Pennington Biomedical Nutrition Obesity Research Center

Pennington/Louisiana NORC Newsletter

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News from the NORC Director

Eric Ravussin, PhD

Boyd Professor

Pennington Biomedical Research Center

Now in the 18th year of funding, the state of the Pennington/Louisiana NORC remains excellent. We continue our mission by facilitating research at Pennington Biomedical and across Louisiana. Our NORC provides state-of-the-art core services and significant funding for Pilot and Feasibility grants. More specifically, our NORC encourages studies designed to identify the mechanisms underlying the interaction between biology and environment in the regulation of energy balance and cardiometabolic health in rodents and humans through the entire lifespan. Our NORC still emphasizes the general theme of **"nutrition and metabolic health through the lifespan"** with focus on mechanisms, prevention, and treatment modalities at each step of the lifespan. Since its inception, our NORC has provided services to many of our 165 members and to more than 50 trainees. So far, our NORC has funded 75 Pilot & Feasibility grants selected from 203 full applications and 259 letters of intent. The Executive Committee of our NORC is proud of these achievements and committed to serving its members for hopefully many more years.

Beginning May 1st, 2024, Leanne Redman will become the new NORC Director while I will step down to the role of Associate Director with the major role of administrating the Pilot & Feasibility grant program. Leanne, with the assistance of the entire Executive Committee, will take the lead for developing our next NIDDK competitive renewal due in Summer 2025.

Other NORC Highlights:

- **2023 NORC P&F round.** Applications were due on April 15, 2023, and three awards were issued:
  - Steve Hennigar – Mediating effects of hepcidin on increased rates of iron deficiency and anemia during prolonged caloric restriction
  - Redin Spann – Neurodevelopment of hindbrain metabolic circuits in a mouse model of intrauterine growth restriction
  - Joshua Sparks – A Pilot Study to Examine Metabolic Flexibility as the Mechanism to Understand High-Fat Diet-Induced alterations to male Epigenetic Markers of Obesity

- **NORC in Senator Bill Cassidy's radar**
  - On March 29, 2023, Senator Cassidy visited Pennington Biomedical to discuss our research initiatives and the health problems facing the Nation and the State of Louisiana. Among other topics, we discussed a list of needs when it comes to obesity/nutrition research and health disparity in the face of the pandemic of obesity. Senator Cassidy was very receptive to our research and its translation to the population.
  - On October 18, 2023, the Senate HELP Committee held a hearing on the nomination of Dr. Monica Bertagnolli to be Director of the

National Institutes of Health. At this hearing, Senator Cassidy commented on the need for increased funding for obesity research. He asked how NIH can better address obesity and whether Dr. Bertagnolli would commit to increasing funding for obesity research. She concurred about the importance of obesity research but could not speak to funding distribution. **Senator Cassidy remarked that increasing funding for Nutrition Obesity Research Centers could be a starting point**.

Highlights from ObesityWeek 2023

Each year at ObesityWeek, world-renowned experts in obesity explore leading-edge science, clinical interventions, and policy approaches to combat the obesity epidemic. In 2023, faculty and postdoctoral fellows from the Pennington/ Louisiana NORC joined in to share their research and to celebrate how far Obesity Research has come in the past 40 years.


Ursula White, programming committee chair, thanks her committee at the Keynote during Obesity Week 2023.

Ursula White, Associate Professor at Pennington Biomedical served as the Chair for the programming committee. In addition, 6 Pennington/Louisiana NORC members presented or were panelists including Leanne Redman, Corby Martin, Steven Heymsfield, Justin Brown, and Emily Flanagan. Four served as Session Chairs: Owen Carmichel, Peter Katzmarzyk, Candida Rebello and Eric Ravussin; and many more gave poster presentations.

We congratulate two of our Pennington/ Louisiana NORC members who received awards this year. Considered by many to be the top award for obesity research, Leanne Redman was selected for the 2023 TOPS Research Achievement award for her research in the field of maternal energy regulation. This award is funded by the Take Off Pounds Sensibly, or TOPS, Foundation.

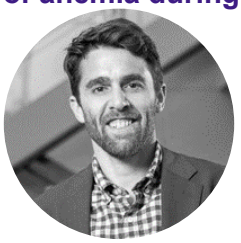
The Obesity Society also recognized former NORC P&F awardee Emily Flanagan, honoring her with the 2023 Early Career Travel Award. Her abstract, "Infant Activity: A Missing Link in the New Dietary Reference Intake Equations," highlights gaps in the newly published Dietary Reference Guidelines in infants under the age of three months and proposes the need to consider activity to enhance these prescriptive equations.


From left to right: Alex Niclou, Postdoctoral Fellow, Leanne Redman, Professor, and Emily Flanagan, Postdoctoral Fellow from Pennington Biomedical.

Awards For Pilot & Feasibility Studies

The objective of the NORC P&F program is to encourage young investigators by providing research support to test innovative hypotheses involving nutritional programming-related research and other pilot studies related to the function of NORC. Below are the most recent P&F winners.

Mediating effects of hepcidin on increased rates of anemia during prolonged caloric restriction.



Stephen Hennigar, PhD

Assistant Professor

Pennington Biomedical Research Center

Comprehensive Assessment of Long-Term Effects of Reducing Intake of Energy (CALERIE) was a two-phase clinical trial that studied the effects of caloric restriction (CR) in humans. In both phase 1 and phase 2 of CALERIE, participants in the CR group had lower hemoglobin, hematocrit, and serum iron compared to the control group, suggesting increased rates of iron deficiency and anemia with CR. Interestingly, this was despite consuming a multivitamin and mineral supplement containing iron. A similar phenomenon has been reported in undernourished populations who have high rates of anemia and are refractory to iron supplements. Recent data from Dr. Hennigar's lab

demonstrates that increased rates of anemia with CR may be due to increases in the iron regulatory hormone hepcidin. These data show that hepcidin increases with even mild-to-moderate CR, which inhibits dietary iron absorption and recycling, leading to an iron restricted anemia. This NORC P&F study will determine the effects of CR compared to energy balance on hepcidin and whether the effect of CR on indicators of iron status is mediated by changes in hepcidin in CALERIE-2 participants. Findings from this study could suggest that increased rates of anemia with CR are due to increases in hepcidin, and lead to future work to determine iron requirements and interventions to mitigate the anemia that develops with CR.

Neurodevelopment of hindbrain metabolic circuits in a mouse model of intrauterine growth restriction

Redin Spann, PhD

Postdoctoral Researcher

Pennington Biomedical Research Center

Intrauterine Growth Restriction (IUGR) is a serious gestational issue that can have an adverse impact on the health of the child for the remainder of their life. Infants that are born small-for-gestational age (SGA) because of growth restriction are at a greater risk for metabolic disease. It is unclear, however, why those that experience IUGR are more likely to develop obesity and suffer neurodevelopmental delays. While some research exists showing that the hypothalamus, the central regulator of energy homeostasis, is changed post-IUGR, little attention has been paid to the brainstem. This area is also essential for feeding and thermogenic behavior and is where many signals to and from the periphery are processed.

IUGR is a result of malnutrition or hypoxia, but this does not explain the fetal programming mechanisms that result in aberrant weight gain in adulthood even when catch up growth has been achieved. One possibility is that gut hormones that respond to nutrient deficiency play a part. Work in the Morrison lab has identified FGF21 as a hormone sensor of dietary protein that signals to neurons in the brainstem. FGF21, then, is well positioned to perform a crucial role in the development of these sensory neurocircuits. Limited knowledge exists about the role of FGF21 during development, however, it is known that FGF21 rises during pregnancy in both humans and rodents and is expressed in the placenta and fetal liver. We hypothesize that during low-protein-induced IUGR, FGF21 levels will be abnormally high and alter neural development in the brainstem. We will use a mouse model of growth restriction and FGF21 receptor knockout mice to better understand FGF21's significance in neurodevelopment as well as the pathophysiology of obesity following IUGR.

A Pilot Study to Examine Metabolic Flexibility as a Mechanism for Diet-Induced Epigenetic Alterations in Male Gametes.

Joshua Sparks, PhD

Postdoctoral Researcher

Pennington Biomedical Research Center

In a twenty-year period from 1999 to 2020, obesity in the United States (US) increased from 30.5% to almost 42%. In men of reproductive age (20-39 years), the prevalence of obesity is 40.3%. Of importance, obesity impacts approximately 20% of children and adolescents in the US. Observational and longitudinal studies have highlighted that paternal and maternal obesity at conception independently predicted obesity in the child, but the strongest odds were observed when obesity of both parents were considered together. Evidence supports that preconception DNA methylation (DNAm) patterns in male and female gametes are impacted by health behaviors (e.g., diet) that also impact risk for obesity development in the offspring. Yet, male gametes have distinctly unique epigenetic landscapes and may be affected to a greater extent due to diet, owed to high turnover in sperm cells. As such, epigenetic inheritance may originate independently through sperm DNAm. Epidemiological studies in men have shown that exposure to poor diet in one generation can increase the risk for development of obesity in future generations. Yet, there are no diet manipulation experiments in men to test whether an acute exposure to an obesogenic diet produces DNAm of genes in male gametes.

This NORC P&F aims, for the first time, to examine the impact of an acute, controlled 4-day high-fat diet (50% fat) on DNAm in human sperm, while also elucidating mechanisms underlying this change. The proposed study is designed to test the hypothesis that perturbations in substrate flux (i.e., metabolic flexibility) and the circulating metabolic and pro-inflammatory milieus (i.e., glucose, triglycerides, IL-6, and TNFα) will modulate DNAm of genes in sperm following an acute high-fat diet in young, healthy men. To do so, we will utilize inpatient metabolic chambers to determine metabolic flexibility and simultaneously perform a mixed-meal tolerance test to determine the postprandial metabolic and inflammatory milieus. Importantly, we will collect semen and analyze sperm DNAm in collaboration with the NORC Genomics Core at PBRC. Findings from this work will establish a rationale for inclusion of males in research during the preconception period to positively impact intergenerational health.

Enrichment Core Updates

Update on T32 Trainees

Pennington Biomedical's NIDDK-supported T32 on Training in Obesity Research began its 20th consecutive year of funding in 2023. During grant year 20, the program recruited and appointed three trainees. Read their short biographies below.

Emily Woolf received her Ph.D. in Food Science and Human Nutrition from Colorado State University. Dr. Woolf began training on the T32 in July 2023 and will pursue research with mentors Eric Ravussin, Ph.D. and Leanne Redman, Ph.D.

Sora Kim received her Ph.D. in Nutrition Science, from Perdue University. Dr. Kim began her T32 training in August 2023 and will pursue research with mentor Chris Morrison, Ph.D.

Semira Ortiz received her Ph.D. in Molecular Nutrition, from Cornell University. Dr. Ortiz began her T32 training in September 2023 and will pursue research with mentors Krisztian Stadler Ph.D. and Robert Noland, Ph.D.

Visiting Speakers Fall 2023

Each year, the Pennington/Louisiana NORC sponsors speakers who are prominent scientists from national and international universities as well as governmental and industrial labs. These seminars are available to all NORC participants. Listed below are those invited for Fall 2023.

Date	Speaker	Topic/Title
Nov 9	**Herman Pontzer, PhD** Professor of Medicine Evolutionary Anthropology Duke Global health Institute	**The Evolution of Energy Expenditure in Man**
Nov 16	**Vishwa Deep Dixit, DVM, PhD** Professor of Pathology & Immunobiology; Director, Yale Center for Research on Aging, Yale School of Medicine	**Immune-Metabolic Interactions that Drive Age Related Chronic Diseases**
Dec 7	**Jonathan Krakoff MD** Section Chief: Obesity and Diabetes Clinical Research Section, Phoenix Epidemiology & Clinical Research, NIDDK	**Energy and Macronutrient Absorption in Humans**

2023 Men's Health Summit

Nearly 300 men of all ages and from all over the state came to Pennington Biomedical for the 2023 Men's Health Summit on Saturday, August 26. The health and wellness event, themed "Empowering Men to Live Healthier Lives," featured free health screenings, educational sessions on men's health topics, immunizations, and local health and wellness exhibitors. Participants were provided with blood glucose screens, EKGs, blood pressure, BMI, colorectal cancer kits and other cancer screens. The summit also featured fitness activities, including a walk/run facilitated by Varsity Sports and a shadow boxing demonstration from TITLE Boxing Club. The event also included giveaways, prizes and a keynote address from comedian and motivational speaker John Morgan.

LAUNCHED Program

Pennington Biomedical houses the Louisiana Center for Advancing Underrepresented Scientists' Careers in Health, Nutrition, Obesity, and Disparities Research (LAUNCHED), funded by NIDDK (U24DK132740). LAUNCHED is one of four funded centers across the US that are designed to provide underrepresented minorities with a tailored training program to increase the chance of receiving diabetes, obesity, and/or nutrition funding.

The LAUNCHED program focuses on one-on-one mentoring, grant writing, professional development, career coaching, and includes didactic programming around nutrition, obesity, and diabetes in addition to pilot & feasibility project funding opportunities.

Save the Date

The following are Enrichment Core events for 2024 partially sponsored by our NORC.

March 2, 2024 – Wellness Day of Women
Annually, this event brings together women from the community to engage in a valuable information exchange directly relating to issues of women's health, nutrition, and wellness. The program includes 5-7 educational sessions, interaction with local health and wellness exhibitors, and free health screenings.

March 21 to 23, 2024 - "BOSS"
The inaugural Pennington Biomedical Annual George A. **B**ray **O**besity **S**cience **S**ymposium will take place in New Orleans, LA and feature an Obesity Management Symposium and ABOM Exam Prep Course for Clinicians and Research Scientists. Visit the website for more information.

April 14 to 16, 2024 - Scientific Symposium
Pennington Biomedical's Symposia attract world-renowned scientists to Baton Rouge, LA and gives them the opportunity to interact and synthesize knowledge on the chosen topic. For Spring 2024, the topic is "Precision Prevention, Diagnostics and Treatment of Obesity: Pipedream or Reality?". Co-chairs are Corby Martin, Ph.D., Pennington Biomedical and Caroline Apovian, M.D., Harvard University.

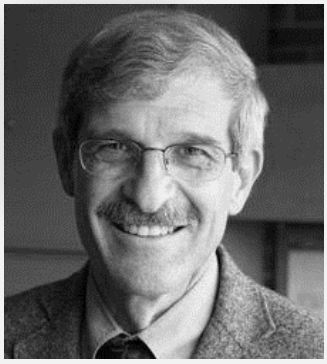
September 14, 2024 – Men's Health Summitt
The Men's Health Summitt is an annual event that offers educational sessions on a variety of important men's health topics, including urology, cardiology, preventive care, nutrition, cancer, and Medicare changes. In addition to the educational sessions, this event also includes health and wellness exhibitors, and free health screenings.

September 23 to 27, 2024 – Clinical Methods for Nutrition and Obesity Research Course
This 5-day course at Pennington Biomedical Research Center will train postdoctoral fellows and early career faculty on gold standard and cutting-edge research methods for conducting obesity and nutrition related research. Visit the website for more information.

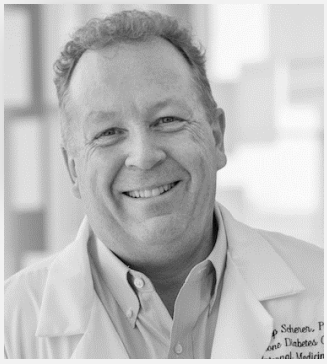
NORC External Advisory Board

The Pennington / Louisiana NORC would like to express our gratitude and acknowledge the contributions of our external advisory board members. Their Advice and feedback are invaluable to the operations and strategic planning of the center.

Rudolph L. Leibel, M.D.
Professor of Medicine
Columbia University



William Kraus, M.D.
Professor of Medicine
Duke University



Philipp Scherer, Ph.D.
Professor of Cell Biology
UT, Southwestern

Allison Xu, Ph.D.
Endowed Professor
UC, San Francisco