NUTRITION OBESITY RESEARCH CENTER
NEWSLETTER
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# Our Findings - NORC Produces Significant Research

The NORC is designed to support research at all levels, including pilot programs that eventually lead to long-term funding. Here are some of our researchers and their work…

**"Validation of innovative technology to measure the energy intake of free-living humans." - Corby Marin, Ph. D.**
(This is an R21 grant won after the presentation of data gathered under a pilot grant of the NORC.)

"Food intake is one of the primary culprits of weight gain, yet there are few methods to accurately measure food intake in free-living conditions. Consequently, it is difficult for scientists to study food intake, energy balance, and weight gain in free-living conditions, and clinicians have few tools to measure the food intake of patients. The "gold standard" for measuring food intake relies on the doubly labeled water method, but this method is costly, not available to most researchers and clinicians, and does not provide information on macronutrient intake. The proposed research will test the validity of the digital photography of foods method in free-living conditions. The digital photography method accurately measures food intake in cafeterias. When using this method, the plate of foods selected by an individual is photographed, before the meal and plate waste is photographed after the meal. Standard portions of known quantities of the foods are also photographed and registered dietitians use these photographs to estimate food intake. The purpose of the proposed research is to develop and test innovative technology that will facilitate the collection of accurate food intake data in free-living humans using the digital photography method. Participants will take photographs of their food selection and plate waste using cell phones, and these data will be transferred to the researchers over a cellular network in near "real-time." A semi-automated computer application will be developed to automatically identify the foods in these pictures and estimate the amount of food eaten based on the pictures. During the proposed project, this computer application will be developed and the reliability and validity (accuracy) of the method for estimating food intake will be tested in laboratory and free-living conditions. This research promises to significantly advance the study of energy balance and provide a useful tool to clinicians for measuring food intake."

Preliminary data from the R21 (featured last year) suggests that our method accurately measures the

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## In This Issue:



## T32 Training Grant Renewed

Dr. Phillip J Brantley, Enrichment Director for the NORC, was awarded a five-year continuation on his NIDDK T32 Institutional Training Grant entitled *Obesity: From Genes to Man*. The grant provides four training slots and up to three years of training for postdoctoral fellows. Trainees complete required graduate coursework taught by Pennington Faculty, attend seminars on the responsible conduct of research and acquire laboratory and research skills from mentors who are members of the NORC. The original T32 grant funded 12 postdocs over the course of five years, many of whom now hold faculty positions in research institutions.

## Organizational Changes

The original director of the NORC Human Phenotpying Core, Dr. Steve Smith, will be leaving the Pennington Biomedical Research Center to start a new clinical research effort in central Florida. With his departure, Dr. William Cefalu has been named the new core director.

With the departure of Andrew Butler earlier this year, Randy Mynatt is the new director of the NORC Animal Models & Phenotyping Core. Dr. Don Ingram is the Associate Core Director.

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food intake of people while they reside in their natural environment. This is a significant success; there are few methods to accurately measure what people eat.

**Note: The Domino effect NORC was designed to create...** Results from this grant have led to the funding of another NIH grant entitled *Design and Evaluation of the Remote Intervention for Diet and Exercise (RIDE),* See on the right.

**"Maternal dietary fat independent of obesity predisposes offspring to obesity" -Christopher Morrison, Ph.D. (**This project began as NORC pilot grant in 2008, and has been refunded in 2009.)

"This research project, which uses rodents as the animal model, focuses on the maternal environment and its impact on the subsequent body weight regulation and obesity predisposition in offspring. Several lines of evidence, including work done as part of this project, indicate that mothers that consume a high fat diet and become obese during gestation/lactation produce offspring that are more prone to obesity in adulthood. Thus the obese maternal environment induces a persistent programming effect on the offspring. However, several questions remain regarding the mechanism underlying this programming effect. In the first year of funding, we specifically tested whether this programming effect was driven by the high fat diet itself, or whether maternal obesity was also required. Our data indicate that when mothers were fed a high fat diet but prevented from becoming obese (via limiting food intake), their subsequent offspring were not predisposed to obesity. These data therefore indicate that it is not the HF diet itself that alters the offspring, but that some factors specific to the obese maternal environment induce the permanent change in body weight. In our second year of funding, we are specifically focusing on the early postnatal period and are testing whether maternal obesity alters the development of key brain areas that are associated with body weight regulation. It is well known that specific populations of neurons are critical for the appropriate regulation of body weight and food intake, and these neurons do not appear to fully develop until the first 2-3 weeks of life. Our project will determine whether maternal obesity alters the development of these neurons, thus predisposing these offspring to obesity later in life." – Chris Morrison

# New Grants

***Design and Evaluation of the Remote Intervention for Diet and Exercise (RIDE),* – Corby Martin, Ph. D.**

*Corby Martin, Ph.D.*

The proposed research will provide important information on the efficacy of the Remote Intervention for Diet and Exercise (RIDE) e-Health application at promoting weight loss. The findings will have significant implications for the affordable delivery of weight management services to people who have limited access to health care, including people who live in rural communities and those with financial limitations. A disproportionate number of these individuals would benefit from weight management services, but a number of barriers limit access to services. The RIDE e-Health application overcomes many of these barriers, as well as the limitations of previous e-Health weight loss interventions.

**Project Summary/Abstract**

A large proportion of the adult population in the United States qualifies for weight loss treatment based on the NIH treatment recommendations, but traditional clinic-based weight loss treatments have a number of limitations. For example, access to healthcare facilities is limited among people living in rural communities and people of low socioeconomic status, yet a disproportionate number of these people would benefit from services. Internet-based weight loss interventions have been used to deliver services to these populations, but these "e-Health" interventions suffer from a number of limitations and produce only modest weight loss. The limitations associated with internet-based interventions include decreased use of the internet application over time; patients must logon to the internet to receive treat-

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ment recommendations, yet few patients regularly logon to the application and this negatively affects treatment outcome. An additional limitation is the quality of self-reported food intake, exercise, and body weight data that participants enter into the internet application or report to their online counselor. Self-reported data are associated with error and accurate data are needed to formulate effective treatment recommendations for participants. Lastly, most applications rely on asynchronous communications between the patient and the counselor, and patients do not always receive personalized treatment recommendations in a reasonable amount of time (1 to 3 days), which limits the extent to which the recommendations result in behavior change and weight loss.

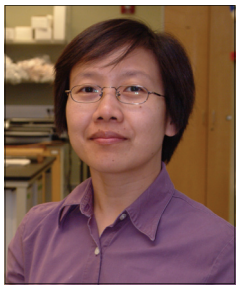
The purpose of the proposed pilot and feasibility project is to test the efficacy of the Remote Intervention for Diet and Exercise (RIDE) e-Health application at promoting weight loss compared to a control condition. The RIDE e-Health application addresses the limitations of internet-based interventions that are noted above. The application relies on novel technology to collect near real-time food intake, body weight, and exercise data from participants while they reside in their free-living environments. These data are transmitted to the researchers in real-time: food intake data are collected and transmitted with camera and Bluetooth-enabled cell phones using the Remote Food Photography method that was developed by our laboratory, body weight data is automatically transmitted daily from a bathroom scale using the same phones, and accelerometry is used to collect exercise data that is transmitted via the internet. These data are analyzed and personalized treatment recommendations are sent to the participant in a timely manner, e.g., every 1 to 3 days, using cell phones. The RIDE e-Health application was developed based on learning and behavioral theory to maximize behavior change and weight loss. The findings of this study will have significant implications for the affordable delivery of effective weight management interventions to patients with limited access to health care.

# New Awards for Pilot and Feasibility Studies

***Congratulations to the following researchers. Of twelve applications for NORC Pilot and Feasibility grants, only four were awarded***

**Bolormaa Vandanmagsar, PBRC** - *Endothelial-mesenchymal transition, adipocyte lineage and obesity*

Endothelial-mesenchymal transition is a key mechanism for generation of fibrogenic cells that cause cardiac fibrosis. The secondary mesenchymal cells are multipotent and can give rise to adipocytes. Furthermore, mesenchymal stem cells in multiple human organs are thought to be of perivascular origin, but *in vivo* evidence that adipocyte lineage can be traced to endothelial cells is lacking. Our fate-mapping experiments will allow the determination of fate of endothelial cells as they transition into fibroblasts and adipocytes. We predict that endothelial cells are one source of fibrogenic cells and adipocytes during obesity in the white-adipose tissue.



**Rea Anunciado-Koza, PBRC** - *The effect of Slc25a25 deletion on bioenergetic and Ca2+ profile in vitro*

Slc25a25 is an integral protein of the inner mitochondrial membrane which in response to $Ca^{2+}$ stimulation functions to shuttle ATP-Mg for Pi. In order to understand the contribution of Slc25a25 to $Ca^{2+}$ cycling mechanism and its importance to thermogenesis and energy balance, we conducted in vivo studies in Slc25a25$^{-/-}$ mice. Our studies show that Slc25a25$^{-/-}$ mice are protected against diet-induced obesity (DIO) and have reduced endurance capacity. Our hypothesis is that inactivation of Slc25a25 will reduce susceptibility to DIO by decreasing metabolic efficiency in skeletal muscle and adipose tissue by inability to maintain adequate levels of ATP for the normal function in these tissues. To determine the mechanisms by which Slc25a25 modulate energy metabolism, we propose to conduct bioenergetic profiling of mouse embryonic fibroblasts (MEF) and mitochondria isolated from liver and skeletal muscle of Slc25a25$^{-/-}$ mice, and conduct cytosolic and mitochondrial $Ca^{2+}$ imaging in MEF.

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**Michael Salbaum, PBRC** - *Embryonic epigenetics in diabetic and obese pregnancies*

Adverse conditions such as diabetes or obesity during pregnancy may not just lead to birth defects, but exert long-term health consequences for the offspring. It is unclear how these long-term effects are mediated. One possible mechanism is epigenetic modification of the embryonic genome during adverse pregnancies, as it is thought that such modifications remain for a long time. The goal of this project is to detect an epigenetic marker in the embryo on a genome-wide basis, and determine the effects of maternal diabetes as well as maternal obesity on the status of this epigenetic landmark.

**Mingquan Zheng, LSU Health Science Center in New Orleans** - *The role of Vitamin D in Th2 and Th17 related asthma*

The active form of vitamin D suppresses the development of human autoimmune diseases. It has been shown to decrease proliferation of all T helper (h) cells *in vitro* and decrease the production of various cytokines. Th cells aid in immune response by recognizing antigens and secreting cytokines. A novel subset of Th cells, Th17 cells have been identified and shown to be highly pathogenic in many autoimmune diseases as well as in asthma and cystic fibrosis (CF) patients with a specific allergy to aspergillus termed Allergic Bronchopulmonary Aspergillosis (ABPA). Th17 cells, as opposed to Th2 cells, are highly resistant to glucocorticoid suppression and can mediate steroid-resistant asthma in mice. Vitamin D deficiency is a significant risk factor for ABPA. Moreover, *in vitro* treatment of aspergillus-pulsed dendritic cells and CD4 T -cells with active form of vitamin D significantly suppressed aspergillus induced Th2 and Th17.

Based on this, we hypothesize that vitamin D plays a role in Th17 cytokine production. Under our proposed aims, we will determine the effects vitamin D has on Th2, Treg, and Th17 cytokine production both *in vivo* and *in vitro*. We will examine whether mice genetically deficient in vitamin D deficient mice have an altered Th17 response in response to allergen.

## NORC Capabilities

***Continuous improvement is the watchword in the NORC. Here is partial list of the latest advances***

**Human Phenotyping (Steve Smith/Donald Williamson)**

- validation of the 6,6, $^{2}$D glucose oral glucose tolerance test
- tested multiple metabolic carts (indirect calorimetry) and selected a replacement for the aging Sensormedic carts
- determined the precision and accuracy of a whole body NMR device (EchoMRI ™ – we renamed this device *QuickScan*).
- completed the development of a technique for the measurement of epicardial adipose tissue mass by MRI.
- Initiated development of a dynamic exercise protocol for the measurement of TAP synthesis in the magnetic resonance spectrometer.

## PBRC Executives stay tuned in

Executive Committee meetings this year have continued to include scientific presentations from NORC members. Recent examples include Carol Lammi-Keefe, Ph.D., R.D. who presented on maternal nutrition and Tuomo Rankinen, Ph.D. who presented on the use of llumina platform for SNPs, genotyping and gene expression. The Committee also received presentations from the NORC Pilot and Feasibility Grant recipients to update progress on their projects.

## Acknowledging NORC in publications

Friendly reminder - In the manuscripts you submit, please add under the *Acknowledgements*:

"This work was partially supported by a NORC Center Grant # 1P30 DK072476 entitled *Nutritional Programming: Environmental and Molecular Interactions*" sponsored by NIDDK."