

Saturday, November 16, 2013

8:30 AM – 10:00 AM

Oral Abstracts Track 1 - Inflammation and Adipose Cell Dynamics**T-88-OR****Interplay between Adipose Tissue Macrophages and CD4+ T Cells Regulates Obesity-Induced Inflammation**Kae Won Cho, Jennifer Delproposto, Brian Zamarron, Lynn M. Geletka, Durga Singer, Carey Lumeng *Ann Arbor, MI*

Background: Obesity leads to dynamic changes in a range of adipose tissue leukocytes that contribute to inflammation that includes macrophages and T cells. We have examined the interactions between adipose tissue macrophages (ATM) and adipose tissue T cells (ATT) and how they contribute to metainflammation. **Methods:** Intravital microscopy with multiphoton confocal techniques was used to evaluate T cell trafficking in adipose tissue of live mice. T cells were labeled with CFSE and localized in relation to fluorescent ovalbumin. Chimeric mice with CD11c-DTR bone marrow were injected with PBS or DT for 2 weeks to evaluate T cell content and metabolism. Mice were injected with MHCII blocking antibodies and T cell proliferation assessed with BrDU labeling. **Results:** Intravital microscopy demonstrated direct and dynamic interactions between ATMs and ATTs in visceral fat that were antigen dependent. Diet-induced obesity increased the expression of MHC II and co-stimulatory molecules in fat, which correlated increased CD4+ ATT proliferation. Ablation of CD11c+ cells (CD11c-DTR) and antibody neutralization of MHC II decreased ATT proliferation and numbers. These interventions shifted the balance from Tconv to Treg cells and altered adipose tissue cytokine gene expression. Both CD11c+ cell ablation and MHC II knockout mice demonstrated decreased obesity-induced insulin resistance and adipose tissue inflammation. **Conclusions:** CD4+ T cells and Macrophages interact dynamically in an antigen dependent way. ATM ablation improves metabolism and decreases T cell content in fat. Suppression of T cells alone does not decrease ATM content and does not improve metabolic parameters in obese mice. This suggests that CD4+ conventional T cells may be dispensable in established obesity but may play a more prominent role in the initiation of metainflammation.

T-89-OR**The Inflammatory Response to Overfeeding Influences Ectopic Fat Deposition and Insulin Sensitivity**Darcy L. Johannsen, Nikhil V. Dhurandhar, Charmaine S. Tam, Eric Ravussin *Baton Rouge, LA*

Background: Obesity is associated with impaired insulin sensitivity and low-grade inflammation triggered by adipose-derived cytokines. Since cytokines are known to impact energy and fat balance, we investigated the association between inflammation and fat gain in response to high-fat overfeeding in humans. **Methods:** We overfed 29 young (27±5 y) healthy men (BMI 25.5±2.3) 40% above their baseline energy requirements for eight weeks (41% CHO, 15% protein, 44% fat). Subcutaneous abdominal (SAT) and visceral (VAT) adipose tissues were measured by MRI, intramyocellular lipid (IMCL) by Oil Red O staining (vastus lateralis, VL), intrahepatic lipid (IHL) by ¹H-MRS, whole-body fat mass (FM) by DXA, and glucose disposal by hyperinsulinemic, euglycemic clamp (50 mU/min/m²). Inflammation was measured in serum (hsCRP, IL-6) and subcutaneous abdominal adipose tissue (AT; IL-6). **Results:** Participants gained 7.6±2.1 kg, 58% of which was fat. SAT increased by 1.3±0.25 kg (31%), VAT by 0.4±0.2 kg (63%) and IHL by 0.7±2.8 %lipid (47%); however there was no change in VL IMCL. Serum hsCRP and IL-6 both increased both by 27% (p=0.04 and p=0.15, respectively). Independent of baseline levels, the change in circulating IL-6 was positively associated with the change in VL IMCL (r=0.40, p=0.03), IHL (r=0.42, p=0.03), and negatively with the change in glucose disposal (r=-0.61, p<0.001). Participants who had an increase in AT IL-6 gene expression during overfeeding gained significantly less FM (r=-0.55, p=0.017) and had a lesser relative increase in body weight (r=-0.53, p=0.02). **Conclusions:** The inflammatory response to energy excess may predict where fat is deposited, i.e. a greater response may promote ectopic (muscle, liver) lipid accumulation while limiting the deposition in 'appropriate' fat depots (adipose tissue) thereby contributing to overfeeding-induced insulin resistance.

T-90-OR**Epigenetic Regulation of Macrophage Polarization by DNA Methyltransferase 3b (DNMT3b)**Xiaosong Yang *Atlanta, GA*; Xianfeng Wang *Winston-Salem, NC*; Dongxu Liu *Wu Han, China*; Liqing Yu *College Park, MD*; Bingzhong Xue, Hang Shi *Atlanta, GA*

Background: Macrophage inflammation is important in obesity-induced insulin resistance. Classically activated M1 macrophages are pro-inflammatory whereas alternatively activated M2 macrophages are anti-inflammatory. **Methods:** In this study we aim to determine the role of DNMT3b in regulating macrophage polarization and inflammation. **Results:** DNMT3b was significantly induced in macrophages exposed to the saturated fatty acid (SFA) stearate and the pro-inflammatory cytokine TNF α , was higher in macrophages isolated from obese mice, but is significantly lower in M2 vs. M1 macrophages. DNMT3b knockdown promoted macrophage polarization to an alternatively activated M2 phenotype, and prevented lipopolysaccharide- and stearate-induced pro-inflammatory gene expression; whereas Over-expressing DNMT3b in macrophages profoundly suppressed interleukin 4-induced alternative macrophage polarization. Peroxisome proliferator-activated receptor γ 1 (PPAR γ 1) is a key transcriptional factor that controls macrophage alternative activation. The promoter and 5'-untranslated regions of PPAR γ 1 are enriched with CpG sites. Chromatin immunoprecipitation assay (ChIP) showed that stearate significantly enhanced DNMT3b binding to PPAR γ 1 promoter. Pyrosequencing analysis also revealed that stearate increased DNA methylation at PPAR γ 1, which was prevented by DNMT3b deficiency. Interestingly, stearate increased the histone-repressive marker H3K9me3 at PPAR γ 1 promoter, which was blocked by DNMT3b knockdown. Finally, in a macrophage-adipocyte co-culture system, 3T3L1 adipocytes co-cultured with DNMT3b knockdown macrophages have significantly improved adipocyte insulin signaling. **Conclusions:** In summary, DNMT3b regulates macrophage polarization through epigenetic mechanisms. Inhibiting DNMT3b may serve as a therapeutic target in inhibiting macrophage inflammation and insulin resistance in obesity.

T-91-OR**Elevated Preadipocyte Proliferation and Differentiation During the Early Stages of Relapse in an Experimental Paradigm Modeling Weight Regain After Weight Loss**Matthew Jackman, David P. Astling, Jordan Lopez, Ginger C. Johnson, Patti Webb, Erin D. Giles, Janine Higgins, AikChoon Tan, Paul MacLean *Aurora, CO*

Background: Diet-induced obese (DIO) rats exhibit an increase in adipocyte number in response to weight regain after weight loss. In this study, we utilized a stable isotope to test the hypothesis that this increase in adipocyte number is the result of an accelerated rate of preadipocyte proliferation and differentiation during the early stage of relapse. **Methods:** DIO rats were fed ad libitum (Obese) or placed on a calorie-restricted, low fat diet that reduced body weight (15%) and fat mass (30%) over an 8 week period, with 4% deuterium (2H₂O) in drinking water. Stromal (SV) and nonstromal fractions of retroperitoneal adipose tissue were isolated from both Obese and weight reduced rats with (relapse, REL) or without (WR) 3-days of ad libitum feeding (n=6-8/group). **Results:** Enrichment of 2H within DNA was normalized to the enrichment of bone marrow. Fractional enrichment of whole tissue, isolated small (5-40uM) and larger (80-250uM) adipocytes, and SV cells was lower in both WR and REL when compared to Obese (p<0.05). REL rats exhibited a higher fractional enrichment of both SV cells and small adipocytes relative to WR (p<0.05), and small adipocytes in REL had a high expression of genes involved in lipid uptake and storage. **Conclusions:** These data provide evidence of accelerated preadipocyte proliferation and differentiation during the early stage of relapse, resulting in a generation of new adipocytes with a high capacity to store energy. This change in adipocyte cellularity likely contributes to rapid, energetically efficient weight gain and may lead to a permanent expansion in the capacity to store fat.

T-92-OR

IL-10 Inhibits Lipopolysaccharide Induced TNF- α and IL-6 Secretion in Human Visceral Adipose Tissue

Zhongxiao Wan, Svetlana Simtchouk, Dorrian Mah Kelowna, Canada; Joanne Chen Vancouver, Canada; Andreas M. Kluffinger Kelowna, Canada; Alice Mui Vancouver, Canada; Jonathan P. Little Kelowna, Canada

Background: Interleukin (IL)-10 is a pleiotropic cytokine involved in the regulation of inflammatory responses. Whether IL-10 can exert effects on human adipose tissue, a key driver of inflammation in obesity, remains controversial. Our aim was to determine whether IL-10 can exert anti-inflammatory responses in human visceral adipose tissue. **Methods:** Human preperitoneal adipose tissue samples were obtained from 4 male [age 57 \pm 7 yr, body mass index (BMI) 27.0 \pm 1.6 kg/m²] and 3 female (age 54 \pm 13 yr, BMI 22.3 \pm 0.4 kg/m²) subjects undergoing abdominal surgeries. Using an established adipose tissue organ culture technique that maintains intercellular interaction between adipocytes, endothelial cells, macrophages and other immune cells, ~250 mg of adipose tissue was minced into ~5-10 mg pieces and placed into culture dishes containing 7.5 ml of M199 media overnight. On the morning of the experiment, media was replaced with fresh M199 and cultured adipose tissue was left untreated (Control) or treated with lipopolysaccharide (LPS; 100 ng/ml) or LPS + IL-10 (1 and 100 ng/ml). Media were collected for assessment of TNF- α (6 hr) and IL-6 (18 hr) secretion via ELISA. **Results:** High dose IL-10 (100 ng/ml) completely blunted LPS-induced TNF- α and IL-6 secretion (P<0.05 vs. LPS alone and LPS + 1 ng/ml IL-10), whereas IL-10 at 1 ng/ml resulted in partial inhibition of LPS-induced TNF- α and IL-6 secretion (P<0.05 vs. LPS alone). **Conclusions:** These findings indicate that IL-10 can inhibit LPS-induced inflammation in human visceral adipose tissue. Ongoing studies are exploring the involvement of IL-10-related signalling through SH2 domain-containing inositol 5'phosphatase 1 (SHIP1) and signal transducer and activator of transcription 3 (STAT3) as possible mechanisms involved in the anti-inflammatory effects of IL-10 in human adipose tissue.

T-93-OR

Rutin Suppresses Palmitic Acids-Triggered Inflammation in Macrophages and Blocks High Fat Diet-Induced Obesity and Fatty Liver in Mice

Mingming Gao, Yongjie Ma, Dexi Liu Athens, GA

Background: The objective of this study is to elucidate the mechanism of rutin in blocking macrophage-mediated inflammation and high fat diet-induced obesity and fatty liver. **Methods:** Both in vitro and in vivo approaches were taken in evaluating the effects of rutin on palmitic acids-triggered inflammation in cultured macrophages, and on weight gain and development of fatty liver of mice fed a high fat diet. **Results:** Palmitic acids increase mRNA levels of pro-inflammatory cytokines including Tnf α , Ifn γ , Il1 β and Il6, and elevate the production of TNF α in cultured macrophages. Pre-exposure of rutin to cells greatly suppressed these elevations. The suppressed inflammation by rutin was correlated with a decrease in transcription of genes responsible for ER stress and production of reactive oxygen species. In vivo, rutin protects mice from high fat diet-induced obesity, fatty liver and insulin resistance. The protective effects were associated with lack of hypertrophy and crown-like structures in the white adipose tissue, decreased mRNA levels of marker genes for macrophages including F4/80, Cd11c and Cd68, and repressed transcription of genes involved in chronic inflammation such as Mcp1 and Tnf α in white adipose tissue. In addition, rutin increases the expression of genes responsible for energy expenditure in brown adipose tissue including Pgc1 α , Dio2, and Elovl3. Furthermore, rutin suppresses transcription of Srebp1c and Cd36 in the liver, leading to a blockade of fatty liver development. **Conclusions:** These results suggest that supplementation of rutin is a promising strategy for blocking macrophage-mediated inflammation and inflammation-induced obesity and its associated complications.

8:30 AM – 10:00 AM

Oral Abstracts Track 3 - Exercise

T-94-OR

Influence of Fitness and BMI on Cardiac Structure and Function in Overweight and Obese Adults

John M. Jakicic, Renee J. Rogers, Erik B. Schelbert Pittsburgh, PA

Background: There is debate over the independent influence of obesity and fitness on health outcomes such as cardiovascular disease. This study examined the association of body mass index (BMI) and cardiorespiratory fitness on cardiac structure and function assessed from magnetic resonance imaging (CMRI) in overweight and obese adults. **Methods:** Overweight and obese adults (n=101; age range=18 to 55 years; BMI=32.1 \pm 3.5 kg/m²) provided data prior to engagement in a randomized clinical trial. Fitness was assessed with graded exercise test, with speed set at 80.4 m/min and grade increase 1% per minute until test termination. CMRI using a 1.5 Tesla system included resting measures of left ventricular mass (LVM), end-diastolic volume (EDV), end-systolic volume (ESV), and ejection fraction (EF). **Results:** Duration of the graded exercise test was 8.3 \pm 3.1 minutes. Results of CMRI were: LVM=90.9 \pm 21.1 grams; EDV=146.2 \pm 28.4 ml; ESV=55.0 \pm 16.0 ml, EF=63.5 \pm 4.9%. BMI was significantly correlated with LVM (r=0.30, p=0.002) but not EDV (r=0.19, p=0.06), ESV (r=0.04, p=0.67) or EF (r=0.10, p=0.33). Fitness was significantly associated with LVM (r=0.37, p<0.001) and EDV (r=0.28, p=0.004), but not ESV (r=0.19, p=0.06) or EF (r=0.12, p=0.25). After controlling for BMI, the strength of the association between fitness and CMRI measures increased for LVM (r=0.52, p<0.001), EDV (r=0.38, p<0.001), and ESV (r=0.21, p=0.03), but remained non-significant for EF (r=0.15, p=0.13). **Conclusions:** Fitness is an important predictor of CMRI measures of cardiac function and structure in overweight and obese adults, and this association may be independent of BMI. Thus, improvement in fitness, in addition to weight loss, should be a goal of interventions for obese adults as this may maximize the health benefits of these interventions. Supported by NIH (R01 HL103646)

T-95-OR

Addition of Aerobic Exercise to Caloric Restriction Increases Adiponectin Circulating Concentrations and Release from Abdominal and Gluteal Adipose Tissue in Obese/Overweight Postmenopausal Women

Xuewen Wang Columbia, SC; Tongjian You Boston, MA; Mary F. Lyles, Karin M. Murphy, Barbara J. Nicklas Winston-Salem, NC

Background: Adiponectin is an adipose tissue-secreted insulin sensitizer. It is suggested that both dietary-induced weight loss and exercise training increase circulating adiponectin concentrations. This study was to determine whether addition of aerobic exercise to dietary weight loss has additive effects on circulating adiponectin concentrations and adiponectin release from regional adipose tissue. **Methods:** Abdominally obese (BMI=25-40 kg/m², waist>88 cm) postmenopausal women were randomized to 20 weeks of caloric restriction with and without exercise (CR+EX, n=50 and CR, n=25). The exercise was treadmill walking at moderate to vigorous intensity for 3 days per week. Abdominal and gluteal subcutaneous adipose tissue biopsies were performed in a subgroup (CR+EX, n=15 and CR, n=10) to determine adiponectin release. **Results:** The interventions elicited a similar amount of weight loss (11.5 \pm 4.4 kg, 13.1 \pm 4.6% and 11.5 \pm 3.4 kg, 12.9 \pm 3.6%, respectively), and reductions in fat mass (8.2 \pm 3.4 kg and 7.7 \pm 2.7 kg, respectively) and abdominal subcutaneous and visceral fat volumes between CR+EX and CR groups. The two groups had different changes in adiponectin concentrations (p for interaction = 0.013), which increased in CR+EX (6.9 \pm 3.9 to 8.5 \pm 4.9 μ g/ml, p< 0.001) but did not change in CR (6.4 \pm 4.4 to 6.5 \pm 4.5 μ g/ml, p=0.98). Likewise, adiponectin release from abdominal and gluteal subcutaneous adipose tissue increased in CR+EX (p=0.008 and 0.089, respectively), but did not change in CR (p=0.13 and 0.95, respectively). **Conclusions:** Despite similar weight and fat mass loss, the addition of exercise to caloric restriction increased circulating adiponectin concentrations, which may be partly explained by increased adiponectin release from abdominal and gluteal subcutaneous adipose tissue.

T-96-OR**Prediabetes Phenotype Influences Improvements in Glycemia with Resistance Training**

Joshua D. Eikenberg *Roanoke, VA*; Jyoti Savla, Elaina Marinik, John F. Pownall, Mary E. Baugh, Kyle Flack, Richard A. Winett, Brenda M. Davy *Blacksburg, VA*

Background: Pathophysiological differences exist between individuals with impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). Current guidelines recommend resistance training (RT) for diabetes prevention, yet differences in response to RT based on prediabetes phenotype (IGT, IFG, or combined [COM]) have not been investigated. Our objective was to determine if prediabetes phenotype influenced improvements in glycemia with RT. **Methods:** Older, overweight individuals with prediabetes (n=159) completed a supervised, full-body RT program twice/week for 12 weeks. Body weight and composition (DXA), strength, fasting plasma glucose, and 2-hr oral glucose tolerance (OGT) were assessed at baseline and week 12.

Results: Participants (aged 60+5 yrs; BMI 33±4 kg/m²) were categorized as IFG only (n = 73), IGT only (n = 21), or COM (n = 65). In the full sample, improvements in waist circumference (-0.9 cm), body fat % (-0.6%), lean body mass (+0.7 kg), leg (+25.3kg [+18%]) and chest press strength (+9.1kg [+27%]) were noted (all P<0.05). Differences by prediabetes phenotype were detected over time in body fat %, lean body mass, and OGT. Improvements in OGT with RT differed by group (IFG: pre 113±23 mg/dL, post 114±28 mg/dL; IGT: pre 161± 13 mg/dL, post 141±20 mg/dL; COM: pre 174± 20 mg/dL, post 155± 36 mg/dL; P<0.05). There were no group differences in change in fasting plasma glucose. **Conclusions:** RT may improve OGT but not fasting plasma glucose in individuals with prediabetes. Individuals with IGT or combined IFG+IGT may benefit more from RT, as compared to those with IFG alone, with regard to improvements in glycemia.

T-97-OR**Exercise Training in Overweight Children Improves Fitness and Fatness but Not Markers of Hepatic Steatosis or Fibrosis**

Norman K. Pollock *Augusta, GA*; Miriam B. Vos *Atlanta, GA*; Jerry D. Allison, Gaston Kapuku, Haidong Zhu, Catherine L. Davis *Augusta, GA*

Background: Currently, there is a paucity of evidence concerning the benefits of aerobic exercise as prevention for nonalcoholic fatty liver disease. This study determined the effect of 8 months of daily, after school, aerobic exercise training on markers of hepatic steatosis and fibrosis in overweight children. **Methods:** Overweight, sedentary children (N = 175, 8-11 years, 61% female, 87% black, 74% obese) were randomly assigned to an aerobic exercise program (40 min/d, n = 90) or a no-exercise control condition (n = 85) for 8-months (5 d/wk). At baseline and posttest, the following measurements were assessed: cardiovascular fitness, percent body fat by DXA, hepatic fat by MRI, liver stiffness measurement by transient elastography (Fibroscan), alanine aminotransferase (ALT), and C-reactive protein. **Results:** The study had 89% retention rate (n = 155). The exercise group had 59% attendance rate and their daily average heart rate was 161 ± 7 beats/min during the intervention period. The exercise vs. control group had greater improvements in cardiovascular fitness (8.4% vs. 4.1%) and percent body fat (-4.7% vs. -2.1%) (both P = .04). There was no group x time effect on hepatic fat, liver stiffness, ALT, or C-reactive protein (all P > .05). **Conclusions:** In this 8-month randomized controlled trial, 40 min/d of aerobic exercise training did not influence markers of hepatic steatosis or fibrosis in overweight children, despite improved fitness and fatness.

T-98-OR**Exercise Provides an Additive Improvement in Insulin Sensitivity and Glucose Effectiveness Following Roux-en-Y Gastric Bypass: A Randomized Trial**

Paul M. Coen *Pittsburgh, PA*; Charles J. Tanner *Greenville, NC*; Nicole L. Helbling *Pittsburgh, PA*; Gabriel S. Dubis *Greenville, NC*; Hui Xie, Steven R. Smith *Orlando, FL*; George Eid, Frederico G. Toledo *Pittsburgh, PA*; Joseph Houmard *Greenville, NC*; Bret H. Goodpaster *Pittsburgh, PA*

Background: Roux-en-Y Gastric Bypass (RYGB) surgery generally has profound effects on weight loss and glucose metabolism in severely obese patients. Although exercise can improve insulin sensitivity in mild to moderate obesity, the potential of exercise to improve insulin sensitivity beyond that observed following RYGB is unknown. We hypothesized that exercise would

result in greater improvements in insulin sensitivity following RYGB compared to surgery alone. **Methods:** 1-3 months following RYGB, participants (N=128) were randomized to 6-months of either moderate structured exercise (EX; N=66), or lifestyle education control (CON; N=62). Main outcomes included insulin sensitivity (Si) and glucose effectiveness (Sg), determined by intravenous glucose tolerance test and minimal modeling. Secondary outcomes were cardiorespiratory fitness as determined by VO₂ peak test, and body composition by DXA. Data were analyzed using an intention-to-treat (ITT) and per-protocol (PP) approach to assess the efficacy of exercise performed (>120 min/week). **Results:** The completion rate was 93%; 95% for CON and 91% for EX. There was a significant decrease in fat mass for both groups (P<0.001 for time effect). Insulin sensitivity improved in both groups following the intervention (ITT: CON vs. EX; +1.65 vs. +2.17, P<0.001 for time effect). A per-protocol analysis revealed that exercise had an additive effect on Si (PP: CON vs. EX; +1.55 vs. +2.5, P=0.011 for group*time effect). Exercise also had an additive effect on improvement in Sg (ITT: CON vs. EX; +0.002 vs. +0.006, P=0.0019 for group*time effect). Cardiorespiratory fitness was improved in EX but not in CON. **Conclusions:** Moderate exercise following RYGB surgery provides additional improvements in insulin sensitivity and cardiorespiratory fitness. Clinicaltrials.gov identifier: NCT00692367. Supported by R01DK078192

T-99-OR**The Impact of Exercise Counseling on Physical Activity among Bariatric Surgery Patients**

David Creel, Leslie M. Schuh, Adrienne Gomez, Christina Reed, Lori Hurst, Brenda M. Cacucci, David Diaz, Christopher M. Evanson, John M. Huse, Margaret M. Inman, Douglas Kaderabek, Ted Eads *Carmel, IN*

Background: This ongoing study examines exercise promotion through pedometer use and exercise counseling among bariatric surgery patients. **Methods:** Participants (n=60) were randomly assigned to usual care (U), pedometer use (P), or individualized exercise counseling (C) before through 6 ½ months postoperatively. Participants wore GT3X accelerometers (Acti-Graph TM) for approximately two weeks preoperatively and 2, 4, and 6 months postoperatively. The C (n=20) group participated in 7 individual sessions, wore pedometers and kept activity journals; the P group (n=14) wore pedometers and recorded daily steps. Usual care participants (n=26) received printed materials and group education promoting physical activity. All participants completed pre- and 6 ½ month post-op treadmill protocols and strength testing. **Results:** Most participants had roux-en-y gastric bypass (75%), were Caucasian (85%), and female (83%). Mean weight and BMI were 133.1 kg and 47.3 kg/m², respectively. Before surgery there were no significant differences in time in moderate activity, steps/day, treadmill time or strength variables. At 6 ½ months post op, C spent significantly more time (31 min/d) in moderate activity compared to U (18 min/d). Daily step counts were 6941, 5530 and 5338 for C, P, and U, showing trends toward more steps for C compared to U (p=.086). 6 ½ month treadmill times were longer in C than U (p=.064). Repeated measures ANOVA of all participants combined showed a decrease in dominant hand strength and chest press repetitions, and an increase in treadmill time. Mean weight loss and BMI decrease were 40.1 kg and 13.8 kg/m². **Conclusions:** Bariatric surgery results in improved cardiovascular endurance but loss of upper body strength. Physical activity counseling leads to improved time spent in moderate activity and appears to improve cardiovascular endurance more than usual care.

8:30 AM – 10:00 AM**Oral Abstracts Track 4 - Lost Gems: Off-the-Beaten Path****T-100-OR****Common Bacterial Genera Abundance is Associated with Anthropometric and Percent Body Fat Measurements in Young Caucasian Children**

Anthony Wang, Mei Wang, Franck Carbonero, Sharon M. Donovan, H. R. Gaskins, Margarita Teran-Garcia *Urbana, IL*

Background: In 2010, 31.8% of children in the United States were considered overweight. Differences in the gut microbiota are associated with obesity in mice and adult humans, but less is known about child obesity. The human distal gut is inhabited by two predominant phyla: Bacteroidetes and Firmicutes. Bacterial species within Clostridium cluster IV are members of the Firmicutes phyla. Several are butyrate producers and have an important

role in gut health. **Methods:** Herein, the association between abundance of several bacterial groups and obesity was studied in Caucasian children (4-7 yrs) recruited from the STRONG Kids Research Program. Quantitative RT-PCR was conducted on DNA extracted from fecal samples for Clostridium cluster XIVa, Clostridium cluster IV, Lactobacillus spp., Bifidobacterium spp. and Bacteriodes-Prevotella group. Height and weight were measured to calculate BMI, and whole body percent fat (%BF) was measured by dual energy X-ray absorptiometry. **Results:** When comparing overweight and obese (ow/ob, n=6) to lean (n=12) children, Clostridium cluster IV levels were lower in ow/ob than lean individuals. This relationship was also observed by stepwise regression, where BMI was negatively associated with Clostridium cluster IV with sex as the only other variable in the model. Differential relationships between %BF and bacterial abundance were also observed when separating by sex. Bifidobacterium spp. was negatively associated with %BF fat in girls. **Conclusions:** While these findings suggest a role for Clostridium cluster IV and BMI, the mechanism of this interaction and butyrate production remains to be elucidated. Our results support previous reports suggesting Bifidobacterium spp. may protect against the development of obesity.

T-101-OR

Oral Health Behaviors and Metabolic Syndrome

Yang-Hyun Kim *Ansan, Republic of Korea*; Jun Goo Kang *Anyang, Republic of Korea*; Chang Beom Lee *Guri, Republic of Korea*; Ki-Young Lee *Incheon, Republic of Korea*

Background: The prevalence of Metabolic syndrome (MetS) is increasing worldwide, especially in South Korea. Among general health behaviors, oral health behaviors including toothbrushing and use of secondary oral products were related with MetS in some studies. This study examined whether oral health behaviors are associated with MetS in Korean adults involved in the 2008-2010 Korea National Health and Nutrition Examination Survey (KNHANES). **Methods:** A total of 18,742 subjects (8,034 men and 10,708 women) were included. MetS was defined according to the criteria of the American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement for Asians. Oral health behavior was assessed using a questionnaire included in the KNHANES. **Results:** Subjects with MetS brushed their teeth less frequently and used fewer secondary oral products than subjects without MetS ($p < 0.01$). As frequency of toothbrushing and number of secondary oral products increased, body mass index, waist circumference, diastolic blood pressure, fasting plasma glucose, triglyceride, and white blood cell count decreased, but high density lipoprotein-cholesterol increased (all p for trend < 0.01). In the multivariable logistic regression models, as frequency of toothbrushing increased, the odds ratios (ORs) for MetS, abdominal obesity, hyperglycemia decreased (p for trend < 0.01) after adjusting for age, gender, education, income, alcohol and tobacco use, and physical activity. The ORs for MetS, abdominal obesity, and high blood pressure were more than one in subjects who do not use dental floss. **Conclusions:** MetS is associated with infrequent daily toothbrushing and use of dental floss in South Korean.

T-102-OR

Are Studies That Agree with Popular Opinion Cited More? Evaluating Nutrition-Obesity Research Using Crowdsourcing

Andrew W. Brown, David B. Allison *Birmingham, AL*

Background: The likelihood of a paper being cited is dependent on factors such as study topic, quality of the science, and journal. It is unclear if the citation counts are dependent on the study's agreement with popular opinion. Evaluating literature to answer such questions can be time consuming, and crowdsourcing may be a feasible way to evaluate a large volume of research. **Methods:** Human studies in PubMed from 2007 through 2011 with major headings of food and obesity were obtained. Abstracts were limited to studies demonstrating or implying effects of foods on obesity by using Amazon's Mechanical Turk (MT) to crowdsource abstract evaluation. Foods in abstracts were identified and confirmed iteratively using MT. Abstract conclusions were categorized using MT as indicating the food was beneficial, detrimental, or not related to obesity, or dependent on multiple factors. MT workers were asked their opinions about the obesogenicity of the food in each abstract. MT was used to determine the number of times a paper was cited according to Google Scholar. Citation counts were modeled against the agreement between opinions and abstract conclusions. **Results:** Of 689 abstracts submitted to MT, only 44 required investigator review, and of these

only 9 needed to be fully rated by an investigator. Preliminary results show 137 abstracts met all inclusion criteria, including containing foods known by $>70\%$ of respondents. The number of times these papers were cited was not associated with the study conclusions, respondent opinions of the foods being studied, or agreement between the conclusions and opinions. **Conclusions:** Citation counts in nutrition-obesity research were not associated with the agreement between study conclusions and popular opinion in this set of data. Crowdsourcing proved to be a feasible way to evaluate a large volume of research.

T-103-OR

Prospective Association between Sleep Duration and Weight Gain among Female Adolescents and Young Adults

Kendrin R. Sonneville, Emily A. Blood *Boston, MA*; Jess Haines *Guelph, Canada*; Alan Flint, Carlos A. Camargo, Alison E. Field *Boston, MA*

Background: Short sleep duration is a risk factor for obesity in youth and adults, although the mechanisms driving the association are not well understood. Prospective studies of sleep and weight gain are sparse, particularly during the transition from adolescence to adulthood, a period when a dramatic rise in obesity prevalence is seen. **Methods:** We used generalized estimating equations to examine the prospective association between sleep duration (hrs/night) and weight change (BMI units) among 1843 girls who responded to the 2011 and 2013 waves of the Growing Up Today Study II. We further explored whether factors previously associated with short sleep duration (more binge eating, more emotional eating, more TV/video viewing, less breakfast consumption) attenuated the sleep-BMI association. **Results:** In 2011 (baseline), participants had a mean (SD, range) age of 20.0 (1.8, 16-24) years, with large variation in sleep duration (4% reported sleeping <5 hrs/night, 16% 6 hrs/night, 36% 7 hrs/night, 32% 8 hrs/night, 9% 9 hrs/night, and 2% >10 hrs/night). Girls had a mean (SD) BMI of 22.8 (3.6) in 2011 and gained a mean (SD) BMI units of 0.36 (1.72) from 2011 to 2013. In models controlling for age and baseline BMI, higher sleep duration was associated with smaller BMI gains ($\beta = -0.86$, 95%CI = -1.35, -0.36). The association was attenuated by adjusting for TV/video viewing ($\beta = -0.49$, 95%CI = -0.79, -0.19) and by further adjusting for breakfast consumption ($\beta = -0.40$, 95%CI = -0.64, -0.15). Adjustment for binge eating and emotional eating did not materially alter the sleep-BMI association. **Conclusions:** Shorter sleep duration predicts greater BMI gain among adolescent and young adult females. Some, but not all, of the association is explained by the increased TV/video viewing and decreased breakfast consumption of women with short sleep duration.

T-104-OR

Longitudinal Associations of Psychotropic Medication Use with Childhood Body Mass Index Trajectories

Lisa Bailey-Davis *Danville, PA*; Brian S. Schwartz, Karen Bandeen-Roche, Jonathan Pollak *Baltimore, MD*; Annemarie G. Hirsch *Danville, PA*; Thomas A. Glass *Baltimore, MD*

Background: Twenty million youth are estimated to be using psychotropic medications, which have been linked to weight gain but longitudinal studies are sparse. The number of children receiving such medications has significantly increased since the 1990's, concurrent with the childhood obesity epidemic. Whether medication use or the underlying diagnosis is the primary causal factor is unclear. **Methods:** This longitudinal study utilized electronic health records to examine body mass index (BMI) trajectories among 163,820 geocoded children (ages 3-18 years) from 2001-2012. Random effects linear regression models were used to examine associations of psychotropic medication use (at least one physician order vs. never) with BMI over time (modeling age, age2, and age3), adjusting for sex, race/ethnicity, and Medical Assistance. **Results:** Children had a mean (SD) of 3.2 (2.4) BMI measures. The number (%) of children who ever were prescribed a medication: 13,923 (8.5%) anti-anxiety agents; 9,190 (5.6%) anticonvulsants; 19,305 (11.8%) anti-depressants; 15,713 (9.6%) stimulants; and 9,845 (6.0%) antipsychotics. Compared to children who never took these agents, BMI trajectories for those prescribed anti-depressants, antipsychotics, and anticonvulsants showed significantly more rapid weight gain over time (most $p < 0.001$). Trajectories with anti-anxiety agents were similar with less divergence at older ages, while those prescribed stimulants were more complex. **Conclusions:** Five classes of psychotropic medications were associated with more rapid weight gain with increasing age in children. Given the persistence of obesity into adulthood, related co-morbidities, and social disparities, care-

ful consideration of the risk-benefit relationship associated with psychotropic medications in children is warranted.

T-105-OR

Simulating Obesity Development in a Young Population Through Consistent and Holiday Overeating

Grant Zhao *Sugar Land, TX*; Kevin D. Hall *Bethesda, MD*

Background: Studying the process of obesity development in a real human population is difficult. However, mathematical modeling of human metabolism and body weight simulations can provide important insights into both obesity development and its treatment. **Methods:** We used a previously validated mathematical model of human metabolism to investigate obesity development in a virtual population of 1000 male and 1000 female 18 year old individuals created by randomly sampling from the normal height and weight distributions obtained from US population survey data (NHANES). Three samples, each consisting of 100 men and 100 women, were randomly selected from “normal weight”, “overweight”, and “obese” categories according to BMI. Two simulation case studies were performed: consistent overeating by varying excess daily Calories and holiday overeating by adding 550 kcal/d to the baseline energy-balanced diet during a 40 day holiday season, after which the baseline diet was resumed. **Results:** The simulations showed: (i) the time for normal weight individuals to become obese decreases exponentially with the amount of extra daily Calories consumed; (ii) body weight gain from a single 40 day season of holiday overeating lasts for more than one year, and thus yearly holiday overeating generates an accumulative weight gain; (iii) compared to normal weight individuals, obese individuals have a higher excess energy-to-fat conversion rate (71% vs. 62%); (iv) continued yearly holiday overeating for 10 years results in a weight gain plateau with an average of 12.4 kg of weight gain in obese individuals vs. 10.6 kg in normal weight individuals. **Conclusions:** Our study shows a novel approach for quantitatively understanding how consistent and holiday overeating can lead to obesity development in a young population. These results may provide useful information for obesity prevention.

8:30 AM – 10:00 AM

Oral Abstracts Track 4 - Understanding Underreporting of Weight and Dietary Intake

T-106-OR

Underreporting of Self-Reported Dietary Energy Intake in Five Populations of African Diaspora

Dale A. Schoeller, Lindsay Orcholski *Madison, WI*; Amy Luke *Maywood, IL*; Pascal Bovet *Lausanne, Switzerland*; Terrence Forrester *Kingstone, Jamaica*; Estelle V. Lambert *Cape Town, South Africa*; Jacob Plange-Rhule *Kumasi, Ghana*; Lara Dugas, Elizabeth Kettmann, Ramon A. Durazo-Arvizu, Richard S. Cooper *Maywood, IL*

Background: Studies on the role of diet in the development of chronic diseases often rely on self-reported questionnaires of dietary intake. Unfortunately, many validity studies have demonstrated that self-reported dietary intake is subject to systematic underreporting, but the vast majority of such studies have been conducted in industrialized countries. **Methods:** The aim of this study was to investigate systematic reporting error in individuals of African ancestry (n=324) in five countries distributed across the human development index scale. Using 24-hour recalls to assess dietary intake and the doubly labeled water method to assess total energy expenditure, we calculated the difference between these two values to identify underreporting of habitual energy intake in selected communities in Ghana, South Africa, Seychelles, Jamaica and the United States. **Results:** Under-reporting of habitual energy intake was observed in all countries. South Africans displayed the greatest under-reporting of -52.1% ([self-report - expenditure/expenditure]x100) compared to -22.5%, -17.9%, -25.0%, and -18.5%, for, Ghana, Jamaica, Seychelles and the United States, respectively. BMI was the most consistent predictor of underreporting compared to other markers. **Conclusions:** We conclude that there is substantial under-reporting in populations across the whole range of the human development index and that this systematic error increases according to an individual's BMI. METS is supported by NIH.

T-107-OR^{PT}

Does the Accuracy of Weight Status Reporting in Young Adults Vary by Race/Ethnicity? Findings from the National Longitudinal Study of Adolescent Health

Tracy K. Richmond, Carly Milliren, Kendrin R. Sonneville, Idia B. Thurston, Courtney E. Walls, S. Bryn Austin *Boston, MA*

Background: Surveillance data describing the weight status of the U.S. population often rely on self-reported height and weight. Accuracy may vary by sociodemographic characteristics. We set out to determine if there were racial/ethnic differences in accuracy of self-reported body mass index (BMI) in a nationally representative sample of young people. **Methods:** Using gender-stratified multiple linear regression to analyze Wave III of the National Longitudinal Study of Adolescent Health (n=12,940) when participants were aged 19-26, we examined the association of self-reported BMI (i.e., BMI calculated from self-reported height and weight) and race/ethnicity, controlling for measured BMI (i.e., BMI calculated from height and weight measured by study staff). Models were adjusted for factors known to influence weight self-perception: age, household income, parental education, level of physical activity, and depression score. **Results:** The population underestimated their BMI (females: beta=0.87, p<0.001; males=0.86, p<0.001) by 13-14%. However, there was variation in underreporting by race/ethnicity. Among females, Blacks (beta=0.54, CI: 0.18, 0.89) and Hispanics (beta=0.37, CI: 0.10, 0.63) reported significantly higher BMIs (i.e., closer to their measured BMI) relative to their similarly-weighted White peers. Similarly, Black (beta=0.24, CI: 0.03, 0.45) and Hispanic (beta=0.34, CI: 0.09, 0.58) males reported higher BMIs (i.e., were more accurate) than their White peers, accounting for measured BMI. There were no differences in accuracy of self-reported BMI among other racial/ethnic groups relative to Whites in either gender. **Conclusions:** While all youth underreported their BMI, Blacks and Hispanics were more accurate relative to their similarly weighted White peers. Studies relying on self-reported BMI may exaggerate racial/ethnic weight differences.

T-108-OR^{PT}

Physical Characteristics Associated with Weight Underestimation among Overweight and Obese Men: NHANES 1999-2006

Dwight W. Lewis, Olivia Affuso, Gareth R. Dutton, David B. Allison *Birmingham, AL*

Background: Research suggests that weight underestimation is negatively associated with attempts to lose weight. It is unknown whether physical characteristics are associated with increased weight underestimation. The objective of our study was to examine associations of weight underestimation with anthropometric and body composition measures among overweight and obese men. **Methods:** We used data from a nationally representative sample of 3,679 overweight or obese men ages 20-79 years old with a dual energy x-ray absorptiometry (DXA) derived total body fat percent > 25% (White: n=1,992; Black: n=664; Mexican American: n=1,023) from the 1999-2006 National Health and Nutrition Examination Surveys. Weight underestimation was defined as participants who classified themselves as either “underweight” or “about right weight.” Logistic regression was used to examine the association between weight underestimation and participants' physical characteristics. Predictor variables included DXA derived total percent leg (DXA-%LF) and arm (DXA-%AF) fat, obesity status, height, waist circumference, race/ethnicity, and age. **Results:** Weight underestimation (prevalence, 95% CI) was highest among Black (44.0%, 39.2-48.9%) followed by Mexican American (41.9%, 38.6-45.3%) and White men (26.5%, 24.6-28.4%). Physical characteristics associated with weight underestimation (OR, 95% CI) were decreased DXA-%AF (0.95, 0.91-0.98), having a BMI 25.0-29.9 (9.02, 5.34-15.24), and having a waist circumference ≤ 94 cm (2.31, 1.72-3.09), irrespective of race/ethnicity. **Conclusions:** Findings suggest that overweight men should not rely on visual cues to determine obesity status. Therefore, other strategies for helping overweight men to recognize unhealthy weight may need to be developed.

T-109-OR

Adjusting for Differential Error in Energy Intake Reports in Race-Specific Analysis of Diet and BMI Associations: The CARDIA Study

Katie Meyer, Michelle A. Mendez *Chapel Hill, NC*; Arlene Hankinson *Chicago, IL*; Lyn M. Steffen *Minneapolis, MN*; Catherine M. Loria, Tiffany M. Powell-Wiley *Bethesda, MD*; Penny Gordon-Larsen *Chapel Hill, NC*

Background: It is not known how adjusting for misreporting of energy intake impacts race- and sex-specific estimates of diet-BMI associations, of interest given race and sex disparities in obesity. **Methods:** We used data from yr 0, 7, and 20 of CARDIA, a biracial cohort study (n=5,115), aged 18-30 at baseline (1985-86) with detailed diet history and physical activity surveys and measured anthropometry (weightkg/heightm²) at each wave. We created a summary diet quality score consistent with a Mediterranean-style diet. We used standard equations to estimate basal metabolic rate (BMR) from weight, height, age, and sex, defining reporting error as the deviance (± 1.5 SD) between reported energy intake (rEI) and energy needs based on BMR and physical activity level. We tested for differential reporting error by race and sex, and examined the impact of adjusting for reporting error on cross-sectional associations (yr 0, 7, 20) between diet quality and BMI in multivariable-adjusted linear regression models. **Results:** At year 20, whites, as compared to blacks, were more likely to underreport (25 vs 22%) and less likely to overreport (7 vs 10%) energy intake (χ^2 , $p < 0.01$). We found race-specific associations between diet quality and BMI (p , interaction < 0.01): diet quality [mean(SD): 71(13)] and BMI [30(7)] were inversely associated in whites ($\beta = -0.08$, SE=0.02) but not blacks ($\beta = 0.02$, SE=0.02). Adjusting for reporting error did not significantly change race-specific associations. **Conclusions:** We found evidence for differential reporting error for energy intake by race, but adjusting for reporting error using our method did not alter diet quality-BMI associations.

T-110-OR

A System Dynamics Model for Estimating Energy Imbalance that Can Explain U.S. Adult Obesity Trends

Saeideh Fallah-Fini *Baltimore, MD*; Hazhir Rahmandad *Falls Church, VA*; Terry Huang *Omaha, NE*; Thomas A. Glass *Baltimore, MD*; Regina Bures *Bethesda, MD*

Background: Quantifying the energy imbalance gap that can explain the obesity epidemic in different subpopulations is important for understanding the magnitude of changes required to reverse the epidemic, providing intervention targets, and estimating the contribution of different causes. We present a novel population-level System Dynamics model for quantifying the energy imbalance gap responsible for the U.S. adult obesity epidemic. We show how this model explains obesity patterns across gender, age, and race/ethnicity subpopulations. **Methods:** Our System Dynamics model divides the U.S. adult population into J subpopulations based on gender, race/ethnicity and age, and further into I BMI (Body Mass Index) groups. Transition rates between these groups are then defined as a function of metabolic dynamics of individuals in these groups according to existing models of body weight dynamics. The energy intake in group JI at time t is then estimated as a multiplication of the equilibrium energy intake of individuals in that group by an energy gap multiplier. Through calibration, the energy gap multiplier for each group is estimated by maximizing the match between simulated BMI distributions for each gender/race/age group against data from NHANES using maximum likelihood estimation. **Results:** Preliminary results using white adult females as a test case suggest that the trajectory of increasing BMI is consistent with a 50 kcal/day positive energy imbalance, providing confidence to the utility and credibility of this new methodology. We apply our method to all other subpopulations for this presentation. **Conclusions:** Systems Dynamic models offer potentially useful tools for researchers and policy makers. We illustrate how these novel models can be connected to population data sets for purposes of calibration and validation.

T-111-OR

The Impact of Self-Reported Weight, Height and Dietary Intake on the Valid Estimation of Diet-Disease Associations

Jennifer M. Poti, Barry M. Popkin, Michelle A. Mendez *Chapel Hill, NC*

Background: Population-based studies often rely on self-reported weight, height, and dietary intake, yet it is unclear whether misreporting of weight

and height is associated with dietary misreporting and how estimation of diet-disease associations is impacted. **Methods:** Among 1,850 adults from NHANES 2007-2010, dietary underreporters (19.8%) and overreporters (8.4%) were classified using the revised Goldberg method. The association between BMI error (measured BMI (BMI_M) minus BMI calculated from reported weight and height (BMI_R)) and dietary misreporting was estimated using linear regression. Diet-BMI and diet-metabolic syndrome (MetS) associations were estimated using linear and logistic regression, with or without adjustment for dietary misreporting and using BMI_M or BMI_R as an outcome or mediator. **Results:** Dietary underreporting was associated with error in BMI_R (adjusted β ; 95% CI: -0.32; -0.55, -0.09), with underreporting BMI_R greatest for obese dietary underreporters (-1.58; -1.92, -1.24). Adjustment for dietary misreporting was necessary to yield significant associations between BMI and highest vs lowest intake of sugar sweetened beverages (SSB) (1.04; 0.15, 1.93), fast food (1.12; 0.20, 2.03), and red meat (0.82; 0.02, 1.61), yet results were robust to use of BMI_R. Self-reported data did not limit valid estimation of associations between diet and MetS. For example, the OR comparing highest vs lowest quintile of SSB intake was significant before (1.70; 1.12, 2.58) and after (1.76; 1.15, 2.70) adjustment for dietary misreporting, and conclusions from mediation analysis by BMI_M vs BMI_R did not differ. **Conclusions:** Error in BMI_R and dietary misreporting are associated. Although BMI_R error had little impact, adjustment for dietary misreporting may be necessary when estimating associations between diet and obesity, but not diet and obesity-related outcomes.