

4th Annual Meeting ▶▶▶▶▶▶▶▶▶▶&◀◀◀◀◀◀◀◀◀◀◀◀Poster Competition

Presidential Cluster Hire
OVPR and RDT
College of Human Sciences
ORC Advisory Committee



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<https://www.depts.ttu.edu/hs/obesityresearch/>

4th Annual Obesity Research Cluster (ORC) Meeting & Poster Competition

An Integrative Look at Obesity Science

3:00 - 3:20 Welcome & Introduction

Dr. Naima Moustaid-Moussa, Professor, Nutritional Sciences & Founding Director, ORC
Dr. David Weindorf, Professor, Plant & Soil Science & Faculty Fellow, OVPR
Dr. Michael O'Boyle, Professor & Associate Dean for Research, COHS

3:20 - 3:30 ORC Overview & Report

Dr. Naima Moustaid-Moussa

3:30 - 3:45 Keynote Speaker I Introduced by: Dr. Wilna Oldewage-Theron

Dr. Debra Reed, Helen DeVitt Jones Chair, Distinguished Professor
Department of Nutritional Sciences, College of Human Sciences, Texas Tech University
"Reflections and Looking Forward on Obesity Prevention"

3:45 - 4:00 Keynote Speaker II Introduced by: Dr. Latha Ramalingam

Dr. Preethi Gunaratne, Director, UH-SeqNEdit Core & Associate Professor
Department of Biology & Biochemistry; University of Houston
"Harnessing the Non-Coding RNA for Extracting Critical Drivers from Rare Cell Populations Driving Aggressive Cancers"

4:00 - 4:12 ORC Pilot & Feasibility Awardees' Presentations Introduced by: Dr. Eric Rivas

(3 min each)

4:15 - 4:35 High Density Oral Presentations Introduced by: Dr. Oak Hee Park

(3 min each)

4:35 - 4:45 BREAK

4:45 - 5:20 Highlights of TTUS Interdisciplinary Research Introduced by: Dr. Melanie Sarge, Assistant Professor, College of Media & Communications (5 min each)

- TTUHSC Lubbock & New Center for Integrative Health- Dr. Jannette Dufour
- TTUHSC Clinical Research Institute - Dr. Alan Peiris
- TTUSC Permian Basin - Dr. Natalia Schlabritz-Lutsevich
- TTUHSC El Paso Center for Emphasis on Diabetes Dr. Munmun Chattopadhyay
- TTU Nutrition Metabolic Health Initiative - Dr. Nikhil Dhurandhar
- TTU International Center for Food Industry Excellence – Dr. Carlos Carpio
- TTU Food and Wine Initiative in Fredericksburg - Dr. Eric Hequet

5:20 - 5:50 TTUS Interdisciplinary Networking

Facilitator: Dr. Melanie Sarge

5:50 - 6:00 Innovation Hub at Research Park Introduced by: Dr. Naima Moustaid-Moussa

Kimberly Gramm, Senior Managing Director

6:00 - 6:10 Closing remarks

6:15 - 8:00 Poster Competition & Reception Facilitator: Drs. Oak Hee Park and Mary Murimi

7:30 Poster Award Announcement



Pilot & Feasibility Awardee Presentations

Conrad Lyford

Using behavioral economics to achieve improved healthy behavior outcomes in breast cancer survivors

Iurii Koboziev

Role of intestinal microbiota in mediating therapeutic effects of fish oil in dietary obesity

Wei Li

An integrated biomimetic adipose tissue microchip

Shu Wang

Browning white adipose tissue using resveratrol nanoparticles carried by hydrogel templates



Student & Post Doctoral Oral Presentations

Rebecca Beights

Effects of overweight or obesity on resting state functional connectivity of brains of children with autism spectrum disorder

Sumedha Liyanage

FTIR micro-spectroscopy application to study dietary induced changes in adipose and liver tissues

Nadeeja Wijayatunga

A multi-faceted education method reduces weight bias among Kinesiology students

Presheet Patkar

Branched-chain amino acid (BCAA) metabolism is improved in a mouse model of roux-en-Y gastric bypass

Kushal Gandhi

Effect of maternal high fat diet on key components of the placental and hepatic endocannabinoid system

Kalhara Menikdiwela

Maternal and offspring supplementation with fish oil improves metabolic health in diet-induced obesity

Ana Moyeda

Community-based Assessment and Intervention for the Prevention of Type 2 Diabetes and its Complications among Hispanics in Lubbock, Texas and in a Mexico-Texas Border City



Student & Post Doctoral Poster Presentations

**Hunter Edwards &
Mizanur Rahman**

Dietary restriction extends lifespan of *C. elegans* in NemaLife, a novel, high throughput microfluidic platform

Georgina Sakyi

Prevalence of overweight and obesity in children with autism spectrum disorder: A systematic review and meta-analysis

Miranda Cox

Relative risk of development overweight and obesity in individuals with ASD: A systematic review and meta-analysis

Hunter Turnipseed

A Pilot Study of The Alter-G Anti-Gravity Treadmill to Overcome Exercise Barriers in Obesity

Fahmida Rasha

Role of hypertensive hormone angiotensin II in breast cancer cell inflammation

Shasika Udahawatte

Anti-inflammatory effects of tart cherry anthocyanins in adipose tissue

Kembra Albracht

Central adiposity is a strong predictor of Non-alcoholic Fatty Liver Disease (NAFLD) in South Asian women

Malihatabassum Munir

Vitamin D3 (calcitriol) reverses epithelial-mesenchymal transition and inhibits stemness and cell migration in breast cancer

**Katelyn Macleay &
Anudeep Dasaraju**

Investigating the association between metabolic syndrome and adenomyosis

Prakash Parajuli

FTIR microspectroscopy study of the oxidative damage occurring in mouse white adipose tissue

Mdkhurshidul Zahid

Blueberry leaf extract inhibits foam cell formation and activates autophagy in macrophages via AMPK/mTOR signaling

Abu Bakkar Siddik

A MetAP2 inhibitor suppresses adipogenesis, yet, enhances glucose uptake

Aaron Teixeira

The effect of pet dog ownership on empirical measures of child activity

Zahra Feizy

Nano-liposome-mediated delivery of the anti-diabetic protein E4orf1



Effects of overweight or obesity on resting state functional connectivity of brains of children with autism spectrum disorder

Rebecca Beights¹, Chanaka N. Kahathuduwa^{1,2}, Blake West¹, Wonjung Oh¹, Ann M. Mastergeorge¹

¹ Department of Human Development and Family Studies, Texas Tech University, Lubbock, TX

² Department of Physiology, Faculty of Medicine, University of Peradeniya, Sri Lanka

Background: Autism spectrum disorder (ASD) is a developmental disorder characterized by difficulties in communication, social interaction, and restricted repetitive behaviors. ASD is often associated with an increased risk of development of overweight or obesity (OWOB). Resting state functional connectivity of the brains of children with ASD, OWOB and their coexistence have not been studied.

Methods: Publicly available, de-identified, phenotypic data and preprocessed resting state functional magnetic resonance imaging (rs-fMRI) data shared via the Autism Brain Imaging Data Exchange (ABIDE) Preprocessed initiative were accessed. Records of children (i.e. age < 18 years) with biologically plausible body mass indices (BMI) were identified and their rs-fMRI data preprocessed using the Connectome Computation System pipeline and mean time series for the bilateral orbitofrontal cortex (OFC), middle frontal gyrus (MFG), and medial frontal cortex (MFC) seed regions were downloaded. Presence of OWOB (i.e. BMI \geq 85th centile for age and sex) was determined using CDC BMI for age charts. Subject level correlations between each seed region's time series and rs-fMRI data of the entire brain were analyzed using the Feat tool in FSL. Group-level analyses were performed to compare the groups with 1) ASD but not OWOB, 2) OWOB but not ASD and 3) both conditions with the group without ASD or OWOB (i.e. controls) using a factorial regression model controlling for sex, age and study site. Final statistical maps were thresholded using a permutation-based approach in FSL (i.e. randomise).

Results: BMI was available for 81 children (11.97 \pm 2.77 years; 59 male; 37 with ASD; 24 with OWOB). Evidence of hypo-connectivity between R/OFC and a cluster that included the posterior node of the default mode network; DMN (i.e. precuneus) was observed in the group with ASD without OWOB compared to the controls ($P = 0.003$; FWER). In contrast, the group with both ASD and OWOB showed hyper-connectivity between the R/OFC and a cluster that included the posterior node of the DMN ($P = 0.015$; FWER).

Conclusion: Previous evidence suggests that strength of rs-fMRI connectivity between OFC and posterior DMN is negatively associated with ASD symptom severity. Our observation of hypo-connectivity between the OFC and the posterior DMN in isolated ASD is consistent with these findings. Observed hyper-connectivity between these regions in coexistence of ASD and OWOB suggests that weight gain may be associated with better symptomatic outcomes in ASD. More evidence is needed to confirm this hypothesis and further explicate any causal inferences.

FTIR microspectroscopy application to study dietary induced changes in adipose and liver tissues

Sumedha Liyanage¹, Amal Bouyanfif^{1, 2}, Latha Ramalingam², Naima Moustaid-Moussa²,
Noureddine Abidi¹

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² Department of Nutritional Sciences, Texas Tech University, Lubbock, TX

Obesity and non-alcoholic fatty liver disease (NAFLD) are closely associated metabolic diseases. Adipose tissue and liver undergo biochemical changes during the pathogenesis of these diseases. Understanding these changes at the cellular level may provide new insights into mechanisms underlying obesity and NAFLD. Fourier Transform Infrared microspectroscopy imaging (FTIRI) is a fast and reliable tool to investigate biochemical changes in biological samples. The location of IR vibrations, their intensities, and shapes provide information on the relative abundance, molecular structure, and chain conformation of the biomolecules present in the biological sample. We investigated obesity-induced biochemical changes in liver, and adipose tissues collected from mice fed either a low-fat or a high-fat diet to induce obesity. Our results showed that the chemical composition of steatotic as well as nonsteatotic areas of the liver change due to NAFLD development. The appearance of intense new IR vibrations attributed to lipids indicates elevated lipid accumulation in adipose tissues with high-fat diet. Moreover, marked changes in functional group distribution of lipids and proteins were observed. Furthermore, the degree of unsaturation in lipids stored in white adipocytes was significantly reduced probably due to oxidative stress associated with obesity. This study demonstrated that FTIRI could be used as a powerful non-destructive technique to investigate diet- and obesity-induced biochemical changes in liver and adipose tissues.

A multi-faceted education method reduces weight bias among Kinesiology students

¹Nadeeja N. Wijayatunga, ¹Youngdeok Kim, ¹Emily J. Dhurandhar

¹ Department of Kinesiology and Sport Management, Texas Tech University, Lubbock, TX

Background: Negative attitudes and discrimination towards individuals based on body weight is known as “weight bias”. Weight bias in health professionals has a negative impact on their treatment decisions. Therefore, it is important to address this issue during the training period of future health professionals. It is known that higher weight bias is present in Kinesiology students. Our objective was to determine if using a multi-faceted education method to teach about obesity would reduce weight bias among college students majoring in Kinesiology.

Methods: Two versions of an 80-minute lecture (day/D1), video and role-play (D3) and examination (D15) were delivered to Kinesiology major undergraduates by the same instructor. Uncontrollable causes of obesity and weight bias were learned by the intervention group (n=33), while role of exercise and diet in weight management were learned by the control group (n=34). Explicit weight bias was measured using Anti-fat attitude test (AFAT) and implicit weight bias was measured by the Implicit Attitude test (IAT) at baseline, after in-class activities (D3) and 15 days after the exam (Post-D₁₅).

Results: At baseline, 64% of all participants (considering both groups) had strong or moderate preference for individuals who are thin over those with obesity. In mixed model analysis, a significant group by time interaction was found ($p < 0.001$). Interestingly, AFAT blame scores reduced immediately after in-class activities (lecture, video and role play) and persisted after Post-D₁₅ with mean differences (standard errors) of -0.35 (.08) and -0.39 (.08), respectively only in the intervention group ($p < .05$). The odds of having a favorable IAT score in the control group at Post-D₁₅ was significantly lower than baseline (Odds ratio=0.4; 95% CI = 0.22 – 0.73) with generalized linear modeling.

Conclusion: A multi-faceted educational intervention reduced “Blame” component of explicit weight bias, but did not change implicit weight bias. Learning only about diet and exercise in obesity actually increased implicit weight bias. This highlights the importance of contents and the method of teaching to address the issue of weight bias among pre-professionals.

Keywords: Weight bias, Explicit weight bias, Implicit weight bias, obesity training, Obesity education

Branched-chain amino acid (BCAA) metabolism is improved in a mouse model of Roux-en-Y gastric bypass

Presheet P. Patkar¹, Zheng Hao², Michael B. Mumphrey², B. Leigh Ballard², Hans-Rudolf Berthoud², Andrew C. Shin¹

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Circulating branched-chain amino acids (BCAAs) are elevated in obese/diabetic individuals, and an emerging evidence shows that BCAA supplementation can impair glucose metabolism, suggesting a causal link between BCAAs and insulin resistance/diabetes. Interestingly, plasma BCAAs are effectively lowered by Roux-en-Y gastric bypass (RYGB) surgery in obese individuals, potentially contributing to improved glycemic control, but the underlying mechanism is not clear. The aim of the study was to assess surgery-induced changes in BCAA metabolism using our established mouse model for RYGB. Diet-induced obese mice were divided into Sham, RYGB, and no-surgery weight-matched controls. Two weeks after Sham or RYGB surgery, mice were sacrificed and blood and tissues were harvested. Plasma metabolites including BCAAs and hepatic branched-chain keto acid dehydrogenase (BCKDH), the rate-limiting enzyme for BCAA degradation, were analyzed by GC/MS and western blot, respectively. Unlike Sham obese mice, RYGB mice were able to lower and maintain the lost weight (~20% compared to pre-surgical levels and Sham group). Plasma metabolomics analysis showed a significant reduction of all BCAAs in both RYGB and WM compared to Sham group. Total BCKDH protein in liver, where the protein activity is the highest, was not different across groups, but their inactive, phosphorylated state of BCKDH was significantly lower in both RYGB and WM compared to Sham group. Our findings suggest that RYGB surgery effectively lowers plasma BCAAs possibly due to increased hepatic BCAA breakdown. Similar finding in WM group indicates weight-dependent effect that is different from a recent human study. This needs further investigation.

Funding sources: NIH DK099463 (A.C.S.) and NIH DK047348 (H.B.)

Effect of maternal high fat diet on key components of the placental and hepatic endocannabinoid system

Kushal Gandhi¹, Cun Li^{2,3}, Nadezhda German⁴, Cezary Skobowiat⁵, Maira Carrillo¹, Marcel Chuecos¹, Stacy Martinez¹, Raja Reddy Kallem⁴, Eneko Lumbe⁶, Gary Ventolini¹, Peter Nathaniel^{2,3}, and Natalia Schlabritz-Loutsevitch¹

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Maternal obesity (MO) in pregnancy has been linked to a spectrum of adverse fetal developmental changes. MO has been linked to offspring autism spectrum disorders, inflammatory bowel syndrome, asthma, diabetes and nonalcoholic fatty liver disease. Involvement of endogenous cannabinoids (eCBs) in obesity is well characterized. However, information regarding eCBs physiology in obesity associated with pregnancy is sparse. This study evaluated fetomaternal hepatic, systemic, and placental eCB molecular changes in response to maternal consumption of a high-fat diet (HFD). From at least 9 months before conception, non-pregnant baboons (*Papio* spp.) were fed a diet of either 45% fat (HFD; n=11) or 12% fat, controls (CTR; n=11). Maternal and fetal venous blood, placental and hepatic tissues were evaluated using liquid chromatography–mass spectrometry, western blot and immunohistochemistry to quantify anandamide (AEA) and 2-arachidonoyl glycerol (2-AG), their receptors (CB1R and CB2R), and fatty acid amide hydrolase (FAAH). Fetal weight was influenced by fetal sex but not by maternal diet. The increase in maternal weight in animals fed the HFD approached significance (p=0.055). Maternal circulating 2-AG concentrations increased and fetal circulating concentrations decreased in HFD group, independent of fetal sex. CB1R receptor expression was detected in syncytiotrophoblasts (HFD) and fetal endothelium (CTR and HFD). Fetal hepatic CB2R and FAAH protein expression decreased in the HFD group vs. CTR. Consumption of a HFD during pregnancy results in systemic fetal eCB deficiency coupled with decreased hepatic AEA degradation. The latter might represent a local compensatory mechanism to balance decreased systemic eCB levels.

Maternal and offspring supplementation with fish oil improves metabolic health in diet-induced obesity

Kalhara Menikdiwela¹, Stephani Clevenger¹, Tochi Eboh¹, Latha Ramalingam¹, London Allen¹, Shane Scoggin¹, Naima Moustaid-Moussa¹

¹Nutritional Sciences, Texas Tech University, Lubbock, TX

Obesity is complex disease and an emerging global epidemic. Half of American women of child bearing age have obesity or overweight which in turn increases the prevalence of childhood obesity. Thus, early interventions during pregnancy may help prevent both maternal and offspring obesity. Fish oil (FO) exerts various health benefits including lowering the risk for chronic diseases. Hence, we hypothesize that FO supplementation during pregnancy and continuation in offspring will reduce obesity and its associated health complications. To test our hypothesis, female mice (moms) were fed a control low fat (LF), a high fat (HF) or HF supplemented with FO diet. After weaning, pups from HF or FO fed moms were assigned to the same maternal diet or switched to the other diet (HF→FO or FO→ HF). Changes in body weight, and blood glucose were tested. Serum, fat and other tissues were collected. Pups fed on HF had significantly higher body weight compared to LF whereas mice who continued on FO had significantly better glucose levels compared to HF groups. Moreover, inflammation was lower in FO group compared to HF. Fat cell size which is an indicator of obesity was significantly reduced in FO groups compared to HF mice indicating beneficial effects of FO. FO supplementation during pregnancy and continuous feeding to pups reduces adverse maternal effects of HF diet on offspring. Further studies are ongoing to better understand the contribution of maternal HF vs FO feeding on offspring health and potential translation of this research to clinical studies.

Community-based Assessment and Intervention for the Prevention of Type 2 Diabetes and its Complications among Hispanics in Lubbock, Texas and in a Mexico-Texas Border City

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Objective: The purpose of this longitudinal study was to assess dietary intake and the level of food insecurity, and to implement a diabetes education intervention among Hispanic adults, currently living in Lubbock, Texas, U.S. and Piedras Negras, Coahuila, Mexico.

Methods: The study used a pre- and post- design with a 4-week intervention consisting of a weekly 2-hour session conducted in Spanish. Participants were recruited through flyers, word of mouth and announcements in churches and house-to-house. Intervention topics included diabetes and its complications, and nutrition strategies to prevent and manage diabetes.

Results: A total of 102 participants were recruited. A majority of the participants had obesity (70.7%) and slightly more than half (51%) reported having diabetes. A majority of participants consumed more than the recommended intake of grains (68.5%), protein foods (51.1%), fats (48.9%), and consumed less than the recommended intake of whole grains (51.1%), fruits (81.5%), vegetables (87.0%), and dairy products (91.3%). Significantly more participants from Piedras Negras reported being food insecure ($p=.04$) than participants from Lubbock. Thirty-five participants completed the intervention. After the intervention, participants significantly increased their diabetes knowledge ($p<0.001$), attitudes towards diabetes ($p<0.001$), and self-efficacy scores ($p<0.001$); and significantly decreased their intake of grains ($p=.006$) and fats ($p=.002$).

Conclusions and implications: Results of this study suggest that interventions are more likely to change dietary behaviors when they target behavior mediators such as knowledge, attitudes and self-efficacy. Future interventions should target people at the community level in an attempt to prevent the onset of diabetes and its complications.

Funding: IRDSG

Dietary restriction extends lifespan of *C. elegans* in NemaLife, a novel, high throughput microfluidic platform

Hunter Edwards¹, **Mizanur Rahman**², Monica Driscoll³, and Siva Vanapalli²

Dietary restriction (DR) has been shown to extend lifespan and delay signs of aging in many organisms. Significant studies on the mechanisms of DR-induced longevity have been conducted in the popular worm model, *C. elegans*. Multiple conserved pathways have been identified to mediate the resulting lifespan extension in these organisms. However, the specific pathways activated in response to DR depend upon various environmental factors and thus differ between experimental assays and methods of induction. Current DR methods are tedious and require the use of controversial pharmacological interventions to prevent the production of progeny and increase effective sample sizes. Here we propose a high throughput microfluidic platform to study the longitudinal and populational effects of dietary restriction in *C. elegans* models without the use of progeny-inhibiting drugs. This platform allows control of food availability (bacterial density) and tracking of age-related changes throughout the life of the worm including size, speed, and strength in addition to lifespan. DR extends lifespan and healthspan in worms when induced both before and after the reproductive period indicating that multiple pathways are working to mediate the effects of reduced caloric intake. Our platform will allow us to quickly investigate the mechanistic pathways which mediate DR-induced longevity and may inform on previously unknown mediators of lifespan.

Prevalence of overweight and obesity in children with autism spectrum disorder: A systematic review and meta-analysis

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Background: In the United States, body mass index (BMI) of 31.7% of children between 2-19 years are considered to have overweight or obesity (i.e. BMI \geq 85th percentile for age and sex) and 17% of children are considered to have obesity (i.e. BMI \geq 95th percentile). Even though some studies have indicated that children with ASD are at a greater risk of developing overweight and obesity the literature is inconclusive. We aimed to explore the prevalence of overweight and obesity in children and adolescents with ASD in a systematic review and meta-analysis.

Methods: PubMed, Scopus, ProQuest and Web-of-Science databases were systematically searched using specific search terms. The records were filtered using pre-defined eligibility criteria. Prevalence of obesity; and combined overweight and were extracted from the eligible records. DerSimonian-Laird random effects meta-analyses of the prevalence data were performed using the metafor package in R statistical software.

Results: Out of 6,458 records, 30 full-text articles survived the eligibility screening. In the random effects meta-analyses, the prevalence of obesity among children with ASD was estimated to be 20.54% [17.7, 23.7] and the prevalence of combined overweight and obesity among children with ASD was 37.1% [33.6, 40.8]. These were significantly greater than the prevalence of obesity (i.e. 17%, $p < 0.001$) and the prevalence of overweight and obesity combined (i.e. 31.7%, $p < 0.001$) among children in the United States.

Conclusion: ASD seems to be associated with an increased prevalence of overweight and obesity. Future research should explore the factors contributing to this association.

Relative risk of development overweight and obesity in individuals with ASD: A systematic review and meta-analysis

Miranda A. Cox ¹, Georgina J. Rosenbrock ¹, Nagaraju Dharavath ¹, Rebecca Beights ¹, Naima Moustaid-Moussa ², Ann M. Mastergeorge ¹, Chanaka N. Kahathuduwa ^{1, 3}

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³ Department of Physiology, Faculty of Medicine, University of Peradeniya, Sri Lanka

Background: Autism spectrum disorder (ASD) is a neurodevelopmental disorder impacting communication and social interaction. Some studies have shown that individuals with ASD have a greater risk of development of overweight (i.e. body mass index; BMI \geq 85th and < 95th percentile for age and sex) or obesity (i.e. BMI \geq 95th percentile). We aimed to determine the relative risk of development of 1) combined overweight and obesity and 2) obesity among individuals with ASD as compared to individuals without ASD in a systematic review and meta-analysis.

Methods: PubMed, Scopus, ProQuest and Web-of-Science databases were systematically searched using specific search terms. The records were filtered using pre-defined eligibility criteria. Using the "metafor" package in R statistics software, DerSimonian-Laird random effects meta-analyses were performed to determine the overall relative risk of developing 1) overweight or obesity; and 2) obesity among populations of individuals with ASD.

Results: Out of 6,458 records, 10 full-text articles survived eligibility and contained data regarding overweight and obesity of ASD and non-ASD control groups. Meta-analysis revealed that ASD have a 46.7% higher chance of development of either overweight and obesity compared to children and adolescents without ASD (RR = 1.47 [1.28, 1.68]). Risk of development of obesity was found to be 84.4% higher in individuals with ASD as compared to individuals without ASD (RR = 1.84 [1.64, 2.07]).

Conclusions: Our results strongly suggest that ASD seem to increase the risk of development of overweight and obesity. Further research should focus on finding potential contributors to this association.

A Pilot Study of The Alter-G Anti-Gravity Treadmill to Overcome Exercise Barriers in Obesity

Turnipseed, H.W., Wijayatunga, N., Oliver, M.; Freedle, C., Kneedler, F., Dhurandhar, E

Although exercise helps manage obesity, pain and low enjoyment are barriers to physical activity in this population. We hypothesized that Alter-G Anti-Gravity Treadmill will help to overcome pain and increase enjoyment of physical activity, without compromising energy expenditure benefits, during a moderate intensity exercise session of self-selected duration. Healthy adults (20 - 55 years) with obesity were recruited for this study. Participants were randomized into control group, who exercised at 100% of their weight, or experimental group who exercised at a lower (self-selected) weight. Physical functioning (6-minute walk and Timed-Up and Go tests), and pain (Short-Form McGill Pain Assessment) were measured at baseline. Participants were then asked to exercise for three sessions, and Physical Activity Enjoyment Scale (PACES) was administered pre- and post-testing. During exercise sessions, energy expenditure and subjective pain were measured. Our participants (control = 10, experimental = 6) had a mean (Standard deviation/SD) age and body mass index (BMI) of 33.06 (10.99) years and 37.94 (5.2) kg/m², respectively. There was no association between baseline pain scores and physical functioning ($p > 0.05$). Pain and PACES scores were not significantly different between groups ($p > 0.05$). However, PACES scores increased after the intervention, only in the experimental group ($p = 0.043$). Energy expenditure was not significantly different between groups ($p > 0.05$). The mean (SD) duration of exercise was significantly higher in the experimental group than the control [45.64(2.43) vs 37.52(1.81), $p = .020$], which may explain how energy expenditure was similar despite the intervention group exercising at a lower body weight. In summary, a walking protocol using the unweighting feature of Alter-G Anti-Gravity Treadmill was associated with a significant increase in exercise enjoyment and duration of physical activity without jeopardizing energy expenditure.

Role of hypertensive hormone angiotensin II in breast cancer cell inflammation

Fahmida Rasha

Breast cancer (BC) is the second leading cause of cancer death with a 12.4% lifetime risk among US women. Various metabolic dysregulations such as obesity and insulin resistance alter breast environment via hormones and growth factors that promote breast cancer. Among these, the hypertensive hormone angiotensin II (Ang II), generated from the renin angiotensin system (RAS) has inflammatory, lipogenic and oncogenic properties. Ang II effects are mediated by 2 major receptors, type 1 and type 2 (AT1 and AT2). RAS inhibitors such as angiotensin converting enzyme inhibitor (ACEI) and AT1 receptor blockers (ARBs) are currently used as anti-hypertensive agents including in BC patients. However, the mechanisms by which RAS affects BC cell inflammation is not well understood. Hence, we hypothesize that Ang II regulates breast cancer cell metabolism through its inflammatory effects. To test our hypothesis, we used human BC cells treated with Ang II, ACEI (captopril) and ARBs (telmisartan) for 24-72 hours, then conducted cell viability, gene expression and protein analyses. ANOVA was used for statistical analyses using GraphPad Prism. Ang II at the doses 0.1 -1000 nM were not toxic to BC cells. Interestingly, Ang II at 1 nM dose increased pro-inflammatory gene expression for 24-72 hours ($p<0.05$), while RAS inhibitors (captopril or telmisartan) for 48-72 hours, reduced inflammatory genes expression ($p<0.05$). These results indicate an important role of RAS in increasing BC cell inflammation and indicate potential therapeutic value for RAS inhibitors in BC treatment.

Anti-inflammatory Effects of Tart Cherry Anthocyanins in Adipose Tissue

Shasika Jayarathne^{1,2}, April Stull³, Latha Ramalingam^{1,2}, Mandana Pahlavani^{1,2}, Naima Moustaid-Moussa^{1,2}

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Several dietary bioactive compounds reduce obesity-associated metabolic diseases. We are specifically interested in understanding the beneficial effects of tart cherry anthocyanins (TCA) in reducing/preventing obesity. We hypothesize that TCA reduces obesity through direct anti-inflammatory effects in adipose tissue, the main fat storage tissue in the human body. To test this, male Zucker fatty rats were fed a diet supplemented with or without tart cherry (TC) powder for 8 weeks. Body weight and glucose clearance were tested at week 8. Serum and adipose tissues were collected after sacrifice to analyze anti-inflammatory effects of TC. 3T3-L1 clonal adipocytes were used to validate the findings from in vivo animal studies. Cells were treated for 4 hrs with or without tart cherry extracts (~36ug ACY/ml, equivalent to ~five cherries). Adipocytes were then treated for 18hrs with 200ng/ml lipopolysaccharide, (a compound used to stimulate inflammation). Gene expression analysis and protein assays were used to identify inflammatory biomarkers regulated by TC. Tart cherry significantly reduced inflammatory biomarkers at both protein and gene levels in both rat adipose tissue and cultured adipocytes. In conclusion, TC consumption may help alleviate obesity-related inflammation and metabolic diseases.

Central Adiposity is a Strong Predictor of Non-alcoholic Fatty Liver Disease (NAFLD) in South Asian Women

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Incidence of non-alcoholic fatty liver disease (NAFLD) is increasing with increasing obesity rates due to its relation with the metabolic syndrome. This is of concern in the South Asian population since they develop metabolic complications at lower levels of obesity compared to their Western counterparts. Furthermore, the relationship between NAFLD, insulin resistance and obesity is not well characterized in humans. To address this issue, we used a convenience sample of Sri Lankan adult females (n = 34) and collected anthropometric data, adipose tissue specimens (for histology), and fasted serum samples (for metabolic and inflammatory markers). Hepatic steatosis was assessed by ultrasound scanning and used to classify participants as NAFL 0, NAFL 1, and NAFL 2. Waist circumference significantly increased with increasing NAFLD grade. Participants with NAFLD had significantly higher body mass index, hip circumference, and fasting blood glucose, as well as a higher mean adipocyte area in both omental and abdominal areas, indicating a higher degree of adipocyte hypertrophy associated with fatty liver. There were, however, no differences in measures of dyslipidemia. Various adipokines were measured; however, resistin was the only pro-inflammatory adipokine significantly elevated in NAFL 2. These findings indicate that measures of adiposity and fasting blood glucose may be important indicators of NAFLD in South Asian women.

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Vitamin D₃ (calcitriol) reverses epithelial-mesenchymal transition and inhibits stemness and cell migration in breast cancer

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Background: Breast cancer is the most prevalent tumor and a major cause of morbidity and mortality among women worldwide as well as in the USA. Epithelial-Mesenchymal Transition (EMT) is a biological process that contributes to tumor invasion and metastasis. Accumulating evidence suggests that cancer stem cells (CSCs) are a subpopulation of tumors that are critical for tumor initiation, chemoresistance, and metastasis. EMT is intimately linked with CSC generation and maintenance. Thus, regulation of EMT and CSC may have therapeutic benefits. Vitamin D is essential for bone metabolism. The active form of vitamin D (VD₃) has shown anti-cancer properties though the molecular details remain unknown. We have recently found that VD₃ reduces glucose utilization in breast cancer cells. Here, we assessed the role of VD₃ on EMT and stemness.

Method: We treated lowly (MCF7) and highly (MDA-MB231) metastatic breast cancer cells without (control) and with VD₃ (0.5 μM and 1.0 μM) for 24 hours. Cells were harvested and processed for Western blotting, quantitative-PCR, cell viability assay (MTT assay) and monolayer wound scratch assay.

Result: VD₃ decreased cancer cell viability, migration, and induced apoptosis. Additionally, VD₃ reversed epithelial mesenchymal transition by increasing E-cadherin and decreasing vimentin expression. VD₃ also decreased the expression of stem cell markers- CD44 and NANOG along with the reduced expressions of tumor growth factor beta (TGF-beta) and Twist. Interestingly, VD₃ lowered P65-NFκB expression which is critical for maintaining stem cell population.

Conclusion: Our results indicate a preventive and therapeutic potential of VD₃ for breast cancer.

Investigating the Association between Metabolic Syndrome and Adenomyosis

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Adenomyosis is characterized by endometrial tissue found in the myometrium of the uterus, causing heavy menstrual bleeding and dysmenorrhea. There is no known etiology, although association with obesity has been documented. The objective of this study is to identify factors that contribute to metabolic syndrome, such as obesity, etc. and see if there is a correlation with adenomyosis. We performed a retrospective chart review of pelvic ultrasounds and electronic clinical charts to extract parameters that could be suggestive of a correlation between adenomyosis and metabolic syndrome such as weight, height, BMI, DM2, HbA1c, total cholesterol, triglycerides, LDL and HDL. Preliminary data of 200 total patient charts, 100 in each group, showed that there was a statistically significant difference in weight and BMI between control(CON) and adenomyosis(AM) patients, with those in the AM group having a BMI 3.62kg/m² higher than those without adenomyosis. Prior pregnancy (60% vs. 85.9%, $p<0.001$) and hysterectomy (17% vs. 31.6%, $p=0.016$) also presented statistically significant differences between groups, with AM being more likely to have been pregnant and had a hysterectomy performed. Our preliminary data showed a trend of lower HDL and higher LDL being associated with adenomyosis. While there were limitations to our study, our preliminary data indicate that there may be a correlation between adenomyosis, estrogen exposure (pregnancy), BMI, LDL and HDL levels. These findings could help guide efforts to prevent development of adenomyosis by targeting treatments for the varying aspects of metabolic syndrome.

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FTIR Microspectroscopy study of the oxidative damage occurring in Mouse White Adipose Tissue

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Fourier Transform Infrared (FTIR) Microspectroscopy is a powerful technique for analyzing biological samples and providing information relative to the biochemical composition. The effect of oxygen free radicals on lipids in mouse white adipose tissue (WAT) was studied using this technique. Oxidative damage was induced to lipids of WAT using microwave plasma; and IR images were recorded before and after treatment. The analysis of the Infra-red (IR) spectra extracted from adipocytes and extracellular matrix of IR images in WAT showed a significant effect of free radicals on lipids. Specifically, unsaturated lipids were found to be highly sensitive to free radicals as indicated by a drastic decrease in the area of the vibration 3005 cm^{-1} , attributed to olefinic ($=\text{CH}-$) stretching vibration. Similarly, significant decrease in the area of vibrations associated with saturated lipids were also observed. Additionally, significant increase in the area of the carbonyl ($\text{C}=\text{O}$) band vibration at 1744 cm^{-1} was observed. Chemimaps developed from IR images recorded after each treatment clearly showed decreasing contents of olefinic and increasing concentration of carbonyl groups. The results showed that FTIR could be used as a rapid technique to monitor subtle changes in the biochemical composition of biological samples. The simplicity of the sample preparation, non-destructiveness, and ease in obtaining results has made it an excellent tool for the analysis of biological samples.

Blueberry leaf extract inhibits foam cell formation and activates autophagy in macrophages via AMPK/mTOR signaling

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Objectives: Atherosclerosis is characterized by macrophage foam cell formation and abnormal lipid metabolism, and the leading cause of death in western societies. Autophagy is a catabolic process that is critical to maintain cellular homeostasis. Recent studies have shown that autophagy activation increases cholesterol efflux, inhibits inflammation, and prevents atherosclerosis. Blueberry is a polyphenol-rich fruit with known health benefits. However, the physiological functions of bioactive compounds present in blueberry leaf (BBL) remain unexplored. The present study investigated the effects of BBL extract on foam cell formation, autophagy, and cholesterol homeostasis in lipid loaded macrophages.

Methods: RAW 264.7 and bone marrow-derived macrophages (BMDM) were treated without (control) and with LPS (100 ng/ml) and oxLDL (25 µg/ml) for 6-24 h followed by treatment with BBL (10 and 25 µg/ml) for an additional 6-24 h. Expression of proteins and genes were analyzed by western blot and QRT-PCR respectively. Oil Red O staining was employed to detect lipid accumulation. Autophagy was detected in macrophages by autophagy detection kit.

Results: BBL extract attenuated LPS and oxLDL mediated induction of foam cell formation in macrophages. Additionally, BBL extract significantly reduced activating transcription factor 4 (ATF4) and CHOP gene expression and increased expression of proteins implicated in cholesterol efflux (ABCA1) and autophagy (LC3II and ATG5) in macrophage foam cells. BBL extract mediated autophagy induction was also observed by fluorescence microscope. Interestingly, BBL extract increased AMPK phosphorylation and reduced mTORC1 gene expression in macrophages.

Significance and Conclusion: BBL extract may be an important therapeutic option to prevent and treat atherosclerosis.

A MetAP2 Inhibitor Suppresses Adipogenesis, Yet, Enhances Glucose Uptake

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Objectives: Adipose tissue needs continuous remodeling of its capillary network or angiogenesis for growth. Suppression of angiogenesis may reduce adipogenesis at the expense of metabolic impairment, such as reduction in glucose uptake by the tissue. The enzyme Aminopeptidase-2 (MetAP2) promotes angiogenesis, which can be suppressed by its inhibitors. This study investigated the effect of a novel MetAP2 inhibitor, BL6, on adipogenesis and glucose metabolism.

Methods: To test the effect on angiogenesis, Human Umbilical Vein Endothelial Cells (HUVEC) were treated with BL6 for 24h to determine tube formation. To determine the effect on adipogenesis and glucose uptake, 3T3-L1 preadipocytes were treated with BL6 (20μM, 50 μM or 100μM) and adipogenesis inducing media. Cells were differentiated for 8 days followed by Oil Red O staining or glucose uptake assay. Protein levels and RNA expression was quantified by Western Blot and RT-PCR respectively.

Results: BL6 dose dependently blocked tube formation or angiogenesis. During differentiation of preadipocytes, 50μM and 100μM BL6 significantly reduced lipid accumulation ($P<0.05$). Though not significant, 100μM BL6 treatment showed lower protein expression for Adiponectin, PPAR γ , C/EBP α and FAS. However, gene expression for FAS, SREBP1 and C/EBP α was significantly decreased ($P<0.05$) for 100μM BL6 treatment. Furthermore, BL6 improved glucose uptake in 3T3-L1 cells in a dose dependent manner ($P<0.05$).

Conclusions and significance: BL6 is a suppressor of angiogenesis, which reduces adipogenesis and yet improves glucose uptake in 3T3-L1 cells. Collectively this study supports further exploration of a role for BL6 as a putative anti-obesity therapeutic agent.

The effect of pet dog ownership on empirical measures of child activity

Aaron Teixeira, Stephanie Soto, Brittany Lancaster, Zohal Heidari, Dr. Jason Vanallen, Dr. Nathan Hall

Weight management and sedentary lifestyles are of growing concern for public health in the United States with nearly 32% of children ages 2-19 classified as either overweight or obese. Further, over 70% of children fail to meet recommendations for moderate to vigorous physical activity. Walking and playing with pet dogs, however, may be a protective factor against sedentary lifestyles by encouraging walking and other physical activity. Our long-term goal is to evaluate a causal model of canines influencing children's physical activity and evaluate intervention and prevention efforts to increase physical activity in children. Our objective here, is to use objective accelerometer measures of physical activity to evaluate the effect of pet dogs on children's overall physical activity (PA) and moderate to vigorous physical activity (MVPA). Using continuously worn accelerometers on children with and without dogs, we have evaluated whether pet owners engage in more PA. One innovation of the proposed study is to use an accelerometer on the dog, allowing for periods of synchronized activity, such as walking the dog or playing with the dog, to be objectively quantified with a novel measure of Dog Associated PA. In our initial pilot study, 14 children between 8-14 years of age wore an Actigraph on the wrist and their pet dogs wore an Actigraph attached to a collar. Our sample of 14 participants on average engaged in 37.35 minutes of Light, Moderate, or Vigorous PA per day with their dog. About 17.5% of the child's daily MVPA was associated with their dog (average of 3.5 minutes [95% bootstrap CI: 2.50 – 4.70]). Children engaged in an average of 33.85 minutes of light physical activity with their dog per day (95% bootstrap CI: 27.14 - 40.60 min), which reflected about 25% of their daily total Light physical activity. The preliminary data suggests our method is an effective and novel way to measure dog-related activity in children.

Nano-liposome-mediated delivery of the anti-diabetic protein E4orf1

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Objectives: E4orf1 is an adenoviral-derived protein that promotes cellular glucose uptake by up-regulating AKT phosphorylation. Previous studies show that the expression of the E4orf1 enhances glycemic control in animal models. However, a system suitable for delivering the E4orf1 protein in humans is needed for extending the findings to clinical setting. Here we show construction and testing of nano-liposome as a carrier to deliver the E4orf1 protein to 3T3-L1 cells in-vitro.

Method: GST- tagged E4orf1 protein was encapsulated in nano-liposomes which were prepared using Soy phosphatidylcholine and labeled with Rhodamine-PE (Phosphoethanolamine). The size and polydispersity index (PI) were measured using a Brookhaven BI-MAS particle size analyzer. To test the delivery efficacy, 3T3-L1 cells were treated with E4orf1-containing nano-liposomes (E4 group) or void nano-liposomes (Void group) and expression determined over time by immunofluorescence. Cell lysates were used to examine changes in molecular signaling.

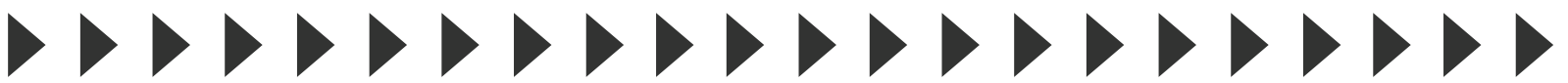
Results: The diameter of nano-liposomes was 133.5 and 90.7 nm and the PI was 0.2 and 0.1 for E4 and void nano-liposomes. The E4 group of cells showed maximum GST and Rhodamine expression at 24 h compared to 2, 4 and 12 h. The Void group showed the expression of Rhodamine, but not GST. The expression of E4orf1 in E4 group was confirmed at 24, 48 and 72 h. Western blot analysis in cells treated for 72 h showed significant increase in p-AKT expression in E4 cells compared to the Void group.

Conclusions: We report the first successful delivery of E4orf1 encapsulated liposomes and the expected effect of E4orf1 on cell signaling.

Notes



Notes



Thank you for participating in the ORC 2018 Annual Meeting & Poster Competition!

Program & Abstracts



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Watch for us next year.

We always need great presenters and amazing posters and appreciate your support.