TEXAS TECH UNIVERSITY®

Obesity Research Cluster Annual Meeting and Networking Event

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SCHEDULE

3:30-3:45pm	**Welcome and Introductions** Dr. Moustaid-Moussa, VPR Duncan, Dean Hoover Introduction of HSC VPR Conn and TTU/HSC Deans
3:45-4:00pm	**ORC overview:** (committees, progress report, strategic plan, survey, etc.)
4:00-4:10pm	**Phytochemical Nanocarriers: A Promising Approach for Preventing and Treating Chronic Diseases** Dr. Shu Wang
4:10-4:20pm	**Relevance of Immunoregulatory Sertoli cells for Obesity Research** Dr. Jannette Dufour
4:20 -4:30pm	**Clinical Nutrition Investigation and Women's Bone Health** Dr. Leslie Shen
4:30- 4:40pm	**Innovative Approaches to Obesity Treatment: One size does not fit all** Dr. Martin Binks
4:40-4:50pm	**Behavioral Interventions for Preventing Childhood Obesity: Innovative and Diverse Approaches.** Dr. Sara Dodd
4:50-5:00pm	**Economics and Health Decisions** Dr. Conrad Lyford
5:00-5:30pm	Small Research Interest Group Breakout sessions
5:30-6:00pm	Group reports, action plans and timelines Identify leaders of specific research interest areas, action items, next steps, timeline Closing remarks
6:00-7:30pm	Poster presentations and reception

SPEAKER ABSTRACTS

Dr. Shu Wang

Phytochemical Nanocarriers: A Promising Approach for the Prevention and Treatment of Chronic Diseases

TTU Nutritional Sciences

Many bioactive compounds have a great potential for the prevention and treatment of chronic diesases including obesity, cancer and cardiovascular disease. However, their low levels of solubility, stability, and bioavailability and target specificity limit their application in those diseases. This is particularly true for (-)-epigallocatechin gallate (EGCG) found in green tea and quercetin widely distributed in many fruits and vegetables that are valuable for the prevention and treatment of atherosclerosis, obesity and breast cancer. We have successfully synthesized biocompatible and biodegradable nanoparticles, which serve as carriers for EGCG and quercetin. Our preliminary data demonstrate that nanoencapsulation can increase their bioavailability, solubility, stability, bioactivities and payload of bioactive compounds, lower their toxicity, prolong their circulation time, and target them to specific cells or tissues for disease prevention and treatment. This innovation portends a potential breakthrough in the prevention and treatment of chronic diseases by using bioactive compounds with minimized immunogenicity and side effects.

Dr. Jeannette Dufour

Relevance of Immunoregulatory Sertoli Cells for Obesity Research

HSC Cell Biology & Biochemistry

The immune privileged nature of the testis is important for the protection of the developing immunogenic germ cells. Sertoli cells are considered key players in creating this immune privileged environment, which has led to their use in transplantation. For instance, Sertoli cells survive and protect co-grafted cells, such as pancreatic islets, when transplanted across immunological barriers as allografts or xenografts. Research in my lab is focused on the immunoregulatory properties of Sertoli cells. Specifically, we are exploiting their immune privileged abilities to immunoprotect co-transplanted cells that express insulin as a treatment for diabetes. For this presentation, I will give an overview of the research in my lab related to diabetes and immunology, which is also relevant to obesity research.

Dr. Leslie Shen

Clinical Nutrition Investigation and Women's Bone Health

HSC Pathology

Among different chronic diseases in women, especially postmenopausal women, osteoporosis (severe bone loss) is a major health problem. Osteoporosis is a weakened bone condition with bone fragility and an increased chance for bone fractures, especially of the hip, spine and wrist. Since bone loss is a natural process and nobody can really stop the progress of loss, how to slow down the progress of developing osteoporosis in postmenopausal women has become a major public health issue. In this short talk, Dr. Leslie Shen is going to cover how to define osteoporosis clinically, introduce new concepts of etiology for osteoporosis development, employ several animal models that commonly used for studying bone health with a focus on the postmenopausal women model, and translational approaches from bench animal findings to human clinical investigation.

Dr. Martin Binks

Innovative Approaches to Obesity treatment:
One Size Does Not Fit All

TTU Nutritional Sciences

Dr. Binks will discuss how traditional group-based approaches to obesity treatment have failed to recognize the importance of fully understanding and targeting individual differences in addressing this multidimensional health issue.

Dr. Sara Dodd

Behavioral Interventions for Preventing Childhood Obesity: Innovative and Diverse Approaches.

TTU Center for Adolescent Resiliency

Three different health promotion research projects are presented as examples of taking an indirect approach to the prevention of childhood obesity: (1) The BodyMind Initiative -- bringing a comprehensive wellness and self-care perspective to impact self-regulated health behaviors in middle adolescence; (2) 4-H Food Challenge – leveraging a popular 4-H program to improve food competency among youth; and (3) Technology, Diet, and the Brain – exploring how the brain processes cell phone pictures of actual food choices in late adolescence.

Dr. Conrad Lyford
Economics and Health Decisions
TTU Agricultural & Applied Economics

Many health-related decisions around obesity are based on choices made. My research has focused on considering how to promote and influence healthy behavior. For example, communities can promote healthy eating, a supermarket can indicate which products are healthier and school lunches can offer rewards for health food consumed. Innovative solutions will be needed to solve the obesity.

POSTER PRESENTATIONS

Tissue Specific Induction of ChREBP Isoforms in Carbohydrate Refed Mice and their Impact on Lipogenesis

Alexis D. Stamatikos, Michael Rogowski, Chad M. Paton, PhD
Nutritional Sciences, College of Human Sciences, TTU

Abstract

Background: Carbohydrate response element binding protein alpha (ChREBP-α) is a transcription factor involved in carbohydrate induced de novo lipogenesis. Recently, a novel isoform (ChREBP-β) has been discovered and the purpose of this study was to determine the effect of different carbohydrates on ChREBP-b transcriptional activity.
Methods: Male mice were fasted for 24 hours and refed either a high glucose, sucrose, or fructose diet for 12 hours. Tissues were collected to assess changes in lipogenic and gluconeogenic gene expression as well as ChREBP-α and ChREBP-β induction. HepG2 cells treated with a fructose-1,6-bisphosphatase inhibitor were challenged with a fructose load to assess if ChREBP mediated de novo lipogenic suppression occurs by blocking gluconeogenesis.
Results: ChREBP-α was not induced with carbohydrate refeeding, in fact it decreased after all three diets whereas ChREBP-β increased in all tissues assessed except muscle. Sucrose refeeding caused the largest increase in ChREBP-β expression followed by fructose, then glucose (24.4±11.1, 17.8±9.5, and 10.1±3.2 fold increase, respectively vs. fasting). ChREBP-β expression was also associated with lipogenic gene expression. SCD-1 expression increased 8.6±4.0, 8.4±3.0, and 4.4±1.3 fold with sucrose, fructose, and glucose refeeding respectively. Fructose was able to induce ChREBP activity independent of its gluconeogenic

capacity. Lastly, obesity was associated with an increase in ChREBP-β expression, suggesting an increased basal lipogenic capacity.
Conclusions: ChREBP-α and ChREBP-β can be detected separately and their induction is detectible in the liver and other peripheral tissues of carbohydrate refed mice. ChREBP-β expression appears to be responsible for carbohydrate-induced lipogenic gene induction and not ChREBP-α.

Collegiate Recovery Programs and Eating Disorders in Emerging Adults: Transitioning from Treatment to Higher Education

M[c]Kenzie T. Wilkes, MS, Kitty S. Harris, PhD, Thomas G. Kimball, PhD
Center for the Study of Addiction & Recovery, College of Human Sciences, TTU

Abstract

Abstract from paper presentation at the 2014 International Conference on Eating Disorders (ICED) hosted by the Academy for Eating Disorders:

Universities across the nation are recognizing the need for collegiate recovery programs (CRPs), offering support to students who are in recovery from addictions while pursuing higher education. 25 years ago Texas Tech University (TTU) began an innovative program that has become the premier model for replication across the nation. CRPs create a network of peers, faculty and staff who provide safety, understanding, accountability and encouragement to thrive in a college environment. The purpose of this study was to evaluate the need for an eating disorder (ED) specific program within the TTU CRP. The total sample for this study was 148 CRP students from across the US. A survey was administered including demographic information, addiction history, general health, and Change in Eating Disorder Symptoms Scale (CHEDS). The results indicate that although most CRP students do not have a diagnosable ED, there is an elevation in ED symptoms in this population. Only 5% of the students sampled reported their primary or secondary addiction as ED, however, over 40% of students scored greater that the cutoff of 60 on the CHEDS. In other words, almost half of the students surveyed could benefit from specialized help with their disordered eating symptoms. TTU CRP has developed an ED program to meet student needs as found in research data and faculty and staff recommendation. The ED program provides CRP students with a

scholarship, bi-weekly seminar meetings for credit hours, nutrition counseling with a registered dietician and weekly individual sessions with staff. In addition to these services, the TTU CRP also provides a therapist lead support group and treatment provider referrals for the TTU campus and community. Providing each of these services enables the CRP to meet the needs of students transitioning from treatment to higher education. The CRP at TTU is at the forefront of collegiate recovery and helping students maintain recovery while pursuing a college education.

Sex Differences in the Cortisol Response Between Two Different Stress Protocols

Jacalyn J. Robert-McComb, FACSM[1], Yu Lun Tai[1], Xu Qian[2], Kembra Albracht[1], Melanie Hart[1], Reid Norman[3]

([1]Texas Tech University, Lubbock, TX. [2]Texas Tech University Science Center, Lubbock, TX. [3]Texas Tech Health Science Center, Lubbock, TX.)

Abstract

Background: In order to examine the effectiveness of intervention programs designed to help individuals cope with stress, two similar stress protocols are needed to serve as pre-post stressors. This would allow the researcher to design experiments that would measure physiological responses to novel stressors pre-post intervention that have been shown to elicit a similar stress response.

Objectives: Therefore, the purpose of this study was to compare the efficacy of two different psychological stressors, the Trier Social Stress Protocol and the Beilock Stress Protocol. In this study, efficacy refers to the cortisol response to the psychological stressor. Sex differences in the cortisol response was also examined.

Methods: Fifty-four college age males (n=30) and females (n=24) completed both protocols. Blood samples were collected every 10 minutes for 100 minutes (11 samples). Baseline and stressor values were averaged (20 min baseline, 20 min stressor, with 60 min of recovery every 10 min. A 2 (test-Beilock or TSST) by 2 (sex: M or F) by 8 (trials) ANOVA with repeated measures on test and trial was used to analyze the data.

Results: Results indicated no significant main effect for sex or test, however, there was a significant main effect for trial, $F(7, 52) = 53.1$, $p = .000$. There was a significant 2-way interaction for test and trial, $F(0, 27) = 6.703$, $p = .000$, the tests changed differently across trials. There was also a significant 3-way interaction for sex, test, and trial $F(7, 52) =$

5.83, p =.000. The TSST elicited a greater immediate cortisol response for both sexes as compared to the Beilock Stressor. There was a sharper increase in cortisol levels for the males during the initial stressor and the first 20-min recovery period than in females. The cortisol levels during recovery were similar for both males and females dropping below baseline during recovery.

Conclusion: Based on the results of this study, the Beilock Stress Protocol and the Trier Stress Protocol could not be used as pre-post stressors in intervention programs designed to help individuals cope with stress. The TSST produced an increase in cortisol that was not seen in the Beilock stressor for both sexes. It was also found that sex had an effect on the cortisol response across trials. Males had a higher initial cortisol response to the stressors than females.

Differential regulation of adipokine levels after Bariatric surgery

Nadeeja N. Wijayatunga[1], Valerie G. Sams[2], Camille D. Blackledge[2], Nalin Siriwardhana[1], Matthew L. Mancini[2], Gregory J. Mancini[2], Monique LeMieux[1], Naima Moustaid-Moussa[1]

([1]Nutritional Sciences, College of Human Sciences, Texas Tech University, Lubbock, TX. [2]Department of Surgery, University of Tennessee Medical Center Knoxville, TN.)

Abstract

Bariatric surgery is known to cause significant weight loss, reduction in insulin resistance, cardiovascular disease and mortality. We hypothesized that adipose and systemic inflammation will be decreased post bariatric surgery. Our objective was to study changes in adipokine levels following bariatric surgery. We recruited patients undergoing Roux En Y gastric bypass and laparoscopic gastric band placement. Demographic data and both serum and adipose tissue samples were collected at the time of surgery, 2 weeks and 6 months post operatively. Luminex Human cytokine and adipokine kits were used along with adiponectin, Tumor Necrosis Factor-α (TNF-α), leptin and Monocyte Chemotractant Protein-1 (MCP-1) ELISAs to measure levels of these cytokines in serum and/or adipose tissues. Percentage changes in adipokines were calculated from time of surgery to each time point after surgery. There was a significant increase in adipose adiponectin at each post-surgery time. Serum adiponectin showed an increasing trend by 6 months, but was not significant. Serum leptin, TNFα and MCP-1 all showed decreasing trends from time of surgery to 6 months post surgery, but differences were not statistically significant. The percentage reduction for MCP-1 at 6 months

was significantly higher than for TNF-α. These findings suggest that serum and adipose adipokine levels are differentially regulated by bariatric surgery. Additional studies are necessary to determine how these changes in tissue and circulating cytokine levels relate to various bariatric surgery outcomes.

Source of research support: PMERF (Physician's Medical Education and Research Foundation, Knoxville, TN) and VPR and COHS Texas Tech University startup funds, Lubbock, TX.

What impacts could obesity have on the operational function of assisted living facilities?

Andrea Wade
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Abstract

Objective: In the US, obesity is an epidemic. Overall life expectancy has increased, with men and women living an average of 3.4 and 1.6 years longer, respectively. Demographics reports state that the expected number of adults aged 65 years and older will increase to approximately 20% of the US population by 2030. The growing prevalence of aging adults who are overweight and obese will have implications for both medical and social services. The purpose of this research was to investigate what impacts obesity may have on the operational function of assisted living facilities as it relates to staff operational needs, building function, and supportive design.
Research Design: A literature review was conducted utilizing the keywords to define related groupings. The keywords were obesity, aging populations, assisted living facilities, design guidelines, nursing guidelines, care methods, and bariatric patient safety.
Key Findings: Obesity is a costly health problem for older adults, their caregivers and has significant implications for the healthcare systems. The highest rates of obesity are among the baby boomer generation, aged 44-62. Increasing numbers of older, obese individuals will need assistive care facilities. Facilities may not be able to accommodate the increased needs the obese elderly population present. No standards exist that specify how the physical environment may enable safe and more-efficient care, but recommendations have been proposed.
Conclusion: Standards and guidelines utilized for designing assisted facilities need to be reformulated to account for the growing needs of

older obese individuals. Current facilities cannot support the growing numbers of elderly obese. If facilities are to care for this population, changes need to address the operations and facilities. Further research is needed to determine how changes should be made and administered. Models for standards of care programs, facility design and equipment standards guidelines are needed.

Exercise Improves Strength and Confers Extended Healthspan on Swim-trained *C. elegans*

Mizanur Rahman[1] Daniel Burke[2], Mary Anne Royal[2], Leo Gefter[2], Christina Chang[2], Jerzy Blawzdziewicz[3], Monica Driscoll[2] and Siva A. Vanapalli[1]

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Abstract

Exercise confers powerful health benefits, with anti-cancer, anti-diabetes, anti-sarcopenia, anti-cognitive decline, and possibly pro-immune consequences in humans. Still, the molecular, cellular, and systems-wide changes by which exercise extends healthspan remain poorly understood, limiting exploitation of molecular exercise pathways for therapeutic application.

To probe the effects of exercise on *C. elegans*, we developed a miniaturized device that can directly measure worm muscle strength as a function of its lifespan. We benchmark this tool by demonstrating that muscle force production in wild-type animals is markedly higher than in mutants (*unc-112* and *unc-52*) with impaired muscle. We also show that, as expected, muscle force production increases with developmental age of the animals.

We exercise animals by subjecting them to an optimized swim training regimen and record changes in muscle strength. Juvenile worms exercised on successive days exhibit an exercise benefit, as revealed by enhanced force production. We show that two independent mutants for *aak-2*[1], a conserved subunit of an AMP kinase homologue that acts upstream of the transcriptional activator PGC-1α to increase mitochondrial density in response to physical activity in higher organisms[2], do not gain a training benefit, even though they swim train like wild type worms. Our data suggest that molecular mechanisms by which *C. elegans* gain an exercise benefit are conserved from nematodes

to humans, opening up a new experimental system for the study of physiological improvements in response to training. Importantly, animals that exercise exhibit some systemic old-age health benefits such as an extended period of pharyngeal pumping and longer median lifespans. Since *C. elegans* exercise confers anti-aging effects, the molecular genetics, and pharmacological benefits of exercise can now be dissected using the powerful nematode model. Finally, we anticipate that the small footprint of the device combined with unprecedented capacity to add or remove reagents at any time point in the lifespan, will allow highly parallelized experiments to unravel the molecular mechanisms regulating the effects of diet and exercise on aging.

1. Apfeld, J., O'Connor, G., McDonagh, T., DiStefano, P. S. & Curtis, R. The AMP-activated protein kinase AAK-2 links energy levels and insulin-like signals to lifespan in *C. elegans*. *Genes Dev* **18**, 3004-3009 (2004).
2. Zong, H. *et al.* AMP kinase is required for mitochondrial biogenesis in skeletal muscle in response to chronic energy deprivation. *Proc Natl Acad Sci U S A* **99**, 15983-15987 (2002).

Metabolic and anti-inflammatory phenotypes of mice lacking adipose tissue angiotensinogen

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Abstract

Adipose Renin Angiotensin System (RAS) has been linked to metabolic syndrome pathogenesis. Previously we showed that overexpression of Angiotensinogen (Agt) in adipose tissue (Agt-TG) increases insulin resistance, adipose and systemic inflammation in mice fed a low fat diet (LF) diet. To further dissect adipose Agt's role in metabolic disorders, we created adipose specific Agt knockout (Agt-KO) mice using the Cre-LoxP system. Agt-KO and control (WT) littermates were fed either a LF or high-fat (HF) diet to assess metabolic changes. Surprisingly, and in contrast to the Agt-TG mice, most metabolic parameters (body weight, glucose and insulin tolerance) were comparable between the WT and Agt-KO littermates in both diets. Analyses of adipose tissue gene expression indicated shifts in angiogenesis and insulin signaling in the Agt-KO mice fed LF diets when compared to the WT mice. MCP1 gene expression was also down regulated in the Agt-KO vs. WT littermates. These changes correlated with MCP-1 and Leptin protein expression,

both of which were downregulated in the Agt-KO vs. WT mice. Moreover, targeted inactivation of adipose Agt reduced total macrophage infiltration in both the LF and HF fed Agt-KO mice. In conclusion, despite the lack of an obvious phenotype in adipose Agt deficient mice, cellular and molecular changes observed are consistent with previously reported functions of RAS in insulin resistance, angiogenesis and inflammation. *Grant Support: AHA & TTU (COHS & OVPR)*

Obesogenic Environments: Shaping Individuals Through Design

Alicia Morton
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Abstract

Purpose: The purpose of this study is to determine different features within everyday environments that can be altered to incorporate more physical activity and therefore strive to reduce the obesity epidemic of the United States. Not only does obesity affect one's body, it also will affect the spaces in which they live, work and play by altering furniture sizes as well as the materials used within building (Zimring et. al., 2005).
Design/Methodologies: A prototype community was created with research gathered through a literature review. Research was then analyzed to determine which techniques were best suitable to create communities. Popular databases such as EBSCO Host were used to find journal articles dealing with specific keywords, such as, obesity, design, weight, environment & overweight, for example.
Findings: The way that most neighborhoods in today's society are shaped show patterns of low-density sprawl, zoning concerns which have created land separation, and lastly, environments created and designed around the use of cars (Wells et. al., 2007). Through research done within this study it is apparent the need for spaces to be designed with obesity in mind.

Locomotion and chemotaxis of C.elegans in complex environments

Alejandro Bilbao[1], Amar Patel[2], Siva Vanapalli[2], Jerzy Blawzdziewicz[1]
([1] Department of Mechanical Engineering TTU; [2] Department of Chemical Engineering TTU)

Survival mechanism of allo-transplanted immune privileged Sertoli cells; induction of an early anti-inflammatory environment and regulatory T cells

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Abstract

Immune privileged Sertoli cells (SC) survive long-term and protect co-grafted cells when transplanted as allo- or xeno-grafts. However, their survival/protection mechanism remains unclear. The objective of this study was to investigate the immune privilege mechanism of SC. Previously we have demonstrated that allotransplanted SC survived whereas MSC-1 cells (a mouse Sertoli cell line), which lack some of the immunoprotective abilities associated with SC, were rejected when transplanted as allografts in naïve BALB/c mice. Microarray analysis revealed that genes involved in inhibiting humoral and/or cell mediated immune response were upregulated in SC. Therefore, we hypothesized that SC survive as allografts by inhibiting humoral and/or cellular immune response. Analysis of SC or MSC-1 cell grafts and serum from the transplanted animals for humoral immune (antibody production and complement deposition) response showed no IgG production whereas an IgM response was generated against the grafted cells. Further analysis of the grafts for complement factor (C4, C3 and MAC) deposition revealed that complement mediated cell lysis was not activated in any of the grafts throughout the study suggesting inhibition of humoral immune response is not the main mechanism for SC survival as the results were similar between SC and MSC-1 cells. On the other hand, significant increase in apoptosis (cell mediated death) was observed in MSC-1 cell grafts while very few apoptotic cells were detected in SC grafts throughout the study. Analysis of the grafts for immune cell infiltration revealed that macrophages and CD4T cells infiltrated both sets of grafts, whereas little to no CD8T cells were detected in MSC-1 cell grafts. Furthermore, early anti-inflammatory environment (high IL10, low TNFα and low IL17) promoting regulatory T cells (Tregs) was detected in SC grafts compared to MSC-1 cell grafts. Tregs are important for maintaining tolerance at immune privileged sites, increasing graft survival and preventing autoimmunity. Therefore, we hypothesized that T cells detected in SC grafts could be of regulatory phenotype. To verify this, double immunofloresence for Tregs (CD4+Foxp3+ cells and CD8+Foxp3+ cells) was performed on both sets of grafts. A large number of

CD4+Foxp3+ and CD8+Foxp3+ Tregs were detected in SC grafts whereas Tregs were either absent or very few were detected in rejected MSC-1 cell grafts. Overall, this led to the conclusion that SC survive as allografts by inhibiting apoptosis, creating an early anti-inflammatory environment and increasing the number of Tregs at the graft site.

Eicosapentaenoic acid regulates brown adipose tissue gene expression and metabolism in high fat fed mice

Mandana Pahlavani[1], Nishan S. Kalupahana[2], Monique LeMieux[1], Arwa Aljawadi[1], Shane Scoggin[1 3] and Naima Moustaid-Moussa[1]

([1]Nutritional Sciences, Texas Tech University, Lubbock, TX, USA
[2]Physiology, University of Peradeniya, Peradeniya, Sri Lanka)

Abstract

Brown adipose tissue (BAT) is a thermogenic tissue, a key regulator of energy balance and a potential therapeutic target for obesity. We previously reported that eicosapentaenoic acid (EPA) reduced high fat (HF) diet-induced obesity and insulin resistance in mice, independent of energy intake. We hypothesized that these effects are mediated in part by BAT thermogenesis. Using mice fed HF or HF-EPA diets for 11 weeks, we demonstrated that BAT from HF-EPA mice expressed higher mRNA levels of thermogenic genes such as fibronectin type lll domain containing 5 (FNDC5), peroxisome proliferator activated receptor gamma coactivator 1 alpha (PGC1α) and uncoupling protein 3 (UCP3), compared to HF mice. EPA also induced expression of angiotensinogen (Agt) gene and other genes related to insulin sensitivity such as Glut 1 while downregulating arachidonate 5-lipoxygenase (ALOX5), an inflammatory biomarker. At the protein level, EPA upregulated uncoupling protein (UCP) and downregulated fatty acid synthase (FAS). Thus, EPA exerts dual effects on adipose tissue depots, by reducing WAT inflammation and lipid accumulation, while activating BAT thermogenesis and reducing lipogenesis. In conclusion, EPA exerts differential tissue specific effects to reduce obesity-associated metabolic disorders. Further molecular studies in cultured brown adipocytes are being conducted to dissect direct effects of EPA on brown fat.

Supported by AHA, USDA and TTU

Impact of Multi-tiered Community-based Cancer Prevention Efforts on Cancer Knowledge, Health Attitudes, and Behavior in Rural West Texas Community

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Abstract

Background: There is less choice for healthy food, less access to health facilities and sparse access to public health information in rural communities that create higher risk of preventable cancer in rural areas. The prevention efforts are often minimal. Feasible means of encouraging lifestyles that will reduce cancer risk for residents of rural communities are needed. A project to deliver educational interventions to rural populations by using local supermarkets was launched in June of 2011 in a rural community of West Texas. This project developed and tested a model that communities might adopt to incorporate cancer risk education throughout the community

Methods: The paper is based on quasi-experimental two-group pretest-posttest design comparing baseline and follow-up data in an intervention community with a matched comparison community. 68 participants from the intervention community and 39 participants from the control community, between the ages 18 and 92 participated in both the pretest and posttest survey. The outcomes are assessed with descriptive statistics, paired t tests and adjusted multiple linear regression model with change in health knowledge score as the dependent variable.

Results: Significant improvement in cancer knowledge and increase in nutrition awareness was observed in the intervention community. The mean cancer knowledge score had increased significantly in the intervention community compared to control community. The effect of the intervention contributed significantly for the change in cancer knowledge score from pre-test to post-test.

Conclusions: The finding from this research suggests that multi-tiered community based participatory research has positive impact in changing cancer knowledge, health attitudes and behavior.

Funding: Research relating to this abstract was funded by Cancer Prevention Research Institute of Texas

Quercetin encapsulated nanoparticles: effects on breast cancer cell growth, apoptosis, and uptake in vitro and bioavailability in vivo

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[2] Department of Electrical & Computer Engineering, Texas Tech University, Lubbock, TX 79409)

Abstract

Background: Quercetin, a natural flavonoid, has a potential against many breast cancer cells, but its low solubility and bioavailability in the body make administering it in therapeutic dose unrealistic. We have successfully synthesized quercetin encapsulated nanocarriers (Q-NP). Our hypothesis is that Q-NP can enhance quercetin stability and solubility, increase quercetin bioavailability in vitro and in vivo, decrease the viability of breast cancer cells, and induce their apoptosis.
Methods: The stability, solubility and cellular uptake of quercetin in MCF7 and MDA-MB-231 breast cancer cells were measured using a high performance liquid chromatography system. The viability and apoptosis of breast cancer cells were measured using a 3-(4, 5-dimethylthiazol-2-yl)-2, 5-diphenyltetrazolium bromide assay and Annexin-V/propidium iodide assay, respectively. The pharmacokinetics of Q-NP was measured in SD rats.
Results: Q-NP was about 30 nm in diameter. Nanoencapsulation significantly increased the stability and solubility of quercetin, and increased quercetin cellular content 3.9 times and 9.3 times in MCF7 and MDA-MB-231 cells, respectively. Q-NP also significantly lowered the viability of both breast cancer cells and induced their apoptosis as compared to free quercetin at the same concentrations.
Conclusion: Q-NP is a promising approach for the prevention and treatment of breast cancer.

The antiatherogenic effects of targeted epigallocatechin gallate (EGCG) - loaded nanoparticles

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[1]Nutritional Sciences, College of Human Sciences, TTU and [2] Cell Physiology & Molecular biophysics, TTUHSC

Abstract

Objective: The objectives of this study were to incorporate scavenger receptor target ligands on the surface of biocompatible and biodegradable epigallocatechin gallate (EGCG)-loaded nanoparticles (E-LNP), to evaluate their target specificity to macrophages in vitro and atherosclerotic lesions in LDLr-/- mice.

Method: E-LNP were synthesized using a sonication method. Particle size, zeta potential and morphology were determined using a transmission electron microscope and Brookhaven analyzer. The target specificity to macrophages (in vitro) and to atherosclerotic lesions in LDLr-/- mice (in vivo) was measured using a fluorescence microscopy and imaging system, respectively. Macrophage cholesterol content and EGCG uptake were measured using a HPLC method. After intravenous injection of E-LNP once per week for 20 weeks, the aortic lesion was quantified by a microscope and image J software.

Results: E-LNP are negatively charged and less than 100 nm in diameter. As compared to nanoparticles without target ligands, targeted E-LNP significantly increased macrophage EGCG content and decreased macrophage expression of monocyte chemoattractant protein 1 (MCP-1). The target ligands significantly increased the binding and uptake of those nanoparticles to THP-1 derived macrophages and improved the target specificity to atherosclerotic lesions in LDLr-/- mice.

Conclusions: Targeted E-LNP have a potential for decreasing aortic cholesterol accumulation and inflammatory responses through targeting to macrophages and foam cells in atherosclerotic lesions.

Grant Funding Source: Grant Funding Source: NIH 1R15AT007013-01

All tested omega 3 fatty acids decrease macrophage prostaglandin E2 and inflammatory cytokine production

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Abstract

The objective of this study was to determine if docosapentaenoic acid n-3 (DPAn3) enrichment of macrophages (MΦ) changed their inflammatory response relative to saturated (S), mono-unsaturated (MU), and other poly-unsaturated (PU) fatty acids (FA). Differentiated THP-1 cells were incubated with one of 11 FA (50 and 100 μM) of varying degrees of unsaturation or no FA for 24 h prior to 24 h of stimulation with lipopolysaccharide from E. coli. Fatty acids were collected from MΦ without stimulation to determine the fatty acid profiles. Media was collected from MΦ post-stimulation and probed for prostaglandin E2 (PGE2), and cytokines, including tumor necrosis factor-α, monocyte chemoattractant protein-1, and interleukin-6. Prostaglandin E2 production was greater ($P<0.05$) for AA than all other FA, and n3 PUFA decreased ($P<0.01$) PGE2 compared to n6 PUFA and all other FA. Incubating THP-1 cells with SFA, or MUFA did not change inflammatory cytokine release ($P>0.10$); however, PUFA decreased inflammatory cytokine release ($P<0.01$) and n3 PUFA were the most potent followed by arachidonic acid (AA). The results of this study suggest n3 PUFA can decrease inflammation associated with endothelial damage and stress, and the anti-inflammatory effect of DPAn3 was similar to other n3 PUFA. Further, PGE2 production by THP-1 cells increased greatly when incubated with AA and likely has a negative feedback on inflammatory cytokine release.

A Fluorescent Molecular Probe for Telomerase Detection in Cancer Cells

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Abstract

The ribonucleoprotein telomerase is a nearly indispensible survival factor for proliferating cancer and stem cells. This claim is supported by the observation that close to 90% of human tumor samples examined thus far with the Telomere Repeat Amplification Protocol (TRAP) demonstrates enzymatically-active telomerase. As a result, most immortalized cell lines derived from human tumors also share this phenotype, with the remainder maintaining telomere integrity through a poorly defined pathway that utilizes recombination-associated protein(s). Despite the near ubiquity of telomerase expression among tumors, and a possible relationship between the level of telomerase expression and/or activity, and the "aggressiveness" of tumors, there are no convenient assays for the clinical quantification of telomerase in oncology units. The experiments that are described subsequent to this introduction are based on a fluorescent DNA probe, or molecular beacon, that possesses a sequence construction which mimics the single-stranded 3' overhang of telomeric DNA (tel-MB). Consequently, binding interactions between telomerase and the tel-MB results in proportional fluorescence output. Four different cell lines that differ with regard to expression and enzymatic activity of hTERT were assayed for binding and show a reproducible hierarchy of activity that is comparable and complementary to currently existing methodologies that were performed in parallel.

Metabolomics and optical imaging shows tissue specific mitochondrial oxidative stress as early biomarkers of polycystic ovary syndrome

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Abstract

Purpose: Polycystic ovary syndrome (PCOS) is associated with metabolic and endocrine disorders in women of reproductive age. Causation and onset of PCOS are still unknown and only diagnosed after puberty. The objectives of this study were to quantify the tissue-specific (kidney, heart and ovary) mitochondrial activity during the progression of PCOS from 8 to 16 weeks in a prenatally glucocorticoid treated (cort) mouse model.

Methods: We employed nuclear magnetic resonance (NMR)-based metabolomics and the complementary optical imaging technology to examine the mitochondrial function and redox state.

Results: Nuclear magnetic resonance (NMR) spectroscopy analysis of kidney showed 123% decrease in succinate and 48% increase in fumarate from 8 to 16 weeks old cort mice. Optical imaging revealed significant changes in the mean NADH redox state (RR) in a tissue specific manner during the same time course. Kidneys from cort-mice revealed more oxidized respiratory chain in 8 (50%) vs. 12 (17.5%) and 16 (15%) weeks, whereas ovaries showed gradual changes in the RR during the time course as compared to controls at the same age. In the heart, cort mice exhibited a similar increase (35%) in the RR in all three ages. Combined approaches of optical imaging and NMR analysis provide the first glance into early oxidative stress biomarkers as metabolic disturbances associated with PCOS progression.

Eicosapentaenoic acid regulation of muscle lipid metabolism in vivo and in vitro

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Abstract

Eicosapentaenoic acid (EPA), an omega 3 fatty acid, exerts potent anti-inflammatory and hypolipidemic effects. We previously reported that mice fed high fat diets supplemented with EPA (HF-EPA) were resistant to diet-induced obesity, inflammation and insulin resistance. Here we further investigate both in vivo and in vitro the mechanisms by which muscle tissue contributes to the metabolic benefits of EPA. We compared changes in gene and protein expression and tissue metabolites in mice fed either HF or HF-EPA for
11 weeks and in C2C12 cells treated with or without EPA. Docosahexaenoic acid, saturated fatty acids (SFA) and cholesterol precursors were increased in muscle of mice fed HF-EPA vs. HF. Surprisingly, EPA increased fatty acid oxidation in adipose tissue but not in muscle. To determine mechanisms mediating direct effects of EPA in muscle in vitro, we used the mouse myocyte cell line C2C12 cells. Consistent with our findings in vivo, treatment of C2C12 cells with 50mM EPA increased lipoprotein lipase (Lpl) gene expression in a time-dependent manner while fatty acid oxidation was unchanged. In conclusion, high fat diets supplemented with EPA increased SFA and cholesterol precursors content in muscle with no significant changes in fatty acid oxidation. These finding suggest a possible unique role of EPA in mediating muscle cholesterogenesis in mice. Funding support: USDA, AHA, and TTU (COHS and OVPR)