabolism

Benjamin A. Levine[1], Jordan E. Rindels[1], Brett R. Loman[1,2]

[1]Division of Nutritional Sciences, University of Illinois Urbana-Champaign, IL
[2]Department of Animal Sciences, University of Illinois Urbana-Champaign, IL

OBJECTIVES: Whole grains (WG) offer an array of dietary fibers, including fructan, arabinoxylan, and beta-glucan, which consistently contribute to improved cardiometabolic and digestive health across different studies and populations. Despite this, postprandial responses to whole grain consumption vary widely among individuals, which cannot be fully attributed to genetics, meal macronutrient composition, and microbiome composition. Individual patterns of gastrointestinal motility (GIM) – the key physiological parameter coupling nutrient digestion and absorption to the postprandial appearance of nutrients in circulation – may account for much of the variability in postprandial nutrient metabolism. This randomized, controlled, balanced, crossover clinical trial investigated the effect of acute whole grain and refined grain (RG) ingestion on individual GIM patterns and postprandial responses.

METHODS: Equal numbers of male and female participants (N=34, aged 20–59) underwent acute feeding of 4.3 oz of WG (12g total fiber) and RG (3g total fiber) rye bread, each served with 0.7 oz butter and water ad libitum. Participants completed a 12-hour overnight fast before each feeding and underwent a one-week washout between bread treatments. Within each treatment, GIM metrics (transit time, luminal pressure, pH) were measured by SmartPill motility capsules in tandem with blood metabolites (glucose, HDL, LDL, triglycerides, total cholesterol) measured by portable capillary blood analyzers. The fecal sample containing the SmartPill was collected and evaluated for stool consistency. Participants fasted during an 8-hour postprandial period, with blood metabolites measured at 10 time-points: Baseline, 0.5, 1, 1.5, 2, 3, 4, 5, 6, and 8 hours. Following the 8-hour blood sampling period, participants were instructed to break their fast by returning to their habitual dietary pattern.

RESULTS: Total blood glucose was lower with WG vs RG (Time $p > 0.0001$, Meal $p = 0.0003$). WG elicited a lower mean colonic pressure compared to RG ($p = 0.09$). Colonic pressure was positively correlated with total cholesterol ($r = 0.40$, $p = 0.02$). WG elicited a greater whole-gut transit time in females vs males ($p = 0.02$). RG had no differences in whole-gut transit time across sexes ($p = 0.80$). Greater whole-gut transit time was mainly driven by a sex-by-meal (bread type) interaction in colonic transit time ($p = 0.01$). These findings were supported by a strong negative correlation between colonic transit time and stool consistency in female participants ($r = -0.78$, $p = 0.0003$).

CONCLUSIONS: These data provide initial evidence that sex-by-meal interactions modulate GIM, particularly colonic pressure and colonic transit time. Ongoing investigations are assessing relationships between GIM and postprandial responses by assessing participants' habitual nutrient intake, perceived stress exposure, microbiome composition, and stool metabolites with the long-term goal of recognizing which factors contribute most to GIM, and thus, the postprandial response to a meal.

Microbial and metabolic impact of walnut consumption in adults with obesity

N. Marahí Pérez-Tamayo[1], Maggie Oleksiak[2], David Revilla[2], Andrew T. Askow[3], Takeshi M. Barnes[3], Max T. Deutz[3], Jason Ridlon[1,4], Nicholas A. Burd[1,3], and Hannah D. Holscher[1,2]

[1]Division of Nutritional Sciences,
[2]Department of Food Science and Human Nutrition,
[3]Department of Health and Kinesiology, and
[4]Department of Animal Sciences, University of Illinois, Urbana Champaign

OBJECTIVES: We aimed to determine the impact of walnut consumption on the gut microbiome, serum and fecal bile acid profiles, systemic inflammation, and oral glucose tolerance to a mixed-meal challenge.

METHODS: Adults (n=30) with obesity (BMI > 37 + 6 kg/m2; 43.7 + 11.3 y) without diabetes or gastrointestinal diseases were enrolled in a randomized, controlled, crossover, complete feeding trial with three 3-wk conditions, each identical except for walnut halves (WH), walnut oil (WO), or corn oil (CO) in the diet. A 3-wk washout separated each condition. Fecal samples were collected on days 18-20. On day 20, participants underwent a 6h mixed-meal tolerance test (75g glucose + treatment) with a fasting blood draw followed by blood sampling every 30min. Fecal microbiome and microbiota were assessed using metagenomic and amplicon sequencing, respectively. Fecal microbial metabolites were quantified using GC/MS. Blood glucose, insulin, and inflammatory biomarkers (IL-6α, TNF, CRP, and LBP) were quantified. Fecal and circulating bile acids were measured via LC-MS/MS. Gut permeability was assessed by quantifying 24h urinary excretion of orally ingested sucralose and erythritol on day 21. Statistical analysis used linear mixed-effects models and repeated measures ANOVA.

RESULTS: Roseburia spp. were greatest following WH (3.9 ± 0.6%) vs WO (1.6 ± 0.3%) and CO (1.9 ± 0.01%); Lachnospiraceae UCG-001 and UCG-004 were also greatest with WH vs WO and CO. WH fecal isobutyrate concentrations (5.41 ± 0.59 µmol/g) were lower than WO (7.17 ± 0.62 µmol/g) and CO (7.77 ± 0.72 µmol/g). Fecal isovalerate concentrations were lowest with WH (7.84±0.93 µmol/g) vs WO (10.3±0.99 µmol/g) and CO (11.6 ± 1.11 µmol/g). Indoles were highest in WH (36.8 ± 7.86 µmol/g) vs WO (6.78 ± 7.20 µmol/g) and CO (8.67 ± 9.54 µmol/g). There were no differences in glucose concentrations among groups. Insulin 2h AUC was lower with WH (469 ± 51.9 µIU/mL/min) and WO (494 ± 62.6 µIU/mL/min) vs CO (604 ± 57.5 µIU/mL/min) while glycolithocholic acid 4h AUC was lower with WH vs WO and CO. Sucralose recovery was lowest following WH (10.5 ± 1.2%) vs WO (14.3 ± 1.5%) and CO (14.6 ± 1.4%).

CONCLUSIONS: Walnut modified the fecal microbiota and metabolome, improved insulin response, and reduced gut permeability. Further bile acid and microbiome analyses are ongoing.

FUNDING AND ACKNOWLEDGEMENTS: USDA NIFA grant no. 2020-67017-30836/project accession no. 1021932

Fiber's Utilization for Energy and Life (FUEL): A randomized, controlled feeding trial assessing metabolizable energy of the diet with and without high fiber cereal

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

OBJECTIVES: Our primary objective was to evaluate dietary metabolizable energy with and without high-fiber cereal. Secondary objectives included evaluating the effects of the high-fiber cereal on the gut microbiota. We hypothesized that including a high-fiber cereal would reduce the metabolizable energy of the diet.

METHODS: Healthy adults (n=19) participated in a double-blind, randomized, controlled, crossover study with two experimental conditions (2 wks each) separated by a 2-wk washout. The study was a fully controlled feeding intervention with the same base diet consumed in each experimental condition, scaled such that participants remained weight stable; the base diet was supplemented with either 3 servings/d (282 total kcal) of a low (1 g) or high (30 g) fiber cereal. After a 9-d acclimation period, participants collected all urine and fecal samples produced over 5 d. Combustible energy, protein, fat, and total dietary fiber were measured in composite samples of the diet and feces; urine was analyzed for combustible energy and nitrogen. Metabolizable energy and apparent digestibility coefficients were calculated. Amplicon (V4) sequencing was conducted to characterize the fecal microbiota. Fecal microbial cells (qPCR) and protein (BCA assay) were quantified. Fecal bile acids were measured using LC-MS/MS. Participants completed daily compliance logs and GI symptom and bowel habit questionnaires.

RESULTS: 17/19 participants completed the study per-protocol. Fecal output was 40% (as-is basis) and 66% (dry matter basis) greater in the fiber condition. Urinary energy excretion did not differ between conditions; however, fecal energy excretion was greater in the fiber condition than control (221.8 vs. 143.0 kcal/d; $P<0.01$). The apparent total tract digestibility of fat was lower in the fiber condition compared to the control (92.6 vs. 93.5%, $p=0.04$). In the fiber condition, fecal microbial protein ($p=0.01$) and microbial cells were greater ($p=0.07$). GI tolerance symptoms did not differ between conditions.

CONCLUSIONS: Consuming a high-fiber cereal impeded fat digestibility and increased total fecal energy excretion. Fecal output, microbial cells, and microbial protein were greater in the fiber condition. The high-fiber cereal was well tolerated by participants.

Funding and Acknowledgments: The Bell Institute of Health and Nutrition, General Mills Inc.

GRADUATE STUDENTS ORAL SESSION ABSTRACTS

ORAL SESSION 2: FEEDING THE MIND

Gut-brain neuronal co-activation networks are altered by acute ileal GABA exposure

Jordan E. Rindels[1], Brett R. Loman[1,2]

[1]Division of Nutritional Sciences, College of ACES, University of Illinois at Urbana-Champaign,
[2]Department of Animal Sciences, College of ACES, University of Illinois at Urbana-Champaign

INTRODUCTION: Poor diet quality is associated with the onset of both gastrointestinal (GI) and central nervous system (CNS) disorders such as depression and anxiety. Nutrition may be an effective therapeutic option for individuals with GI and CNS disorders given their high comorbidity. The microbiota-gut-brain axis is influenced by diet, and is a central mediator of GI and CNS disorders, providing one possible explanation for high co-occurrence of these diseases. Data from our lab indicate that consumption of dietary fiber enhances gut microbial synthesis of the neurotransmitter GABA, which may be beneficial in the treatment of several CNS disorders where reduced GABA signaling is common. However, it is difficult to parse the physical effects of fiber from the effects of microbial metabolites on gut-brain signaling. Models that independently manipulate these effects can therefore be utilized to better understand these phenomena. Therefore, this study utilizes a mouse surgical model to examine the effects of luminal GABA injection on behavior and gut-brain communication.

METHODS: Male C57BL/6 mice (age 6-8 weeks, N=12, n=3) were randomized to receive injection of one of the following GABAergic metabolites directly to the ileal lumen: saline control (SAL), 0.2 mM GABA, 5.44 mM bicuculline (BIC, GABAA receptor antagonist), and 17.53 mM muscimol (MUSC, GABAA receptor agonist). Injection concentrations were calculated so treatments would have similar biological activity. Mice were anesthetized via isoflurane inhalation, a small medial incision was made to the abdomen, and respective injections were given 4 centimeters upstream of the ileal-cecal junction, and the incision was closed with sterile sutures. Mice recovered in individual cages for 4 hours prior to a 10-minute open field behavioral test, from which individual behaviors and an overall anxiety-like behavior z-score were scored. Brain (amygdala (AMG), cerebellum (CEB), hippocampus (HIP), hypothalamus (HYP), medulla (MED), prefrontal cortex (PFC)) and intestine (cecum (CEC), distal colon (DC), ileum (ILE), proximal colon (PC)) were collected following behavioral testing for expression of cFOS via qPCR.

RESULTS: Across all injection groups: DC cFOS expression was negatively correlated with 3 brain regions: AMG ($p = 0.020$, $r = -0.67$, CEB ($p = 0.028$, $r = -0.64$), MED ($p = 0.063$, $r = -0.56$), PFC ($p = 0.01$, $r = -0.73$). PC cFOS was negatively correlated with AMG ($p = 0.099$, $r = -0.50$), HIP ($p = 0.059$, $r = -0.57$) and positively correlated with HYP ($p = 0.080$, $r = 0.53$). The following correlations existed within treatment groups: SAL: ILE-PC ($r = 0.034$, $r = 1.0$), ILE-MED ($p = 0.073$, $r = -0.99$), PC-MED ($p = 0.040$, $r = -1.0$); BICUC HIP-PFC ($p=0.034$, $r = 1.0$); MUSC: ILE-CEC ($p=0.032$, $r = 1.0$), ILE-PC ($p = 0.090$, $r = 0.99$); GABA: CEC-CEB ($p = 0.043$, $r = -1.0$), CEC-MED ($p = 0.014$, $r = -1.0$), DC-PC ($p = 0.025$, $r = -1.0$), HIP-HYP ($p = 0.01$, $r = -1.0$). BICUC increased anxiety-like behavior z-score compared to SAL ($p = 0.047$) and GABA ($p = 0.13$).

CONCLUSIONS: Acute ileal luminal exposure to GABA influences enteric and central nervous system neuronal activity. Correlations may highlight important neural networks moderating the gut-brain axis; however, further work is needed to understand this network's influence on GI and CNS disorders.

Effects of soluble corn fiber consumption on cognitive function and gastrointestinal Microbiota

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INTRODUCTION: This study evaluated the effects of soluble corn fiber (SCF) on cognition, gastrointestinal (GI) microbiota composition, and fermentation end-products, with pre-defined aims to investigate GI microbiota-dependent mechanisms by which SCF consumption may underpin cognitive performance.

METHODS: This randomized, double-blind, crossover trial included 42 healthy adults (45-75 yr) who consumed maltodextrin (CON, 22 g/d) or SCF (18 g/d) for 4 weeks, with a 4-week washout in counterbalanced order. Outcome assessments included cognitive control, GI microbiota, and metabolome, with exploratory in vitro and genomic analyses identifying microbial species and genes facilitating SCF fermentation in the full cohort and in select responders and non-responders.

RESULTS: SCF consumption improved response times (RT) for congruent ($P=0.002$) and incongruent ($P<0.001$) flanker tasks. Faster congruent RT was correlated with higher fecal acetate ($\rho=-0.33$, $P=0.048$) and propionate ($\rho=-0.36$, $P=0.03$). SCF also enriched Parabacteroides abundance (FDR $P<0.001$), which correlated with acetate ($\rho=0.34$, $P=0.04$) and propionate ($\rho=0.27$, $P=0.1$). In vitro culturing confirmed P. distasonis (Pd) growth (log OD600/hr) with SCF, comparable to glucose and maltodextrin. Linear models for differential abundance (LinDA) analysis with PICRUSt2 predicted metagenome identified enriched carbohydrate metabolism pathways following SCF consumption (FDR $P<0.05$), while microbiome multivariate association with linear models (MaAsLin) revealed 2,701 differentialy associated KEGG orthologs (KO), including carbohydrate-active (CA) KOs (FDR $P<0.05$). Shotgun metagenomic confirmed CA gene families linked to Pd in responders.

CONCLUSIONS: SCF consumption improved attentional inhibition and increased Parabacteroides abundance. In vitro culturing confirmed Pd utilization of SCF. Acetate and propionate correlated with Parabacteroides and inversely with flanker response times.

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Feasibility of a MIND diet protocol with remote meal delivery: A randomized controlled pilot trial

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OBJECTIVES: While the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) may reduce dementia risk in older adults, randomized controlled trials (RCT) assessing the effects of the MIND in middle age are limited. This pilot study assessed the feasibility and acceptability of a remotely delivered MIND intervention and explored its effects on nutritional status, cardiometabolic risk, and cognitive function compared to a control.

METHODS: Healthy adults (N = 48, 45-64 y) were enrolled in a 12-week, single-blind RCT. The intervention consisted of a daily meal containing key MIND foods (e.g., berries, greens) shipped to homes plus dietary education. The control group received isocaloric meals aligned with the Dietary Guidelines for Americans plus education. Feasibility was assessed via retention and compliance, acceptability via questionnaire, and nutritional status via skin and macular carotenoids. Cardiometabolic risk was assessed using waist circumference, blood pressure, and fasting blood glucose, triglycerides, and HDL. Cognitive function was evaluated using a modified Eriksen flanker task. Outcomes were measured pre- and post-intervention. Mixed-effects models analyzed group and time effects with participant intercepts as random effects.

RESULTS: Participants (N=39 [MIND=21, control=18], 36% male) aged 53.2 ± 4.9 y completed the study. The intervention showed high feasibility (87.5% retention and compliance) and acceptability (100% found meals easy to prepare, 85.7% liked the diet and found it low effort). There was a time x group interaction effect for skin carotenoids ($F=6.29$, $P=0.016$) with only the MIND group increasing ($\mu d=56.13$, $P<0.001$). There was a time x group interaction effect for flanker accuracy interference, an index of poorer ability to maintain cognitive control with varied difficulty levels ($F=4.58$, $P=0.039$) with non-significant decreases in the MIND ($\mu d=-0.58$, $P=0.228$) and increases in the control ($\mu d=0.89$, $P=0.082$). No group differences were observed for macular carotenoids, cardiometabolic risk, or flanker reaction time.

CONCLUSIONS: The MIND remote meal RCT was feasible and acceptable. Further, the MIND demonstrated benefits for nutritional status and cognitive control relative to the control.

TRIAL REGISTRATION: ClinicalTrials.gov identifier: NCT06437860

GRADUATE STUDENTS POSTER SESSION ABSTRACTS

POSTER SECTION: MICROBIOME, GUT HEALTH, AND METABOLISM

Metagenomic estimation of dietary intake from human stool using MEDI

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INTRODUCTION: Nutrition intervention studies rely on participant dietary adherence, which is frequently a self-reported measure. Biological samples, including stool, provide objective biomarkers of dietary intake that can complement self-reported data. Herein, we evaluated the ability of the Metagenomic Estimation of Dietary Intake (MEDI) pipeline to detect foods consumed as part of a complete feeding trial.

METHODS: Dietary and fecal metagenomic data from a complete feeding study with a 7d menu cycle were utilized. Healthy adults (n=28) participated in a randomized, controlled, crossover trial with three 21-day dietary conditions that were identical except for the inclusion of walnuts, walnut oil, or corn oil in the diet. Participants provided 2 fecal samples between days 18–20 of each dietary condition. Following fecal DNA extraction, shotgun genomic DNA sequencing was conducted using a NovaSeq X Plus. Metagenomic shotgun sequence data were analyzed using the MEDI pipelines for recovering food abundances, including mapping items to FOODB and quantifying food DNA. Binary and continuous read counts of detected foods were analyzed.

RESULTS: MEDI detected varying proportions of consumed foods across the 7d menu cycle: 72% on Day 1 (13/18 foods), 67% on Day 2 (12/18 foods) and Day 3 (10/15 foods), 89% on Day 4 (8/9), 86% on Day 5 (12/14 foods), 69% on Day 6 (9/13 foods), and 73% (11/15 foods) on Day 7. Commonly detected foods included turkey, lettuce, onion, peas, and celery. Walnut DNA was detected in 55% of samples during the walnut condition. Walnut oil and corn oil were not among the foods identified in the dataset.

CONCLUSIONS: MEDI effectively profiled dietary intake from human fecal microbiome data, demonstrating robust detection of whole foods but limited sensitivity to highly processed foods like oils. The frequent detection of whole plant-based foods may be attributed to their raw consumption, which supports DNA durability throughout digestion, resulting in food-based DNA detectability within the stool. MEDI can be used to generate objective dietary biomarkers that can complement self-reported dietary data, thereby supporting diet-microbiome research.

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Persea americana for Total Health 2 (PATH-2): Effects of avocado intake on gastrointestinal and cognitive health

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

METHODS: This study utilized a randomized-controlled crossover complete feeding design with 3 dietary periods (AA, AV, and OF). All diets provide 20%, 35% and 45% of energy from protein, fat and carbohydrates, respectively. Relative to the AA group, the AV and OF provide greater MUFA and fiber. The OF group received a snack that mimicked the fiber and MUFA profile of avocados. Each 4-week diet period was separated by a 2-week washout. Weight-stable adults (25-74 y) without diabetes with overweight or obesity (BMI > 25 kg/m2) were eligible for enrollment. Fecal, blood, and urine samples were collected during week 4 of each condition. Fecal microbiome will be assessed through shotgun metagenomic sequencing. Fecal metabolites (SCFA, branched chain fatty acids [BCFA], ammonia, phenols, and indoles) will be measured with GC/MS. Fecal bile acids will be quantified via LC-MS/MS. Other measures of gastrointestinal health will include tolerance, stool consistency, and fecal pH. ELISA will be used to measure systemic inflammatory cytokines (IL-6, TNF-alpha, LPS-BP, and CRP) and fecal inflammatory markers (IgA and calprotectin). Gut permeability will be assessed by quantifying urinary excretion of orally ingested rhamnose, mannitol, and sucralose. Urinary excretion between 0-2hrs and 8-24hrs reflect predominantly small intestine and colonic permeability, respectively. Lastly, neuropsychological performance will be evaluated by administering the NIH toolbox and neuroelectric function will be assessed using event related potentials (ERPs) during a modified Eriksen Flanker task.

RESULTS: 57 participants were randomized with 43 participants completing all three study conditions as per protocol.

CONCLUSIONS: The findings of this study will highlight the impact of daily avocado consumption on gut microbiome composition and gastrointestinal health, anti-inflammatory responses and cognitive function.

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Herbal extract supplementation as a functional ingredient in canine health

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INTRODUCTION: Herbal extracts have gained popularity for their functional properties due to their phenolic compounds and phytochemicals. Humans have a long history of utilizing these herbal extracts and their phytochemicals for their medicinal properties, including antioxidant, antimicrobial, and digestive health promoting effects. The objective of this study was to determine the effects of different inclusion rates of an herbal extract mixture (cinnamon, tea, and pomegranate hydrogenated vegetable oil) on blood chemistry, apparent total tract digestibility (ATTD) of macronutrients, and fecal metabolites and microbiota in adult canines.

METHODS: This study used a complete randomized design with 32 canines fed a complete and balanced chicken and rice diet formulated to meet the nutritional requirements of adult canines (AAFCO, 2024) containing different inclusion rates of the herbal extract mixture: Control (0 ppm), Diet 1 (100 ppm), Diet 2 (200 ppm), Diet 3 (400 ppm). The total experimental period was 56 days, with the first 7 days as diet adaptation to the Control diet prior to baseline collections. Total fecal collection was performed on days 10-14 and days 31-35, while fresh fecal and blood samples were collected on days 0, 14, 21, 35, and 49. An antibiotic challenge was performed on days 14-21. Food was given once per day to maintain body weight and body condition score.

RESULTS: A quadratic effect was observed for ATTD of dry matter (DM), organic matter (OM), total dietary fiber (TDF), and gross energy (GE). Dogs fed Diet 1 had the highest digestibility in DM, OM, TDF, and GE ($P < 0.03$) compared with other treatments before the antibiotic challenge. In addition, Diet 1 and Diet 2 had the highest OM and TDF digestibility ($P < 0.009$) compared with other treatments considering pre and post-antibiotic challenge measurements. Serum alanine aminotransferase (ALT) concentration differed among treatment and day ($P=0.0025$), with the highest in the Control treatment on Day 49 and lowest in the Control treatment on Day 0. Complete blood count showed a significant interaction between treatment and day ($P=0.0205$) for lymphocyte percent with the Control treatment on Day 21 having the highest and the Control treatment on Day 35 and Diet 2 on Day 0 having the lowest concentrations. Fecal score and pH did not differ among treatment groups ($P>0.05$). However, fecal metabolites differed among treatments. Indole was highest in the Control treatment ($P=.0.0047$) with a linear contrast ($P=0.0437$), and 7-Methylindole and total indole was highest in Diet 1 ($P<0.05$). Alpha and beta-diversity ($q < 0.05$), as well the abundance of Fusobacteriaceae, Selenomonadaceae, Holdemanella, Na.17, and Blautia_glucerasea in the fecal microbiota ($P<0.05$), decreased in response to the antibiotic challenge ($P<0.05$).

CONCLUSIONS: In conclusion, this herbal extract mixture was well tolerated and accepted by dogs and had positive effects on nutrient digestibility and fecal metabolite concentrations.

Age-related changes in intestinal Sphingolipid metabolism and microbiota-dependent lipid absorption

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INTRODUCTION: Aging is a degenerative process linked to increased inflammation and dysfunction of the intestinal epithelial barrier, which may impact nutrient absorption in the rapidly growing elderly population. Emerging evidence suggests that disruptions in intestinal host-microbiota crosstalk involving sphingolipids may precede the decline in immune function and intestinal nutrient absorption observed with aging, but the mechanisms associated with this disruption remain poorly defined. Given the pivotal role of intestinal sphingolipids in regulating lipid metabolism and inflammation, we propose that age-related inflammation and reduced barrier integrity are linked to alterations in host-microbiota sphingolipid metabolism.

METHODS: We utilized liquid chromatography and mass spectrometry-based lipidomics to identify colonic digesta lipid alterations with aging in C57BL/6 mice, comparing young mice (three to four months old) with aged mice (eighteen to twenty months old). Small intestinal expression of fatty acid synthesis and trafficking genes, including fatty acid synthase (Fasn), acetyl-CoA carboxylase two (Acc2), elongation of very long chain fatty acids protein six (Elovl6), cluster of differentiation thirty-six (Cd36), and apolipoprotein B (ApoB), was assessed. We also analyzed sphingolipid metabolism genes, including serine palmitoyltransferase long chain base subunit one (Sptlc1), serine palmitoyltransferase long chain base subunit two (Sptlc2), ceramide synthase two (Cers2), ceramide synthase four (Cers4), ceramide synthase six (Cers6), 3-ketodihydrosphingosine reductase (Kdsr), delta 4-desaturase sphingolipid one (Degs1), and delta 4-desaturase sphingolipid two (Degs2). Additionally, we examined immune cell infiltration markers, toll-like receptor four reactivity, and the effects of broad-spectrum antibiotic cocktail treatment.

RESULTS: Gut sphingolipid metabolism was robustly altered with aging, characterized by the accumulation of numerous sphingolipids and ceramides. Among sphingolipid metabolism genes, ceramide synthase six (Cers6) was significantly higher in the small intestine of young mice, suggesting a greater synthesis of barrier ceramides that declines with age. Higher accumulation of sphingolipids in digesta was strongly associated with immune cell infiltration markers such as calprotectin and increased toll-like receptor four reactivity in both intestinal mucosa and feces. Antibiotic cocktail treatment in aged mice led to a robust accumulation of digesta triglycerides after a washout period, indicating a heightened lipid malabsorptive phenotype with aging. This disruption was associated with an inability to recover microbiome structure and persistent toll-like receptor four immunogenicity of the digesta.

CONCLUSIONS: Our findings align with previous studies showing greater sphingolipid accumulation in intestinal tissues with aging and emphasize the role of gut microbiota in maintaining intestinal lipid homeostasis. We demonstrate that aging and antibiotic cocktails disrupt intestinal lipids, which may underlie the chronic inflammatory milieu and reduced barrier integrity. Future studies are needed to understand how aging disrupts intestinal host-microbiota lipid metabolism and nutrient absorption.

Exercise training induces a hepatic memory associated with improved glucose control and hepatic secretory function

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INTRODUCTION: Metabolic dysfunction-associated fatty liver disease (MAFLD) is a global healthcare challenge. While increasing physical activity through exercise is considered a powerful therapy against MAFLD, its long-term effects on liver function remain unclear. This study aimed to investigate how exercise elicits hepatic memory, hypothesizing that exercise training cycles enhance long-term liver function and metabolic health, which persist after exercise cessation and are amplified with retraining.

METHODS: Here, 8-week-old male mice were fed a control diet and assigned to endurance-(voluntary wheel running; VWR) or resistance-based training (progressive weighted wheel running; PoWeR), or were sedentary (SED) and monitored throughout successive training (4 weeks), detraining (4 weeks), and retraining cycles (4 weeks). In vivo glucose homeostasis and hepatic function were assessed at each time point. We proposed that resistance-based training would yield superior metabolic outcomes.

RESULTS: Both endurance (VWR) and resistance training (PoWeR) groups maintained lower body weight throughout training cycles, compared to SED, and following retraining, both training modalities resulted in fat mass reductions and increased lean mass, with PoWeR showing superior effects. While VWR only improved glucose tolerance (GTT) after retraining, PoWeR training robustly enhanced glucose (GTT) and pyruvate tolerance (PTT, and indirect marker of hepatic function) following training and retraining. Next, we studied the hepatic transcriptional adaptations (RNA-seq) and identified an upregulation of genes associated with hepatic secretory functions (Herpes simplex) following retraining including ~70 zinc finger protein (Zfp). Moreover, we identified that endurance retraining induced a group of hepatic carboxylesterases (Ces2b, Ces3b, Ces4a), which play a key role in complex lipid clearance from circulation. Greater liver expression of carboxylesterases was associated with higher serum carboxylesterase enzymatic activity (assessed by substrate cleavage). Additionally, PoWeR mice showed higher hepatic Ces2b expression and CES activity, particularly after training, further supporting the role of exercise in enhancing hepatic secretary function.

CONCLUSIONS: Our findings indicate that exercise induces a hepatic memory that is potentiated by retraining and may be associated with glucose regulation and lipid metabolism. Notably, resistance-based training persistently enhanced the hepatic glucoregulatory function. Our study highlights the powerful effect of exercise as a targeted intervention for improving long-term metabolic health in MAFLD.

GRADUATE STUDENTS POSTER SESSION ABSTRACTS

POSTER SECTION: DIETARY INTERVENTIONS

Feasibility, acceptability, and initial outcomes: A pilot study of a three-month online dietary weight-loss program in Saudi Arabia

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INTRODUCTION: Obesity is a global concern, and Saudi Arabia faces a particularly high prevalence, with projections of up to 57% by 2035. This study aimed to evaluate the feasibility, acceptability, and initial outcomes of a three-month online dietary weight-loss program.

METHODS: A single-group, pre-post design was used to assess the intervention. Adults with a BMI ≥ 25 kg/m^2 were recruited from King Abdullah Medical City (KAMC) in Saudi Arabia. The three-month program included daily weight tracking via a Wi-Fi scale, weekly online sessions, and nutrition coaching by a dietitian. Feasibility was assessed through recruitment, retention rates, session attendance, adherence to weight logging, and dietary data collection. Acceptability was evaluated through surveys and an exit survey to gather participant satisfaction and suggestions for improvement. Program outcomes were measured by anthropometric measurements and dietary intake changes, assessed through 24-hour dietary records and food frequency questionnaires (FFQs).

RESULTS: Eighteen participants enrolled, with a 94% retention rate (N=17) at three months. All participants successfully accessed the apps for session attendance. Feasibility was demonstrated with a 6% dropout rate. Session completion rates showed 47% completed all 12 sessions, and 65% completed at least 75% of sessions. Daily weight monitoring showed 76% logged their weight for 60% of study days. Anthropometric measurements were completed by 100% at baseline and 88% at three months. Acceptability was high, with 88% finding the website easy to use and 76% satisfied with the program. Significant reductions were achieved in weight (-1.63 kg), waist and hip circumference. Dietary changes included a 36.4% reduction in calorie intake and a 65.9% increase in fiber density. Exit surveys (N=12) showed high satisfaction, with 67% recommending the program and 83% finding it enjoyable.

CONCLUSIONS: The three-month online weight-loss program was effective, well-received, and led to significant weight loss and diet improvements. Participants were satisfied, and their feedback will enhance a future program. Future studies should focus on refining enrollment criteria, addressing comorbidities, and examining long-term results for sustainability.

Palatability and post-prandial glycemic responses of breads enriched with soybean flour

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INTRODUCTION: Bread, a carbohydrate-rich staple food, is a primary calorie source in many regions worldwide but often lacks balanced nutritional value. This study aimed to address two key objectives: first, to determine whether replacing a portion of wheat flour with soy flour in bread, thereby increasing dietary protein, reduced postprandial blood glucose excursions without increasing insulin spikes in individuals with overweight or obesity. Second, to evaluate whether the modified bread maintains sensory appeal for consumers.

METHODS: Using a within-subject design, 10 adults (5 males, 5 females) without diabetes (age 32 years (SD 5); BMI 30.53 kg/m2 (SD 3.16)) participated in three study visits. In a quasi-randomized order, they consumed isocaloric portions of bread containing 0% (control), 10%, or 30% soy flour. Blood samples were collected via intravenous catheter before and at multiple intervals within two hours after bread consumption to measure plasma glucose and insulin concentrations. Participants also rated hunger, satiety, and product liking using visual analog scales.

RESULTS: Results showed a dose-response relationship between soy flour content and reductions in plasma glucose over time, peak plasma glucose, and glucose area under the curve (AUC) (all p values < 0.05) with no differences in insulin concentrations between bread conditions. The 30% soy flour bread significantly reduced peak glucose and AUC compared to the control bread ($p < 0.05$), while the values for the 10% soy flour bread were intermediate between the 0% and 30% soy flour. All breads were equally liked, and there were no differences in hunger or satiety ratings (all $p > 0.1$).

CONCLUSIONS: These findings suggest enriching bread with at least 30% soy flour may optimize metabolic benefits by reducing postprandial glucose spikes without compromising sensory appeal.

Peptides from adzuki bean (Vigna angularis) beta-vignin and soybean beta-conglycinin (Glycine max) revealed potential DPP IV inhibitory, antidiabetic and antilipogenic activity in vitro

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INTRODUCTION: Diabetes (T2D) is one of the four most significant noncommunicable diseases in the world and annually accounts for two million deaths. Studies reported that adzuki bean consumption can help manage T2D outcomes. More scientific research is needed to examine the role and potential of adzuki bean beta-vignin (AB7S) peptides in managing T2D. The objective was to compare the dipeptidyl peptidase IV (DPP IV) activity and to evaluate the antidiabetic and antilipogenic potential of AB7S and soybean beta-conglycinin (S7S) functional peptides in regulating hepatic glucose and lipid metabolism in vitro.

METHODS: Human liver cells (HepG2) were treated with either AB7S peptides or S7S at various concentrations or gliptin, a dipeptidyl peptidase IV (DPP IV) inhibitor. Peptide sequences were verified by RP-HPLC and ESI-MS. Cell viability (CV) was measured by MTS-CV and luminescence-based assay to determine DPP IV activity in the cells. A peptide interaction study was performed to investigate the role of peptides on synergistic, antagonistic, or additive DPP IV inhibition. Western blot was used to evaluate the protein expression of markers in the glucose uptake (GU) and lipogenesis (LG) pathways, such as IRS-1, Akt, GLUT 2, SIRT 1, and SREBP-1. ANOVA and post-hoc tests were conducted, and $p < 0.05$ was considered statistically significant.

RESULTS: AB7S peptides—Val-Pro (VP; 215 Da) and Pro-Met (PM; 247 Da)—and S7S peptides—Ile-Pro-Ala (IPA; 300 Da) and Leu-Leu-Ser (LLS; 332 Da) —were identified from the colonic digests. Peptide solubility of VP, PM, IPA, and LLS was ≥ 1 mg/mL in water. VP, PM, and IPA (1.78 nM-1.78 µM) did not affect CV of HepG2 cells, with no significant difference from the untreated cells ($p > 0.05$) while peptide LLS (1.78 µM) significantly decreased the CV (89%, $p < 0.05$). Peptide concentrations needed to inhibit the activity of DPP IV were 1.13 µM (PM; IC25), 0.72 µM (VP; IC50), 0.083 µM (IPA; IC50), and 0.03 µM (LLS; IC20). IPA treatment (1.78 µM) decreased the protein expression of SIRT-1 (~27%) and active-SREBP-1 (~19%) compared to the untreated cells. The ratio of active-SREBP-1/inactive SREBP-1 was 0.35, suggesting lower SREBP-1 activity after the IPA treatment. VP treatment (1.78 µM) increased the protein expression of Glut 2 (~34%) compared to the untreated cells while 0.08 µM gliptin, an FDA-approved diabetic medication, had an increase of ~78%.

CONCLUSIONS: Peptides derived from AB7S and S7S had potential health-enhancing properties via DPP IV inhibition. Compared to digested AB7S protein, tested peptides from AB7S and S7S were more effective in DPP IV inhibition. IPA was effective in suppressing the hepatic LG pathway while VP effectively enhanced the GU pathway, suggesting their effectiveness in modulating T2D-related markers. This may guide the production of adzuki bean-based ingredients that could help manage T2D.

Additive effects of 25-hydroxy-vitamin D3 and microbial phytase on digestibility of calcium and phosphorus, bone biomarkers and blood vitamin D3 metabolites in growing pigs

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INTRODUCTION: The objective was to test the hypothesis that vitamin D3 metabolite, calcifediol [25(OH)D_3] and microbial phytase have additive effects on the standardized total tract digestibility (STTD) of Ca and P, serum bone biomarkers, and plasma vitamin D_3 metabolites in growing pigs.

METHODS: Sixty barrows of 25 kg average were housed in metabolism crates and assigned to a randomized complete block design with three groups, 5 diets, and 12 replicates per diet. The positive control (PC) diet met Ca and P requirements for growing pigs. Four additional diets were formulated using a 2 × 2 factorial design with 75% of the required Ca and P. The factors included 25(OH)D_3 at either 0 or 50 mcg/kg and microbial phytase at either 0 or 500 FTU/kg, with a negative control (NC) diet without metabolites. Each period included a 5-day adaptation period followed by 4 days of total fecal collection. Blood samples were collected on days 1 and 13 to measure serum bone turnover biomarkers: bone alkaline phosphatase (BAP), osteocalcin and type 1 collagen (CTX1) and plasma: 25(OH)D3, 24,25(OH)2D3, and 1,25OH)2D3 concentration. Statistical model included diet as fixed variable. Contrast coefficients were used to determine the effects of Ca and P levels without metabolites, the effects of 25(OH)D3, the effects of microbial phytase, and the interaction between 25(OH)D3 and phytase.

RESULTS: indicated that the STTD of P was greater ($P < 0.05$) in the PC diet than in the NC diet, due to the source of P in PC diets has greater digestibility. The STTD of Ca and P were increased ($P < 0.001$) in pigs fed diets containing phytase. The STTD of Ca and P tended to increase ($P < 0.10$) with 25(OH)D_3 supplementation, but only in the absence of phytase. A trend interaction between 25(OH)D3 and phytase was observed for the STTD of Ca ($P < 0.01$), and a significant interaction ($P < 0.05$) was found for the STTD of P between 25(OHD3 and phytase. On day 13, osteocalcin levels increased ($P < 0.001$) with 25(OH)D_3 supplementation and ($P < 0.05$) with phytase, indicating enhanced osteoblast activity and stimulation of bone tissue synthesis. However, other bone biomarkers did not differ among treatments. Plasma 25(OH)D_3 levels increased ($P < 0.05$) with 25(OH)D_3 supplementation, confirming its role in elevating circulating vitamin D metabolites. Similarly, plasma 24,25$(OH)_2D_3$ increased ($P < 0.001$) with both 25(OH)D_3 and microbial phytase, potentially as a regulatory response to increased precursor availability. Plasma 1,25$(OH)_2D_3$ was higher ($P < 0.05$) in pigs fed the NC diet than in those fed the PC diet but decreased ($P < 0.001$) with microbial phytase supplementation, without indications of a reduction in vitamin D_3 precursor concentrations.

CONCLUSIONS: microbial phytase and 25(OH)D_3 increased Ca and P digestibility, as well as osteocalcin in serum of growing pigs. Vitamin D_3 status improved with 25(OH)D_3. However, no additive effects of 25(OH)D_3 and microbial phytase were observed in 25 kg growing pigs.

GRADUATE STUDENTS POSTER SESSION ABSTRACTS
POSTER SECTION: NUTRIENT MECHANISMS AND PHYSIOLOGICAL OUTCOMES

Vascular roads to a healthier brain: Carotenoids moderate the influence of arterial stiffness on cognitive function

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INTRODUCTION: Arterial stiffness, assessed via pulse wave velocity (PWV), is a marker of vascular aging that may contribute to cognitive decline. Serum carotenoids, known for their antioxidant and anti-inflammatory properties, may mitigate these effects. This study investigated: (1) the relationship between PWV and executive function, (2) the contribution of serum carotenoids in predicting PWV, and (3) the potential moderating effects of carotenoids on the PWV-executive function relationship.

METHODS: 71 adults between the ages of 19–75 (39.4±17.2 yrs, 72% female) were evaluated for carotid-femoral PWV using applanation tonometry, executive function via behavioral and event-related potential (ERP) measures during the Flanker and Go/No-Go tasks, and serum carotenoid levels (lutein, zeaxanthin, beta-carotene, lycopene, and cryptoxanthin). Multiple linear regression examined the relationship between PWV and executive function (adjusted for age, sex, BMI). Relative importance analysis identified key carotenoids associated with PWV, while moderation analysis tested whether carotenoids buffered the relationship between PWV and executive function.

RESULTS: Higher PWV was associated with slower P3 Peak latency during Go target trials (beta = 0.35, p = .02) and N2 peak latency during No-Go target trials (beta = 0.34, p = .03). Lycopene (relative importance = 47.7%), zeaxanthin (26.2%), and lutein (19.1%) were the strongest predictors of PWV. Serum lutein moderated the relationship between PWV and executive function, attenuating its adverse effects on congruent reaction time (beta = 0.48, p= .04) and P3 congruent peak latency (beta = 0.53, p= .04) during the Flanker task, as well as N2 peak latency during Go (beta = 0.52, p= .04) and No-Go (beta = 0.77, p= .001) target trials. Other carotenoids showed no significant moderation effects.

CONCLUSIONS: This study highlights the role of arterial stiffness on executive function, with serum lycopene, zeaxanthin, and lutein as key predictors of PWV. Lutein uniquely attenuated the adverse effects of PWV on reaction time and ERP measures, suggesting its potential to mitigate vascular-related cognitive impairments. Future intervention research is needed to test the effects of carotenoid-rich diets, particularly those high in lutein, on cognitive and vascular health in at-risk populations.

No conflict of interest or funding to report.

Endurance and resistance exercise muscle memory differentially impact muscle growth and mitochondrial \metabolism

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INTRODUCTION: Skeletal muscle is a highly plastic tissue that responds to specific stimuli, including different exercise modalities, which include endurance- or resistance-based training. This is of particular importance given the newfound interest in the muscle memory, or the the long-term, persistent adaptations to prior exercise training.

METHODS: Here, we aimed to investigate how exercise modalities differentially prime the muscle memory. Using novel endurance- (Voluntary Wheel Running; VWR) or resistance-based exercise protocols (PoWeR; progressive weighted VWR of up to 15g added weight), we probed the memory following successive 4wk-TRAINing, 4wk-DETRAINing, and 4wk-RETRAINing cycles. We hypothesize that prior exercise TRAINing induces mitochondrial adaptations resulting in muscle growth which persist through time and are potentiated to improve muscle function. We assessed body composition, muscle fiber type and size (immunofluorescence), transcriptomics (bulk RNA-seq), and protein levels (immunoblot) after each TRAIN, DETRAIN, and RETRAIN cycle.

RESULTS: Endurance (VWR) and resistance (PoWeR) TRAINing showed similar reductions in fat mass and comparable increases in adiposity after DETRAINing, but PoWeR RETRAINing resulted in greater body weight loss. Hindlimb muscles showed increased growth following RETRAINing, with VWR producing greater effect sizes in the tibialis anterior, gastrocnemius, and plantaris muscles compared to TRAINing alone. Importantly, both VWR and PoWeR similarly enhanced the growth of the soleus muscle following RETRAINing. Plantaris muscle fiber analysis showed PoWeR TRAINing increased fiber cross-sectional area (fCSA) in all fiber types, whereas VWR TRAINing only increased size of oxidative fibers. However, with RETRAINing, both VWR and PoWeR increased fCSA of oxidative and intermediate fibers. PoWeR, but not VWR, TRAINing altered fiber type distribution to more oxidative and less glycolytic fibers, which disappeared with DETRAINing and returned with RETRAINing. This is in line with our muscle transcriptomic analysis, showing a marked enhancement of nuclear-encoded mitochondrial genes after RETRAINing. Further, PoWeR TRAINing produced similar increases in fatty acid oxidation protein CPT1B and the oxidative phosphorylation complexes (OxPhos) but were reduced following RETRAINing. Conversely, VWR RETRAINing significantly increased expression of CPT1B and OxPhos complex IV, indicating diverging effects on mitochondrial protein abundance.

CONCLUSIONS: Altogether, our novel exercise training protocols resulted in similar muscle memory recall of prior exercise adaptations. The effects of PoWeR appear to be more intense than VWR, reducing body weight to a greater extent while maintaining lean body mass. Both exercise modalities result in similar muscle growth during TRAINing but differ during RETRAINing, with PoWeR having a greater impact on fiber distribution. These adaptations appear to be linked to diverging effects on mitochondrial metabolism which may be leveraged to enhance muscle health and function.

FUNDING: Funding was provided by the Center for Healthy Aging and Disability at the University of Illinois Urbana-Champaign.

Polyunsaturated fatty acid concentrations are reduced in the cerebral cortex of mice when fed an alpha-tocopherol deficient diet

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INTRODUCTION: Alpha-tocopherol (alpha-T) deficiency causes increased lipid peroxidation, the process by which reactive oxygen species attack membrane lipids, particularly polyunsaturated fatty acids (PUFAs) that are abundant in the brain. We utilize alpha-T transfer protein knockout (Ttpa-/-) mice that are unable to transport hepatic alpha-T to other tissues to deplete alpha-T in the brain. This study evaluated the impact of alpha-T deficiency on brain PUFA composition.

METHODS: Male wild-type (WT) and Ttpa-/- weanling littermates (n= 4-8/group) were fed an alpha-T-deficient diet (VED) or -sufficient diet (VES, 60 mg alpha-T acetate/kg) ad libitum for 9 weeks (Study 1). In addition, mice of the same genotypes were fed an alpha-T-deficient diet for 12 weeks (Study 2). Alpha-T in tissues was measured by HPLC. Brain lipids were extracted from the cerebral cortex, derivatized into fatty acid methyl esters, and quantified using GC-FID.

RESULTS: (Study 1) Concentrations of alpha-T in the brain, serum, and liver were significantly lower/undetectable in VED mice compared to VES mice, but genotype differences were only observed in the brain and serum. Arachidonic, adrenic, linoleic, and alpha-linolenic acid concentrations were significantly reduced in VED mice, with lower arachidonic, adrenic, and linoleic acid levels in WT mice. Docosahexaenoic acid concentrations trended lower in VED mice ($p=0.053$). (Study 2) Alpha-T concentrations in the brain, serum, and liver were significantly lower/undetectable in Ttpa-/- mice compared to WT mice. Docosahexaenoic acid was significantly reduced in Ttpa-/- mice, however no other differences in PUFA concentrations were observed.

CONCLUSIONS: Low alpha-T status negatively impacts the concentration of PUFAs in the murine cerebral cortex, especially in WT mice, which may be more responsive to changes in dietary alpha-T. Docosahexaenoic acid may be especially sensitive to changes in cerebral alpha-T concentrations, as evidenced by the reductions seen in both studies based on diet and genotype. The impact of alpha-T status on oxidative stress and inflammatory responses will be evaluated in future studies.

Enhanced dysplasia and elevated risk of colitis-associated colorectal cancer in hnRNPI knockout mice following AOM/DSS challenge

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INTRODUCTION: Colitis-associated colorectal cancer (CAC) is a subtype of colon cancer that arises from chronic inflammation in the colon, such as that seen in colitis. CAC develops through a multistep process, transitioning from inflammatory epithelium to dysplasia and eventually to malignancy. Knockout (KO) of the RNA-binding protein heterogeneous nuclear ribonucleoprotein I (hnRNPI) in epithelial cells in mice exacerbated inflammatory responses and led to the early onset of colitis. Single-cell RNA sequencing of the colon of hnRNPI KO mice demonstrated an increase in enteroendocrine cells in KO mice compared to WT mice. Since enteroendocrine cells are primary chemosensory cells that involve serotonin signaling, we hypothesize that disrupted serotonin and related tryptophan metabolism in the hnRNPI KO mice leads to the progression of colitis-associated colorectal cancer.

METHODS: Five-month-old wild-type (WT, n=7) and knockout (KO, n=8) mice were challenged with azoxymethane/dextran sulfate sodium (AOM:15 mg/kg BW; DSS:1% in drinking water) to amplify CAC progression further. Body weight, fecal consistency, and fecal blood were monitored daily. After 8 weeks of the challenge, induction, and recovery procedure, mice were euthanized, and tissues were collected. Colon sections were analyzed for histological and pathological changes. Inflammatory markers, proliferation, and colitis were assessed. Fecal metabolites were analyzed using metabolomics.

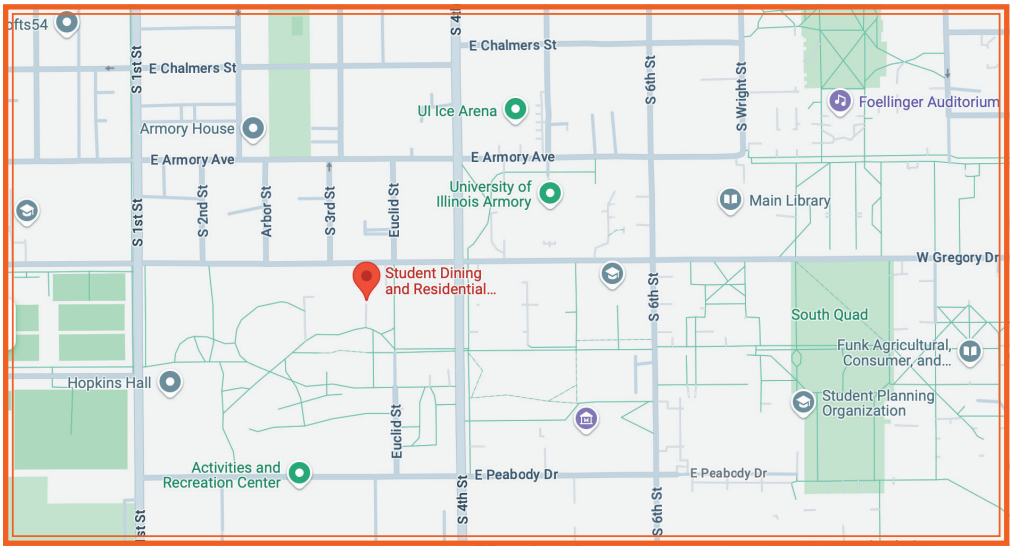
RESULTS: In the AOM/DSS-induced CAC model, KO mice exhibited several significant pathological changes compared to WT mice. KO mice showed shorter colon lengths (5.8±0.7 cm vs. 6.8±0.9 cm). The number of lymphoid nodules was higher in KO mice (1.8±0.3 average nodules number/section) than in WT (0.9±0.2 average nodules number/section) and marked with increase CD45 intensity in KO mice nodules than in WT mice. The dysplasia index was increased in KO mice compared to WT mice (1.2±0.1 vs. 0.7±0.1). Cellular proliferation was also elevated in KO mice, with higher Ki-67-positive cells (33±7.2 Ki67-positive-cells/area) than in WT (15±3.5 Ki67-positive-cells/area). β-catenin showed increased nuclear translocation in KO mice compared to WT mice (11.4±3.2 vs. 4.7±2.0 β-catenin-nuclear-translocation-positive cell number), indicating heightened activation of the Wnt/β-catenin signaling pathway in the epithelium. We also observed more GATA3-positive cells appeared in the lamina propria of KO mice (8.3±0.9 GATA3-positive-cells) than in WT mice (3.6±0.6 GATA3-positive-cells). KO mice also had more serotonin-positive cells (1.8±0.4 serotonin-positive cells/crypt) than WT mice (0.4±0.2 serotonin-positive cells/crypt). In addition, fecal metabolomic analysis revealed higher levels of indole-3-propionic acid and glycocholate and lower levels of tryptophan and indole lactic acid in KO mice, suggesting potential dysregulation of tryptophan metabolism that was associated with colon inflammation and CAC progression.

CONCLUSIONS: Our findings demonstrate that hnRNPI KO mice have a significantly increased risk of developing CAC when challenged with AOM/DSS. The heightened susceptibility is characterized by elevated Ki-67-positive cells, increased lymphoid nodules, higher dysplasia index, increased β-catenin positive cells compared to the WT control mice. Moreover, fecal metabolomic analysis revealed dysregulation of fecal metabolites, such as tryptophan, indole-3-propionic acid, indole lactic acid, and glycocholate. These findings suggest a potential role for these metabolites in the progression of CAC and underscore the need for further research to explore the mechanisms involving fecal metabolites and to identify them as potential biomarkers during colon inflammation and CAC progression.

SYMPOSIUM MAP

Student Dining and Residential Program Building

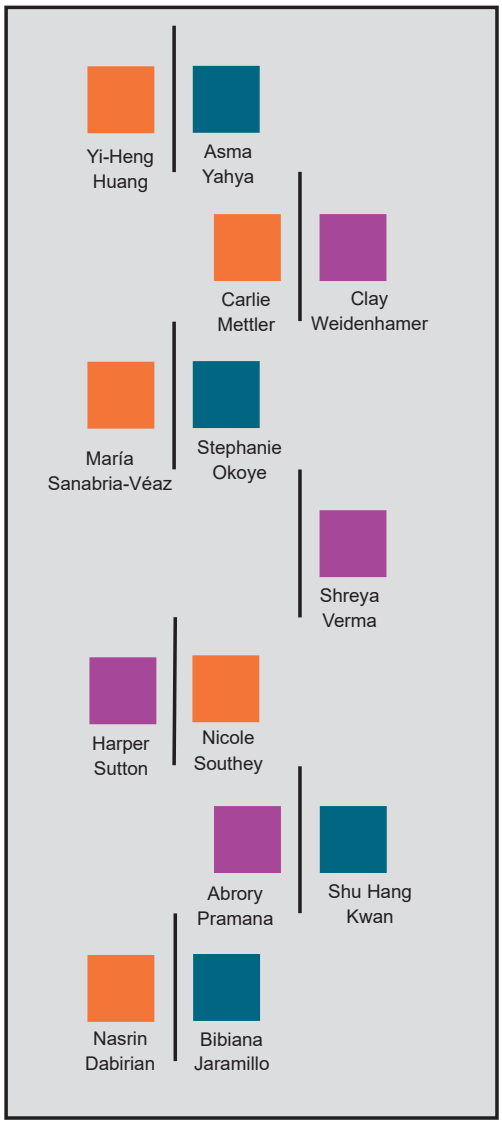
301 E. Gregory Drive, Champaign, IL 61820



GRADUATE STUDENT POSTER SESSION LOCATION

Student Dining and Residential Programs Building (SDRP)

Room 2025B | 5:15 - 6:45 PM



Microbiome, Gut Health & Metabolism

Dietary Interventions

Nutrient Mechanisms & Physiological Outcomes

NOTES