



FY24 IMPACT REPORT

UNC NUTRITION RESEARCH INSTITUTE

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ADVISORY BOARD
*"My experiences align with NRI's mission
to advance precision research that benefits
diverse communities."*



VIEW THIS IMPACT
REPORT DIGITALLY

Our Purpose



VISION

To use scientific discovery to ensure optimal health through individualized nutrition.

Mission: *to understand how nutrition affects individual health through our leadership in precision nutrition research, establishing how differences in our genes, bacteria, metabolism, and environment shape our individual disease risk.*

GUIDING SCIENTIFIC PREMISE

Each of us is metabolically unique. The UNC Nutrition Research Institute is dedicated to finding out how these differences affect an individual's health so that current one-size-fits-all dietary guidelines can be replaced with customized nutritional recommendations and actions to improve an individual's health and quality of life.

Who We Are & Where We Are

UNC CHAPEL HILL

The Nutrition Research Institute is a unit of the University of North Carolina at Chapel Hill. With an environment that inspires pioneering research, innovation, and entrepreneurship, UNC Chapel Hill has long been an agent for economic prosperity in North Carolina. At the NRI we are proud of our Carolina heritage and to be representing it on the North Carolina Research Campus in Kannapolis.

NORTH CAROLINA RESEARCH CAMPUS

The North Carolina Research Campus in Kannapolis, just north of Charlotte, is home to eight university research centers, plus industry, government and nonprofit organizations that share the goal of empowering human health through nutrition. Collectively, scientists focus on understanding the science behind precision nutrition and safer, more nutritious crops and foods.



From the Interim Director



Deborah F. Tate, PhD

Interim Director
UNC Nutrition Research Institute
Professor of Nutrition
Professor of Health Behavior
University of North Carolina at
Chapel Hill

Dear Valued Supporters,

I am delighted to introduce myself as the new interim director of the UNC Nutrition Research Institute. As a translational scientist deeply committed to advancing nutrition research, I am excited to lead our institute during this time. My research has long focused on pioneering nutritional and behavioral strategies to prevent cardiometabolic diseases and cancer. My work also focuses on translating these discoveries into digital health tools and other innovations accessible to the public. As I step into the role of NRI's interim director, my goal is to continue our legacy of scientific excellence, support our cutting-edge laboratory research, and expand our portfolio of clinical and community trials in precision nutrition and health.

This past year has been marked by significant achievements and advancements at the Institute. Our faculty have published 60 new scientific papers contributing to the global knowledge base in nutrition and related fields. In addition to scientific outlets, our research has been featured in prominent media platforms such as the New York Times, the American Association of Cancer Research website, and the Washington Post. Our faculty

research teams secured \$10.8 million in external funding, which reflects well on the quality of our scientific approach and the importance of the problems we are tackling.

We engaged more than 865 participants from the surrounding communities in our ongoing clinical studies to help accelerate our understanding of precision nutrition and public health. And we hosted two major scientific events: the Future Directions in Choline symposium and our NGx: Nutrigenomics and Precision Nutrition in Clinical Practice short course. Together, these events brought 152 participants from 8 countries and 18 states to our North Carolina Research Campus in Kannapolis fostering new national and international collaborations among our faculty and the attendees.

Your generosity and support have been critical to making these achievements possible. We are grateful for your continued commitment to our work and mission. Together, we are advancing nutrition science and paving the way for a healthier future.

Our pioneering research is revolutionizing dietary guidelines, making nutrition recommendations tailored just for you – so we can all Eat Uniquely.





Our Dedicated Experts

PRINCIPAL INVESTIGATORS

NRI's principal investigators are distinguished faculty members at the University of North Carolina at Chapel Hill, representing a variety of departments. They explore nutrition research at the NRI with a focus on critical areas such as cancer, brain health, and cardiometabolic disease. Beyond leading active bench and clinical laboratories, our faculty teach graduate and undergraduate courses, mentor graduate students, oversee core research services, present at professional conferences, and provide expertise to the media.

- Ximena Bustamante-Marin, PhD** • Assistant Professor of Nutrition
- Carol L. Cheatham, PhD** • Associate Professor of Psychology and Neuroscience
- John E. French, PhD** • Professor of Nutrition
- Rachel W. Goode, PhD, MPH, LCSW** • Associate Professor of Social Work and Psychiatry
- Stephen D. Hursting, PhD, MPH** • Professor of Nutrition
- Martin Kohlmeier, MD, PhD** • Professor of Nutrition, Director of Nutrigenetics Laboratory
- Natalia Krupenko, PhD** • Associate Professor of Nutrition
- Sergey Krupenko, PhD** • Professor of Nutrition
- Philip A. May, PhD** • Professor of Nutrition
- Katie Meyer, ScD** • Assistant Professor of Nutrition
- Sandra Mooney, PhD** • Associate Professor of Nutrition
- Wimal Pathmasiri, PhD** • Assistant Professor of Nutrition
- Blake Rushing, PhD** • Assistant Professor of Nutrition
- Nipun Saini, PhD** • Assistant Professor of Nutrition
- Susan M. Smith, PhD** • Professor of Nutrition
- Delisha Stewart, PhD** • Assistant Professor of Nutrition
- Susan Sumner, PhD** • Professor of Nutrition and Pharmacology, Director of Metabolomics and Exposome Laboratory
- Deborah F. Tate, PhD** • Interim Director, Professor of Nutrition and Health Behavior
- Isis Trujillo-Gonzalez, PhD** • Assistant Professor of Nutrition
- Saroja Voruganti, PhD** • Professor of Nutrition, Associate Director, NRI Clinical Research Services
- Steven H. Zeisel, MD, PhD** • *Emeritus*, Professor of Nutrition and Pediatrics, Founding Director of NRI

NRI FACULTY WERE SUPPORTED IN FY24 BY:





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We're dedicated to unraveling the mysteries of nutritional diversity among individuals. By leveraging top-tier scientific minds and cutting-edge genetic, metabolic, and digital tools, we're poised to revolutionize personalized nutrition recommendations and the behavioral support tools needed for realizing healthier futures.

DEBORAH F. TATE, PHD
Interim Director

Pictured:
1. *Walter Friday;* 2. *Saroja Voruganti, PhD and Baba Mass;*
3. *Kendra Nelson, MPH, RD*

Amira Abdellatef
Ramine Alexander
Emmanuel Baah
Jenna Baker
Jamie Beach
Elanaria Billings
Sandy Boucher-Bessent
Cinya Brand
Emily Brasseur
Rhyston Broadhurst
Kalli Brock
Ana Paolo Campos
Daniella Carballo
Samantha Carroll
Walden Cash
Lilly Cates
Brandi Childers
Mansi Choudhari
Angela Clontz
Brendon Coats
Rachel Coble
Shena Cunningham
Suzanne Dane
Ryan Dayvault
Lydia Dooley
Camila Espasandin Cola
Gavin Evans
Victoria Fabry
Isabella Falcone
George Flentke
Addam Flynn
Halle Fogle
Walter Friday
Grace Fu
Jose Luis Garduno
Hernandez
Brooke Giles
Elle Glenn
Madeline Hall
Neplus Hall
Tyisha Harper
Carolyn Harris
Julie Hasken
Karen Hatley
Alyssa Ho
David Horita
Yanping Huang
Chris Hughes
Sherry Irvin
Scott Jaworski
Faustina Jeyaraj

Ketan Joglekar
Charles Jordan
Myneesa King
David Kirchner
Addison Lewis
Monia Logan
Pang Lor
Anju Lulla
Kate Machen
Michael Mackin
Chrysa Mahoney
Erika Maldonado-Rosado
Baba Mass
Katherine Matthes
Jonathan McCormac
Madison McNew
Susan McRitchie
Tim Mills
Sabrina Molina
Bryan Munoz
Carolyn Munson
Michelle Nanney
Kendra Nelson
Carsyn Patton
Evan Paules
Betty Peterson
Hannah Petry
Nathan Pressley
David Raines
Molly Reese
Ariana Reid
Erika Rezeli
Mandi Rider
Julian Robles
Timothy Roth
Hansuk Ryu
Emilio Salazar Garduno
Tom Sawyer
Jonathan Shea
Qing Shi
Jorge Silva-Gomez
George Slebiada
Julie Stegall
Sai Sravani Vennam
Tori Weathers
Craig Watson
Thomas Wilkie
Rebecca Witkowski
Braden Yorke
Mikyong You



Featured Publications and Presentations



Publications

Cheatham, CL, Lukowski, AF, Bauer, PJ (2023). *Update of: Infant memory*. In John H. Byrne (Ed.), *Learning and Memory: A Comprehensive Reference (Second Edition)*, Academic Press, 2017, Pages 383–402, ISBN 9780128052914.

Goode, RW, Bardone-Cone, A, Wilhoit-Reeves, S, Williams, L, Malian, H, Coan, D, Noem, T and **Tate, DF** (2023). Creating an appetite awareness and lifestyle modification intervention for Black women at risk for binge eating disorder: A pilot open trial. *Clin Obes* 13:e12613

Li, YY, Madduri, SS, Rezeli, ET, Santos, C, Freeman Iii, H, Peng, J, McRitchie, SL, **Pathmasiri, W, Hursting, SD, Sumner, SJ** and **Stewart, DA** (2024). “Macronutrient-differential dietary pattern impacts on body weight, hepatic inflammation, and metabolism.” *Front Nutr* 11:1356038

Kohlmeier, M, Baah, E, Washko, M and Adams, K (2023). Genotype-informed nutrition counselling in clinical practice. *BMJ Nutrition, Prevention & Health* 6:407-412

You, M, Shamseldin, HE, Fogle, HM, **Rushing, BR**, AlMalki, RH, Jaafar, A, Hashem, M, Abdulwahab, F, Abdel Rahman, AM, **Krupenko, NI**, Alkuraya, FS and **Krupenko, SA** (2024). Further delineation of the phenotypic and metabolomic profile of ALDH1L2-related neurodevelopmental disorder. *Clin Genet* 105:488-498

Hasken, JM, de Vries, MM, Marais, AS, Kalberg, WO, Buckley, D, Parry, CDH, Seedat, S and **May, PA** (2023). “Maternal dietary intake among alcohol-exposed pregnancies is linked to early infant physical outcomes in South Africa.” *Reprod Toxicol* 121:108467

Shea, JW, Jacobs, DR, Jr., Howard, AG, Lulla, A, Lloyd-Jones, DM, Murthy, VL, Shah, RV, **Trujillo-Gonzalez, I**, Gordon-Larsen, P and **Meyer, KA** (2024). Choline metabolites and incident cardiovascular disease in a prospective cohort of adults: Coronary Artery Risk Development in Young Adults (CARDIA) Study. *Am J Clin Nutr* 119:29-38

Saini, N, Mooney, SM and **Smith, SM** (2023). Alcohol blunts pregnancy-mediated insulin resistance and reduces fetal brain glucose despite elevated fetal gluconeogenesis, and these changes associate with fetal weight outcomes. *FASEB J* 37:e23172

Jeyaraj, FT and **Voruganti, S** (2024). Multifaceted role of inosine in complex diseases and human health. *Nutr Rev* Apr 10:nuae029

DIGGING DEEPER

Goode and Tate

Despite the availability of evidence-based interventions to improve binge eating, Black women have some of the lowest rates of access to care for eating disorders. Innovation is needed to offer accessible and culturally relevant treatment options. Through a group-based program combining appetite awareness training and lifestyle changes investigators effectively reduced binge eating and body dissatisfaction.

Kohlmeier

Precision nutrition, which tailors dietary guidance based on an individual’s genetic makeup, is increasingly effective in clinical practice. The study highlights that specific genetic traits can predict better responses to dietary interventions, improving outcomes for patients. For example, people with certain genotypes may benefit more from specific nutrient adjustments, such as reducing saturated fat or limiting carbohydrates, leading to more successful weight management and better health overall.

Saini, Mooney and Smith

Prenatal alcohol exposure (PAE) impairs fetal growth and neurodevelopment. Although alcohol is well known to alter metabolism, its impact on these processes during pregnancy is largely unexplored. This study investigated how alcohol affects maternal-fetal glucose metabolism. The outcome of the study showed PAE disrupts maternal glucose metabolism, leading to reduced glucose availability for the fetus and potentially contributing to impaired fetal growth and brain development.

Voruganti

Inosine, a breakdown product of adenosine (a naturally occurring chemical that aids cellular energy transfer), shows potential benefits in regulating metabolism, reducing inflammation, and protecting against complex diseases like obesity, type 2 diabetes, cancers, cardiovascular, and neurodegenerative diseases, though more human studies are needed to confirm these effects.

Presentations

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Carol Cheatham, PhD, *Eat Your Way to Better Gut Health*. Osher Lifelong Learning Institute, University of North Carolina at Asheville, Asheville, NC. Spring 2024.

Natalia Krupenko, PhD, *P53-CerS6 Interaction on Endoplasmic Reticulum in Response to Cell Stress*. 4th International Ceramide Conference. Charleston, SC, Fall 2023.

Sandra Mooney, PhD, and **Susan Smith, PhD**, *Metabolic deficits from prenatal alcohol exposure predict offspring cognitive performance and are mitigated by prenatal choline*. Research Society on Alcohol. Bellevue WA. Summer 2023.

Blake Rushing, PhD, **Wimal Pathmasiri, PhD**, and **Susan Sumner, PhD**, *Harnessing the power of metabolomics for the development of targeted intervention strategies*. International Society of Exposure Science annual meeting. Chicago, IL. August 2023.

Nipun Saini, PhD, and **Susan Smith, PhD**, *Dysregulated lipid metabolism in Placenta is associated with reduced fetal brain weight in a mouse model of prenatal alcohol exposure*. Research Society on Alcohol. Minneapolis, MN. June 2024.

Susan Sumner, PhD, *Metabolomics: A Tool for Precision Medicine, Nutrition, and Environmental Health*. NYU Langone Health Seminar. New York, NY. October 2023.

Isis Trujillo-Gonzalez, PhD, *Choline and Brain Inflammation During Development*. Melbourne, FL. August 2023.

Saroja Voruganti, PhD, *NPH: Participant engagement and return of results*. Annual meeting of the International Society of Nutrigenetics and Nutrigenomics. Dallas, TX. October 2023.

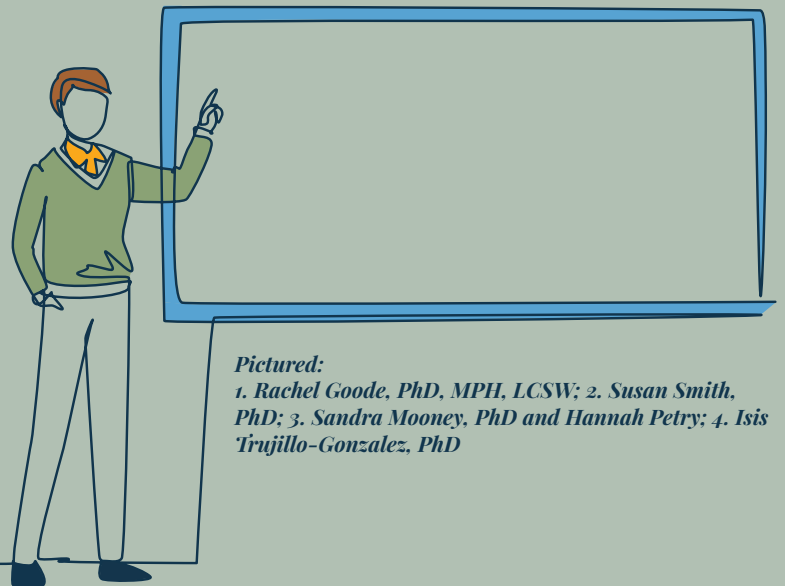
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Pictured:

1. Rachel Goode, PhD, MPH, LCSW; 2. Susan Smith, PhD; 3. Sandra Mooney, PhD and Hannah Petry; 4. Isis Trujillo-Gonzalez, PhD

New Insights into How Prenatal Alcohol Exposure Disrupts Fetal Development

THE PROBLEM

It's well-known that drinking alcohol during pregnancy can harm a developing baby, but exactly how it causes these problems has been unclear. Recent research at NRI has revealed a new way alcohol impacts fetal development that we didn't know before.

THE SCIENCE

Inside a cell, a process called ribosome biogenesis is crucial for making proteins. This process occurs in a special area of the cell's nucleus called the nucleolus, where ribosomes—the cell's protein-making machinery—are assembled. When something disrupts ribosome biogenesis, it can cause nucleolar stress, which might lead to cell death.

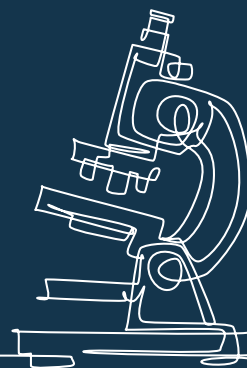
In a recent study from the Saini, Smith and Mooney groups, Huang et al. discovered that prenatal alcohol exposure (PAE) in a mouse model interferes with ribosome biogenesis. This disruption leads to nucleolar stress and cell death in the brains of developing mice, which results in reduced brain size. They analyzed the complete set of RNA molecules, called transcriptomics, from fetal brain tissue to show that PAE blocks ribosome biogenesis, causing stress and cell death.

Another study by Flentke et al. looked at how PAE affects cranial neural crest cells, which are the building blocks for facial bones and cartilage. They found that PAE also disrupts ribosome biogenesis and induces nucleolar stress in these cells, which impairs physical development in a zebrafish model.

THE IMPORTANCE

These studies are the first to demonstrate that alcohol causes nucleolar stress, linking this stress to the negative effects of PAE on fetal growth and survival. This includes both cognitive and behavioral issues and distinctive facial features seen in Fetal Alcohol Spectrum Disorders. Understanding how alcohol affects development can help find ways to lessen these impacts in humans and might provide insights into other diseases related to problems with ribosome biogenesis.

Key Findings



Pictured:

1. Yanping Huang, PhD; 2. Nipun Saini, PhD; 3. Nathan Pressley; 4. Wimal Pathmasiri, PhD and Susan McRitchie; 5. Blake Rushing, PhD and Rachel Coble; 6. Sabrina Molina

Huang, Y, Flentke, GR, Rivera, OC, **Saini, N, Mooney, SM** and **Smith, SM** (2024). "Alcohol Exposure Induces Nucleolar Stress and Apoptosis in Mouse Neural Stem Cells and Late-Term Fetal Brain." *Cells* 13, 440.

Flentke GR, Wilkie TE, Baulch J, Huang Y, **Smith SM** (2024). "Alcohol exposure suppresses ribosome biogenesis and causes nucleolar stress in cranial neural crest cells." *PLoS ONE* 19, e0304557.



Breaking Barriers in Cancer Treatment: Overcoming Drug Resistance

THE PROBLEM

Cancer cells often develop resistance to chemotherapeutics. This resistance makes treatments less effective and contributes significantly to cancer-related deaths. Understanding how this happens is crucial for developing new, more effective treatments.

THE SCIENCE

At the NRI, Rushing is at the forefront of this critical research. His team is diving deep into the biology of cancer cells to discover what makes some of them resistant to chemotherapy. In two recent publications, Rushing applied a multi-omics approach, incorporating transcriptomic, proteomic, metabolomic, and mutation data, to identify differences in key metabolic pathways between drug-resistant and drug-sensitive cell lines in the NCI-60 cancer cell line panel. This panel includes 60 different human tumor cell lines representing leukemia, melanoma and cancers of the lung, colon, brain, ovary, breast, prostate, and kidney.

Rushing discovered that the key difference between cells resistant to cancer-fighting drugs (like cisplatin) and those that are not lies in how they process purines, which are essential components of DNA. In the case of methotrexate (an antifolate drug) resistance, Rushing identified key differentiating pathways involving (1) nucleotide metabolism and (2) autophagy—a process where cells break down and reuse their own components to survive under stress.

A third study with the Sumner lab looked at drug resistance in triple-negative breast cancer (TNBC), a form of breast cancer that is particularly difficult to treat. Here, Rushing and colleagues generated a doxorubicin-resistant model of TNBC and performed comparative metabolomics on these vs. non-resistant TNBC cells. This analysis revealed that resistant cells exhibited altered metabolism of certain key compounds, and also identified metabolic pathways that ceased to respond to doxorubicin in resistant cells, supporting the concept of metabolic rewiring as a resistance mechanism.

THE IMPORTANCE

Drug resistance in cancer is complex, and mechanisms depend on both the chemotherapeutic agent and specific cancer cell type. Rushing's research is important in that it sheds considerable light on the molecular aspects of resistance in multiple types of cancer. By defining specific altered molecular networks and metabolic pathways associated with drug resistance, the results identify potential new targets and alternative strategies that will facilitate the development of new approaches to treat resistant cancers.

Rushing, BR (2023). "Multi-Omics Analysis of NCI-60 Cell Line Data Reveals Novel Metabolic Processes Linked with Resistance to Alkylating Anti-Cancer Agents." *Int J Mol Sci* 24, 13242.

Rushing, BR (2023). "Unlocking the Molecular Secrets of Antifolate Drug Resistance: A Multi-Omics Investigation of the NCI-60 Cell Line Panel." *Biomedicines* 11, 2532.

Rushing, BR, Molina, S and Sumner, SJ (2023). "Metabolomics Analysis Reveals Altered Metabolic Pathways and Response to Doxorubicin in Drug-Resistant Triple-Negative Breast Cancer Cells." *Metabolites* 13, 865.



North Carolina Research Campus (NCRC) Investigators Explore Signs of Good Health

THE PROBLEM

While much research has focused on identifying signs of disease, there has been less emphasis on finding indicators of good health. A recent study involving researchers from the NRI and three other institutes on the North Carolina Research Campus aimed to address this gap. They compared health profiles (proteomic and metabolomic) of two groups: one with a healthy lifestyle, characterized by regular exercise, a balanced diet, and no smoking, and another with less healthy habits—the control group, including being overweight, not exercising, and having a poor diet. Neither group included participants under treatment for heart disease, cancer, or other complicating medical conditions.

THE SCIENCE

The researchers used advanced techniques to analyze the participants' health. They applied proteomics, which is the study of proteins in the body, and metabolomics, which looks at small molecules called metabolites involved in metabolism. By analyzing these, they identified unique biosignatures—distinct patterns of proteins and metabolites associated with health or disease.

The study employing proteomics found a collective biosignature indicative of lower immune activation, likely driven by the lower

BMI of the “healthy” group. The metabolomics study identified a novel “healthy” metabolite signature that included lower plasma levels of bile acids and an amino acid profile associated with decreased risk for chronic disease. Further analysis of the metabolomics data also found that body composition has a substantial impact on the metabolome, with physical activity and fruit/vegetable consumption also having clear effects. Interestingly, the healthy group also had lower plasma levels of numerous environmental contaminants (e.g., herbicides, pesticides, plasticizers). Whether these are due to differences in diet, lifestyle, or other environmental exposures is, at present, unclear.

THE IMPORTANCE

The healthy group showed a different metabolic profile—the complete set of metabolites in their bodies—compared to the less healthy group. They had lower levels of immune system activity and fewer harmful substances. This group also exhibited a chemical profile, or metabolic signature, linked to a lower risk of chronic diseases. These findings suggest that certain measurable factors, known as biomarkers, reflecting lifestyle choices, can provide valuable insights into overall health and help monitor the effects of lifestyle changes.

Nieman, DC, Sakaguchi, CA, Pellegrini, M, Thompson, MJ, **Sumner, SJ**, and Zhang, Q (2023). “Healthy lifestyle linked to innate immunity and lipoprotein metabolism: a cross-sectional comparison using untargeted proteomics.” *Sci Rep* 13, 16728.

Pathmasiri, W, Rushing, BR, McRitchie, S, Choudhari, M, Du, X, Smirnov, A, Pellegrini, M, Thompson, MJ, Sakaguchi, CA, Nieman, DC¹ and **Sumner, SJ** (2024). “Untargeted metabolomics reveal signatures of a healthy lifestyle.” *Sci Rep* 14, 13630.

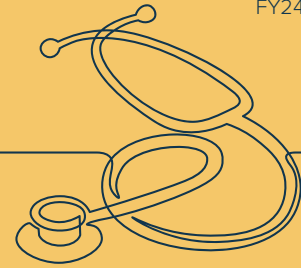


THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL



Appalachian
STATE UNIVERSITY





Making People Healthier Through Science

865

individuals contributed to clinical research at the NRI in FY24.

STUDIES

The NRI's vision is to use scientific discovery to ensure optimal health through individualized nutrition. Achieving this goal requires the participation of volunteers, as many research studies depend on individuals to help NRI scientists understand how nutrition science affects different people.

AGILE

Researching innovative ways to promote healthy eating and physical activity in young adults using a smartphone app and digital health tools.

ALL OF US

Inviting one million people across the U.S. to help build one of the most diverse health databases in history.

BASELINE ORAL HEALTH STUDY

Finding out whether the effects of oral health are associated with corresponding changes in general health.

CHILDREN'S HEALTH STUDY

Identifying genes and lifestyle factors that affect children's health status and overall well-being.

HONOR

Examining the factors that affect eating behaviors of African American adults with Type 2 diabetes.

INFANT NUTRITION AND COGNITION

Showing how nutrition helps babies grow and learn.

NUTRITION FOR PRECISION HEALTH

The goal is to develop algorithms that predict individual responses to food and dietary patterns.

Nutrition for Precision Health partners with the UNC Nutrition Research Institute

UNC received two of 14 awards— totaling \$170 million over five years, pending availability of funds — that the NIH Common Fund awarded as part of Nutrition for Precision Health, powered by the All of Us Research Program (NPH).

Understanding how people differ in both their metabolism and their bodily response to what they eat and drink is critical to tailoring diets for an individual's optimal health and providing personalized intervention strategies for preventing and delaying the onset of chronic and progressive diseases such as obesity, diabetes, cardiovascular disease, dementia and cancer.

The overall goal of NPH is to develop algorithms that predict individual responses to food and dietary patterns. The program will build on recent advances in biomedical science, including artificial intelligence, microbiome research, and the infrastructure and diverse participant group of the All of Us Research Program. These advances provide unprecedented opportunities to generate new data offering insight into personalized (also called precision) nutrition.

The findings gathered over the full five years of the program will be made publicly available to registered researchers through a free database as part of the NIH's All of Us research effort.

Honors

STEPHEN HURSTING

Mechanisms Co-Chair, AICR/WCRF Expert Report Panel, Fall 2023.

NATALIA KRUPENKO

Editorial Board Member, *Frontiers in Nutrition*, 2023-2024.

SERGEY KRUPENKO

Editorial Board Member, *Journal of Biological Chemistry*, 2023.

KATIE MEYER

Panel Member, "Hypertension and Gut Microbiome," American Heart Association. Fall 2023.

SUSAN SMITH

Committee Member, "Alcohol and Health" National Academy of Sciences, Engineering, and Medicine, Dietary Guidelines for Americans. 2025-2030.

SUSAN SUMNER

Session Chair, "Precision Nutrition," National Dairy Council Workshop, December 2023.



Susan Sumner, PhD and Emily Brasseur

“Dr. Voruganti’s work in nutritional genomics is critical to our understanding of the interplay between genetics, nutrition, and health. Her promotion is a testament to her exceptional research accomplishments, her foundational teaching abilities, her unwavering commitment to her students and many years of dedicated service to the NRI and the University.”

DEBORAH F. TATE, PHD
Interim Director

“Nipun Saini was a star of our research team, leading our investigations into Omics of prenatal alcohol exposure. Her discovery of the metabolic dysregulation in alcohol-exposed mothers is a major finding that will propel her career as a future leader in nutrition and metabolism.”

SUSAN M. SMITH, PHD
Professor of Nutrition

Promotions



SAROJA VORUGANTI
Promoted to **Professor of Nutrition** from Associate Professor



NIPUN SAINI
Promoted to **Assistant Professor of Nutrition** from Postdoctoral Research Associate



In the News

The UNC Nutrition Research Institute employs world-renowned experts in precision nutrition, frequently sought by the media for their insights on nutrition science.



PRISM September 9, 2023

BIPOC LGBTQIA+ communities deserve care for eating disorders

“When I think about Black women, eating disorders might show up in emotional eating [and] compulsive overeating to deal with trauma, stress, racism, [and] food insecurity ... It’s a way of coping with trauma.”

Rachel Goode, PRISMreports.org

Newsweek November 4, 2023

Neuroscientists Reveal the Snacks They Eat to Boost Memory

“An habitual wild blueberry consumer requires less time to learn new information. We believe that this improvement in speed is also related to the efficiency with which a memory is coded and stored.”

Carol L. Cheatham, Newsweek.com



January 11, 2024

“Human” touch improves weight-management apps

Deborah F. Tate, UNC.edu



June 4, 2024

Researchers in Kannapolis explore differences in how our bodies respond to food

“We are now learning that because we have diverse backgrounds, different genetics, and come from different cultures, our bodies need different nutrients, and will process those nutrients differently.”

Deborah F. Tate, WSOC-TV

October 27, 2023 The Washington Post

What’s the best diet for your body? A federal study aims to find out.

Deborah F. Tate, The Washington Post

December 13, 2023

pharmacy TIMES.

Experts Say More Research Is Needed to Understand Obesity-Cancer Link

“We, as the cancer research community, need to pivot from the question of whether obesity can be seen as a risk factor for many cancers—that is certainly well established. The question, then, is what are we going to do? How can we reduce the impact of chronic obesity on cancer?”

Stephen D. Hursting, PharmacyTimes.com

April 11, 2024 AACR

Annual American Association of Cancer Research (AACR) Special Session Features Stephen Hursting’s Cancer and Obesity Research

“Incretin mimetics are a game changer in the weight loss field, and our initial data suggests they have great potential to reduce the adverse impact of obesity on cancer risk and outcomes.”

Stephen D. Hursting, AACR Correspondent

June 5, 2024 The New York Times

How Healthy are Avocados?

“According to Dr. Kohlmeier, the lutein in avocados may help keep your vision sharp.”

Martin Kohlmeier, The New York Times

Education & Engagement

After our NRI investigators share their research discoveries, we take the crucial step of translating and distributing this knowledge to scientists, health professionals, and the public through various programs, events, partnerships, and training sessions. We are grateful to our friends and collaborators who participated in these opportunities to learn from and engage with our experts over the past year.



Hosted Scientific Events

NGx

The 2024 NGx short course assembled 52 attendees from five countries and 11 states, uniting researchers and practitioners to advance the field of nutrigenomics. This event featured 20 speakers from top institutions and included hands-on workshops, where participants gained practical skills in analyzing oral microbiome data. Held at the North Carolina Research Campus, the course emphasized the integration of cutting-edge research with clinical applications. Sponsored by USDA, Coddle Creek Capital, North Carolina Biotechnology Center, and Truly Good Foods, NGx 2024 successfully fostered collaboration and innovation in precision nutrition.

Future Directions in Choline

The Future Directions in Choline symposium brought together 81 attendees from five countries and 14 states, fostering international collaboration among the greatest minds in choline research. Aiming to guide the future of choline science, the symposium assessed current findings in human nutrition and identified areas for further investigation to enhance our understanding of this essential nutrient's impact on our health. This event in Kannapolis, NC, was co-presented by the NRI and Balchem Corporation, with sponsorship from the North Carolina Biotechnology Center.

This course [NGX] has opened a whole new world of knowledge to me, has boosted my confidence tremendously, and has inspired me to begin to think of ways that I can explore more and incorporate all that I have learned into my research.

MERCY SOSANYA
Doctoral Student, University of Texas at Austin

It's so good to hear about what is being done to help the community lead healthier lives.

AFL PARTICIPANT
Evaluation Survey

I plan to major/minor in nutrition, as it has always been an important part of my life through sports and overall me feeling my best. I did research to find a program that would align with my interests and the UNC internship did!

VIP PARTICIPANT
Evaluation Survey



Outreach

Appetite for Life

The Appetite for Life program connected with more than 450 attendees throughout the year, covering a diverse range of topics in nutrition and health. This program continues to enhance community health by providing attendees with insights into the latest NRI research and its practical applications for improving well-being. Through expert-led discussions and interactive presentations, the program facilitated meaningful engagement and delivered valuable knowledge on applying research findings to everyday nutrition.

Virtual Internship Program

In June, the UNC Nutrition Research Institute completed its fifth annual Virtual Internship Program (VIP), where 25 high school students from across the country participated in a four-week program that offered valuable insights into nutrition and research. Led by NRI faculty, postdoctoral researchers, and staff, the program included lectures, group mentoring, and hands-on research projects. Each student selected a nutrient to investigate, conducted guided research, and developed a research paper, culminating in presentations to their peers and NRI scientists. The program provided students with a deep understanding of nutrition science, research methods, and potential careers in the field.

Pictured:

1. NGx participants with Saroja Voruganti, PhD; 2. Ana Paola Campos, PhD; 3. Hannah Petry and Sai Sravani Vennam; 4. Stephen Hurstling, PhD, MPH; 5. Tar Heel Bus Tour logo on bus; 6. Jorge Silva-Gomez, PhD



Inreach

Faculty Seminar Series

Traditionally, the NRI faculty seminar series features researchers from other universities but, in FY24, our own 21 principal investigators took turns at the podium to share their ongoing research and insights from their career journeys with the NRI’s full staff. This year’s series emphasized community building and mentorship, providing an opportunity for our team to learn from one another and strengthen our collective knowledge. Through these presentations, we fostered a deeper sense of connection and support within our institute.

Tar Heel Bus Tour

The Tar Heel Bus Tour, an annual University initiative, highlights Carolina’s dedication to community service by taking faculty and senior administrators on journeys throughout the state to examine firsthand communities’ most pressing issues and learn how the University can help address them. Two buses, one traveling east and the other west, made 25 stops in 19 counties. The NRI was a stop for the west bus on October 18. The group, welcomed by Kannapolis Mayor Daryl Hinnant,

toured the NRI’s unique facilities, hearing about four key research areas from these principal investigators.”



The tour highlighted four key research areas, each led by a principal investigator.

- **Rachel Goode** shared her research on nutrition interventions aimed at promoting health equity.
- **Deborah F. Tate** discussed her leadership role in the NIH *All of Us* study.
- **Saroja Voruganti** showcased the institute’s whole-room calorimeter, a pivotal part of the clinical research core.
- **Stephen Hursting** offered insights into his state-of-the-art laboratory, which focuses on the intersection of cancer and nutrition.

Teaching and Mentoring



In addition to overseeing dynamic research and clinical laboratories, 13 of our faculty teach undergraduate and graduate courses, while also mentoring graduate students here at the NRI and on Chapel Hill’s campus.

Undergraduate Students

Our researchers are highly qualified to train, mentor, and provide practical experiences to emerging scientists. In addition to teaching undergraduate classes, our faculty offer internships to students.

Researchers help prepare undergraduate scholars to enter the workforce through career opportunities in science. This year, the NRI offered unique opportunities to 22 student interns to strengthen their education with hands-on research experiences.

FEATURED CLASSES

Nutritional Biochemistry, Metabolism and Health	Hursting, Rushing, and Sumner	Graduate
Human Metabolism: Micronutrients	N. Krupenko	Undergraduate
Analytical Methods in Nutritional Epidemiology	Meyer	Graduate
Human Nutrition	Mooney	Graduate
Macronutrient Nutrition	Smith	Undergraduate
Advanced Nutrition Intervention Research Methods I & II	Tate	Graduate
Biochemistry of Micronutrients	Trujillo-Gonzalez	Undergraduate
Nutrigenetics and Nutrigenomics	Voruganti	Graduate

Graduate Students

The NRI is helping mold the scientific minds of tomorrow by offering unique learning and work experiences for graduate students in sciences related to personalized nutrition, like nutrigenomics and metabolomics. These young researchers, selected from the tops of their classes, are mentored by the NRI’s principal investigators while completing their doctoral degrees. In FY24 our institute was home to 7 doctoral students furthering their education with our elite faculty.



Featured Grants

Securing prestigious grants is a testament to our status as a leading institution in the field of Precision Nutrition. These highly competitive grants allow us to conduct groundbreaking research focused on nutrition intervention and science, directly supporting our mission to advance the understanding of individual nutritional needs and responses.

The support we receive through these grants is crucial, enabling us to continue pioneering studies that shape the future of nutrition and health.

An Avocado Intervention for Enhanced Milk Nutrients and Infant Cognitive Development

Carol Cheatham, PhD

\$56,250
GRANT TOTAL

88
PARTICIPANTS

3
YEARS

Seeks to validate avocado as a nutritious whole food that can effectively supplement mothers and subsequently, infants, for optimal brain development. It evaluates lactating mothers' adherence to a 12-week avocado consumption regimen, analyzes the nutrient content of their milk, and assesses the cognitive benefits for their infants compared to a non-avocado-eating group. Healthy, lactating women who are 13 weeks postpartum and their infants will be enrolled. Infant cognition will be tested when the infants are 4.5 and 6 months of age. Milk samples and diet data will be collected and assayed on a bi-weekly basis.

Appetite Self-Regulation in African American Adults with Type 2 Diabetes

Rachel Goode, PhD, MPH, LCSW

\$198,911
GRANT TOTAL

60
PARTICIPANTS

3
YEARS

This research focuses on developing a culturally tailored diabetes self-management education (DSME) program that incorporates appetite self-regulation (ASE) training for African Americans (AAs) with type 2 diabetes (T2DM) who struggle with binge and emotional eating. Recognizing that traditional DSME programs have been less effective in this population due to unaddressed eating behaviors, the study aims to design and pilot a remotely delivered DSME + ASE program to improve long-term blood sugar control (HbA1c) in AAs. The project not only seeks to improve dietary intake and reduce disordered eating but also aspires to create a diabetes management approach that honors the unique cultural experiences of AAs, paving the way for more equitable and effective interventions in diabetes care.

Preventing Weight Gain in the U.S. Air Force

Deborah F. Tate, PhD

\$558,660
GRANT TOTAL

454
PARTICIPANTS

5
YEARS

Weight gain is disproportionately high among young adults compared to other age groups and of particular concern in the military, which is largely composed of young adults, as obesity has emerged as a threat to national security. Despite the critical need to address weight gain in young military personnel who can face discharge for failing to meet weight standards, there is currently no evidence-based programs available to them. This study aims to adapt an evidence-based weight gain prevention intervention for delivery in a young adult, active-duty military population using mobile technology to prevent weight gain over 2 years.

Total Funding

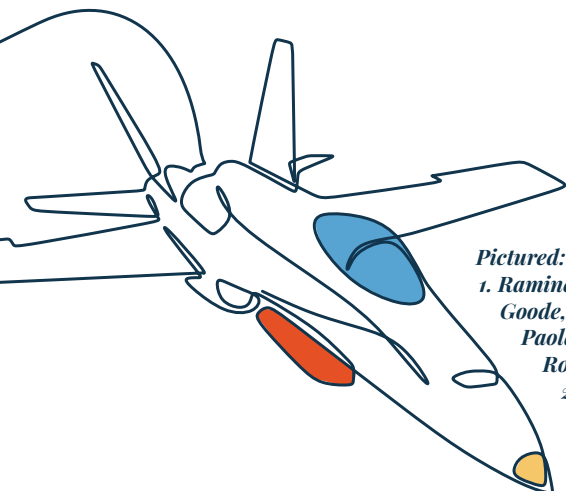
The NRI's sponsored research, funded by the government, industry, and private philanthropy, with FY24 grants totaling \$10.8 million, is a vital part of the economic engine of Kannapolis. Our research activities directly support 96 jobs and generate significant local economic growth, with each dollar of National Institutes of Health (NIH) funding producing \$2.64 in additional economic activity. This impact extends beyond job creation, stimulating local business through the procurement of goods and services, the purchase of new equipment, and the creation of startups.

As a proud member of the North Carolina Research Campus in Kannapolis, the NRI is pleased that our participation in the local business community contributes to the economic development of our hometown. Along with our fellow institutions and private industry, we have attracted many new residents to Rowan, Cabarrus, and surrounding counties, all of whom shop locally and contribute to the revitalization of our beautiful community.

Intervention Science and Clinical Trials

At the Nutrition Research Institute, our work in intervention science focuses on creating and testing strategies that improve nutrition and health outcomes. Intervention science involves making specific changes, or interventions, to observe and measure the resulting effects on health. This can range from dietary adjustments to behavioral treatments, with the ultimate goal of enhancing well-being or mitigating the impacts of diseases.

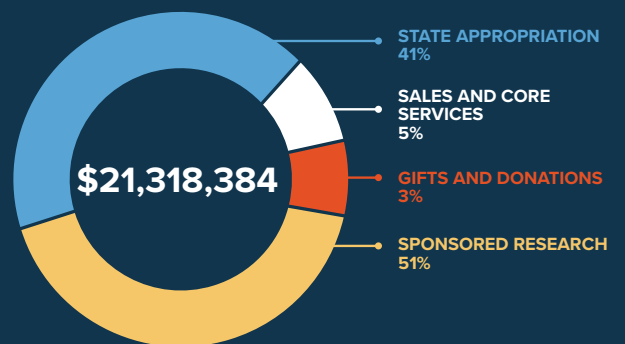
Central to intervention science are clinical trials. These research studies assign human participants to different interventions, such as new dietary plans, medical treatments, or preventive measures, to evaluate their effects on health outcomes. Clinical trials are a critical component of our research, allowing us to rigorously test and validate the effectiveness of our interventions, ensuring that they are both safe and beneficial for the public.



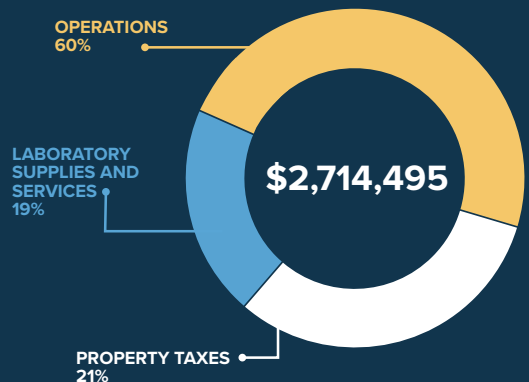
Pictured:
 1. Ramine Alexander, PhD, Rachel Goode, PhD, MPH, LCSW, Ana Paola Campos, PhD, Julian Robles
 2. Deborah F. Tate, PhD
 3. Carol Cheatham, PhD



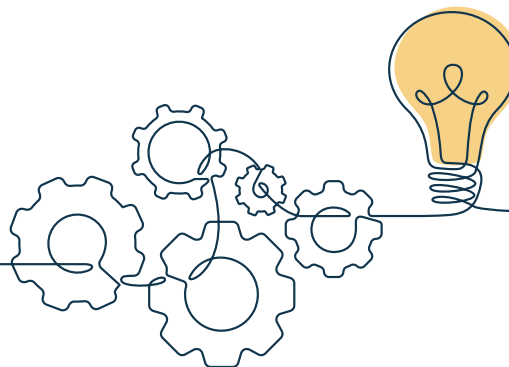
Funding



Local Expenditures



Advisory Board



Our advisory board plays a crucial role in elevating the UNC Nutrition Research Institute to world-class stature. Composed of visionary leaders and experts from diverse fields, our board members are dedicated advocates for the NRI's mission. They enhance our local, national, and global presence, secure essential resources, foster strategic partnerships, and provide invaluable guidance. By supporting groundbreaking nutrition research, our board helps us revolutionize nutrition science and achieve advancements in health and wellness.

Colonel Fred T. Brown, Jr., MPH (ret) • Charlotte, NC
Meg Dees • Salisbury, NC
John Fennebresque, Jr. • Charlotte, NC
J. Steven Fisher • Salisbury, NC
Erika Gantt, MD • Charlotte, NC
Melissa Harman • Portsmouth, NH
Jason C. Holt • Salisbury, NC
Kathleen A. Kaney, DrPH • Charlotte, NC
Farzaneh Keshmiri-Sanchez, DDS • Concord, NC
Chris Komelasky • Chapel Hill, NC
Monique May, MD • Charlotte, NC

Jeffery M. Petry • Charlotte, NC
Almer K. Reddick • Zebulon, NC
Craig Richardville • Broomfield, CO
Rina K. Shah (Chair) • Durham, NC
Samuel Taggard • West Simsbury, CT
Richard A. Vinroot • Charlotte, NC
Jason Walser • Salisbury, NC
Mary Jo Walter • Lumberton, NC
Amanda G. Watlington • Durham, NC
Douglas L. Weed, MD, PhD, MPH • Wilmington, NC

A Personal Commitment to Nutrition Research

ALMER K. REDDICK

Regional Sales Director, Madrigal Pharmaceuticals

A dedicated member of the NRI Advisory Board, Almer Reddick brings valuable insight and passion to our mission. Here, he shares his personal journey and the reasons he believes in the importance of advancing nutrition research through his role at the NRI.

After hearing a presentation by the NRI Advancement Director to ACRED (Alumni Community on Racial and Ethnic Diversity at UNC), I was inspired to explore the NRI and its Advisory Board. Growing up in rural eastern North Carolina, discussions of balanced diets and nutrition were rare. My mother, the eldest of 18 children, witnessed firsthand how her family faced significant health issues like cancer and heart disease. As a child, visiting relatives in the hospital was routine, though I didn't recognize how abnormal this was until adulthood. Learning about NRI's impactful research sparked my desire to support its efforts. When the chance to join the Advisory Board arose, I embraced it. Serving alongside accomplished individuals with a shared mission has been both humbling and gratifying.

As a biotechnology and pharmaceutical sales leader, I've worked with healthcare professionals worldwide to address the economic, social, and medical needs

of patients and caregivers. In my role at Nestlé Health Science, I've collaborated with nutrition researchers, dietitians, and healthcare networks, witnessing the critical role nutrition plays from infancy through old age. Many diseases treated with pharmaceuticals can be prevented or lessened with proper nutrition. My experiences align with NRI's mission to advance precision research that benefits diverse communities.

Diversity is crucial in nutrition research because it enables researchers to better understand the nutritional needs of different populations by considering cultural variations in eating patterns, socioeconomic factors, and ethnic backgrounds, thereby generating more reliable and robust data. This will lead to more applicable findings for a wider range of people, while preventing potential biases and gaps in valuable statistics and data. This data is critical towards ensuring all groups and communities are adequately represented within all nutritional recommendations and publications. This research will not only raise nutritional awareness locally but drive global innovation. I'm excited to contribute to this vision as a member of the NRI Advisory Board.





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2



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THANK YOU

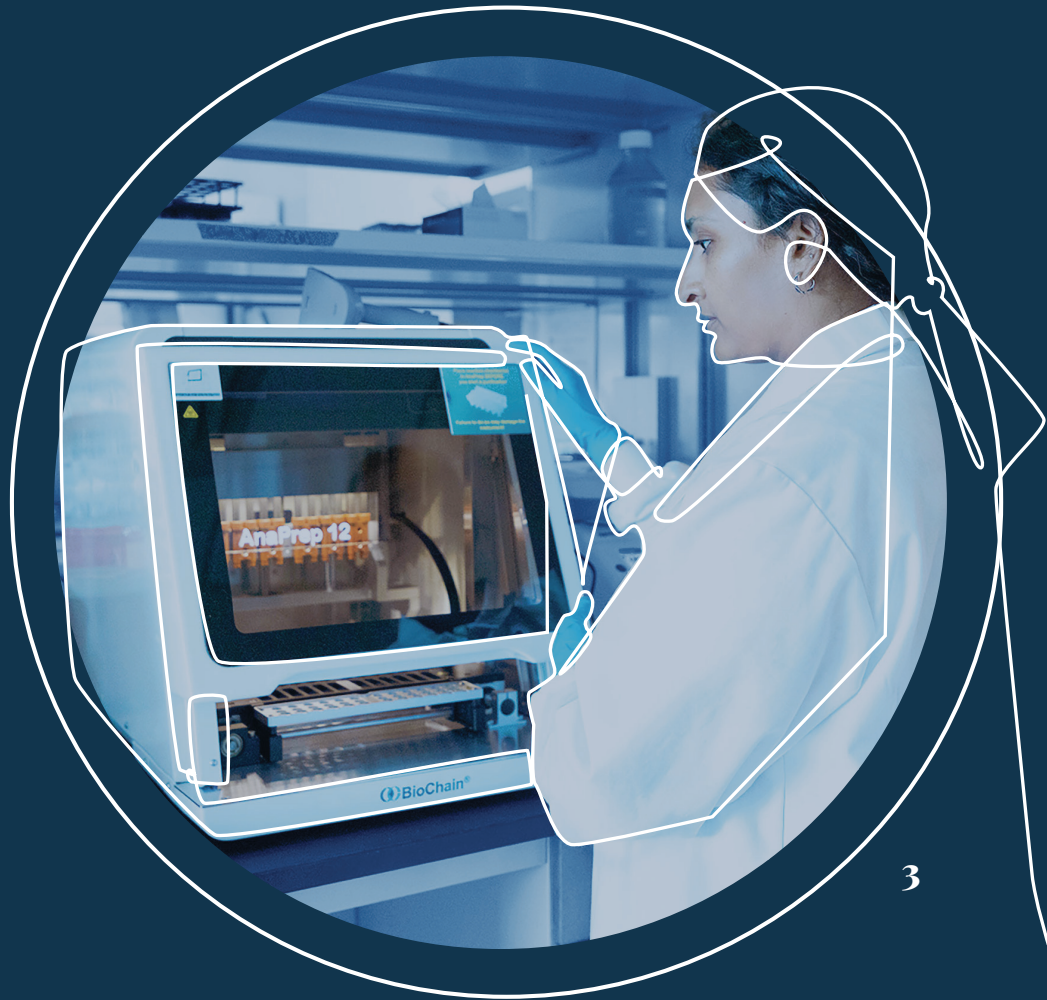
Your support for our research enables us to continue supporting our faculty, their teams, and the vital work of our institute. Gifts from individuals, foundations, and businesses are essential in helping us bring world-class nutrition scientists on board, push the boundaries of precision nutrition research, and offer hands-on learning and mentorship for students.

Your dedication to our institute drives our efforts everyday.



Pictured:

- 1. Evan Paules, PhD*
- 2. Natalia Krupenko, PhD, and Sergey Krupenko, PhD*
- 3. Amira Abdellatef, PhD*



Pictured:
1. Isis Trujillo-Gonzalez, PhD; 2. George Flentke, PhD;
3. Faustina Jeyaraj; 4. Hannah Petry

