

Abstracts from Texas Tech University Health Sciences Center School of Medicine Summer Research Program from the Lubbock Campus presented at the Student Research Week in March 2017

The names in bold are the medical students who participated in this program in 2016.
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1. Analyzing anti-inflammatory effects of delta-tocotrienol on type 2 diabetes

Lillian Cole, Gurvinder Kaur, Michael Tomison, Leslie Shen, Jannette M. Dufour

Diabetes is the 7th leading cause of death, and type II diabetes (TIID) accounts for 90-95% of diagnosed cases in the United States. In TIID, body's cells are unable to utilize insulin resulting in insulin resistance. Inflammation and oxidative stress are associated with the pathogenesis and development of TIID complications. Anti-oxidants have potential to protect against oxidant-mediated inflammation. We are interested in determining the beneficial effects of anti-oxidants, specifically Delta-Tocotrienol (δ T3), on TIID related complications. We hypothesize that δ T3 will improve glucose clearance and reduce insulin resistance through its anti-inflammatory and anti-oxidant properties, thereby ameliorating TIID. The C57BL/6J male mice were categorized into high fat diet (HFD), low fat diet (LFD), and HFD supplemented with either 400mg/kg δ T3 (T400), or 1600mg/kg δ T3 (T1600) over a 14 weeks period. To determine impaired glucose tolerance and insulin resistance, intra-peritoneal glucose tolerance test (IPGTT) and intraperitoneal insulin tolerance test (IPITT) were performed, respectively. Body weights were measured, serum and pancreas were collected at the end of the study. The HFD mice had significantly higher body weight, impaired glucose clearance and insulin resistance. The δ T3 treatments had no effect on body weight or insulin resistance but significantly improved glucose clearance compared to HFD group. Serum insulin was significantly increased in T1600 group compared to HFD group while T400 had no effect on serum insulin suggesting high dose of T1600 resulted in increased insulin secretion from the islet cells. Interestingly, the total pancreatic insulin content was not significantly different between any of the groups. To determine if beneficial effects of δ T3 treatment are due to its anti-inflammatory properties, pancreases were immunostained for galectin-3 (macrophage marker). A promising trend of decreased macrophage infiltration was seen in both δ T3 groups suggesting decreased inflammation could be associated with healthy islets, secreting higher amounts of insulin to combat hyperglycemia.

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2. West Texas is substantially underserved with respect to funding by the National Institutes of Health

Emily Bollinger, Patrick Reynolds

Academic medical centers rely heavily on National Institutes of Health (NIH) grant funding to enable research that enhances medical education and provides cutting-edge therapies to their patients. Disparities exist in geographic distribution of NIH funding and of National Cancer Institute designated cancer centers, a major source of cancer care, research, and prevention resources. To balance large disparities in NIH funding by region Congress implemented the Institutional Development Award (IDEA) grant program. IDEA provides grants to 23 underserved states and Puerto Rico, but fails to address funding disparities that exist in large components of states such as Texas. NIH funding to Texas is 99% to East Texas (urban) and 1% to West Texas (rural). NIH \$ per person in West Texas (\$8) is lower than 22 IDEA states and Puerto Rico (\$9-125\$). Compared to West Texas NIH funding per person for 16 IDEA states is 2-fold higher and > 9-fold higher for 3 states (\$73-\$125). NIH provides > 500 grants to foreign countries; NIH funding to Canada and South Africa exceeds that provided to West Texas. To determine if the funding disparity between East and West Texas was consistent with economic output we examined taxable natural resources produced in East vs West Texas and found that production in West Texas of natural gas, oil, wheat, and cotton was 43%, 51%, 57%, and 75% of totals respectively. To assess the impact of the two West Texas medical schools on health care manpower we determined the geographic location of graduating medical students; most are in residences in East Texas and numerous other states. These data document a disparity in NIH funding to West Texas that is not consistent with population, economic output, or generation of physician manpower. Congress should enable IDEA applications from West Texas to help address the disparity.

3. MYCN expression as a marker for fenretinide-resistance in neuroblastomas

Mark Stephens, **Colton McCoy**, Patrick Reynolds

Neuroblastomas are a heterogeneous family of cancers that arise from tissue with neural crest origin. The most common presentation occurs in the adrenal gland, however neuroblastomas can present in any area of the body in which sympathetically-derived neural crest tissue is present. Fenretidine (4-HPR) is an anti-angiogenic, synthetic retinoid derivative that is currently used as a treatment option for neuroblastomas. Currently it is unclear whether 4-HPR acts through reactive oxygen species (ROS) or through ceramide synthesis to cause apoptosis. The MYCN gene is a member of the MYC family that encodes an N-Myc protein which, when overexpressed, has been linked to tumorigenesis and neuronal transformation. MYCN expression in neuroblastomas has been shown to be promoted by MYC-N opposite strand/anti-sense RNA (MYCNOS) by preventing MYCN phosphorylation through GSK-3B. This study will investigate the role of MYCN expression on neuroblastoma resistance to cell death induced by 4-HPR treatment. MYCN expression levels will be examined via qPCR and Western blot, cell death will be detected in response to 4-HPR via the DIMSCAN assay, and the presence of reactive oxygen species will be detected via flow cytometry. The data generated in this study will enhance our understanding of the role that MYCN plays in neuroblastomas, and also possibly elucidate the molecular mechanism of cell death resistance in MYCN overexpressing cells.

4. Chronic excess iron exposure in prostate epithelial cells

Vadivel Ganapathy, Sabarish Ramachandran, **Nita Kuttikandathil**

Hemochromatosis is an iron metabolism disorder in which the body is overloaded with iron. An excess of iron in the body can contribute to cancer initiation and growth. Preliminary studies have shown that chronic exposure to excess iron promotes export of the tumor suppressor p53 out of the nucleus with subsequent proteasomal degradation in the cytoplasm in normal prostate epithelial cells and in prostate cancer cells. Recent studies have shown that p53 is a heme-binding protein; when it binds heme, the complex gets translocated out of the nucleus. Based on this, we hypothesized that excess iron leads to excess heme, and heme binds to p53 leading to its export out of the nucleus for cytoplasmic degradation in prostate epithelial cells, and that the iron-induced depletion of p53 leads to epithelial-to-mesenchymal transition and promotes cell proliferation. We tested this hypothesis by treating RWPE-1 (normal prostate epithelial cells) and PPEC (primary prostate epithelial cells) with ferric ammonium citrate as an iron supplement. We found that exposure of the cells to excess iron increased cellular levels of heme with concomitant nuclear depletion of p53 and a decrease in the total cellular levels of p53. This process was associated with changes in cell morphology, indicative of epithelial-to-mesenchymal transition and enhanced proliferation of the cells. Exposure to excess iron also altered the expression of androgen receptor and the androgen-specific target protein prostate-specific antigen. We conclude that chronic exposure to excess iron is a risk factor for prostate cancer, and predict that the chronic iron-overload disease hemochromatosis is likely to be a promoter of prostate cancer.

5. Studying the co-expression of alpha7 nicotinic acetylcholine receptors and RIC-3 in *Xenopus laevis* oocytes

Michael Strong, Akash Pandhare, Michaela Jansen

An important initiator of the anti-inflammatory cholinergic pathway is the nicotinic acetylcholine receptor of the alpha 7 subtype (nAChR-a7) on macrophages. The nAChR-a7 receptor is a pentameric ligand-gated ion channel (pLGIC) of the Cys-loop receptors superfamily, and transforms binding of the neurotransmitter acetylcholine into an electrical signal within neuronal as well as non-neuronal networks. These receptors also require the co-expression of the chaperone protein resistance to inhibitors of choline esterase type 3 (RIC-3). Our goal was to measure the effect of RIC-3 on expression levels of nAChR-a7 when co-expressed in *Xenopus laevis* oocytes using electrophysiological recording followed by Western blot analysis. The data generated from these experiments may be used as a precursor for a further study investigating nAChR-a7 and RIC-3 expression levels in human monocytes. Oocytes were microinjected with mRNA for nAChR-a7 and/or RIC-3. When the functional expression of nAChR-a7 channels in the oocyte plasma membrane was measured by two-electrode voltage clamp recordings, we observed significantly larger acetylcholine-induced currents in oocytes injected with both nAChR-a7 and RIC-3 mRNA, as compared to injected with nAChR-a7 alone. Western blot of plasma membrane proteins supported these findings.

6. Characterizing the primary amino acid structure of the intestinal proton-coupled folate transporter

Joseph Whitt, Michaela Jansen

Folic acid, colloquially known as folate or vitamin B9, is a water-soluble vital nutrient that plays a key role in biochemical processes required to sustain life in both prokaryotes and eukaryotes. One of these key roles is in the synthesis of DNA precursors. The role folic acid plays in cell division has rendered it a prime target for pharmacologic interference in the treatment of various maladies. The first commercially available antibiotic, Protonsil, was a pro-drug metabolized to a sulfonamide moiety which antagonizes folic acid synthesis in prokaryotes. Folic acid antagonists in humans are used in a variety of settings, most notably in the treatment of malignancy and autoimmune disorders. In humans, folate deficiency often manifests as a macrocytic anemia, neutropenia, and thrombocytopenia with normal methylmalonic acid serum levels. Folic acid is ingested in a polyglutamate form which is then converted to a monoglutamate form in the jejunum by an intestinal conjugase. Folate is then absorbed from the intestinal lumen by the proton-coupled folate transporter. PCFT maintains optimal activity in a low pH. In malignancy, rapidly dividing neoplastic cells often rely on anaerobic metabolism to generate the necessary energy for continued growth. The acidic metabolic byproducts often produce a low pH in the cancerous core, and increased folate uptake in such low pH environments is being investigated as a novel approach for delivering cytotoxic agents. The goal of my project was to investigate the substrate translocation pathway in PCFT using techniques in chemical biology. To this end I employed a click-chemistry folic acid derivative in photo-affinity labeling experiments with heterologously expressed PCFT. Identifying the amino acids involved in interacting with substrate will provide the basis for structure-focused drug design of novel folate-based pharmaceuticals.

7. Dynamic control of Ca binding in the c2 domains of synaptotagmin 1; synaptotagmin senses fluctuations in the Ca 2 environment of neurons near active zones

Patrick J. Rock, Austin G. Meyer, Chantell S. Evans, Edwin R. Chapman, R. Bryan Sutton

Synaptotagmin senses fluctuations in the Ca²⁺ environment of neurons near active zones and transduces a signal to the SNARE complex to initiate exocytosis at the presynaptic terminus. The 3D structures of the two tandem C2 domains of synaptotagmin have been determined to high resolution; however, it is currently unclear how each domain dynamically interacts with Ca²⁺ at the atomic level. By studying the effects of mutations at the AD3 locus in the C2A and C2B domains of synaptotagmin 1, we can construct a model that explains the relationship between Ca²⁺ binding and the structural changes that are possible within the C2 domain. We show that the flexibility of loops 1 and 3 of the Ca²⁺ binding pocket of C2A and C2B can be modulated by the intra-domain interactions between the AD3 locus and loop 3. The change in flexibility, and the concomitant change in Ca²⁺ affinity, likely explains the lethal phenotype observed in *Drosophila*. Since the AD3 locus is a highly conserved feature in most C2 domains, our conclusions about the dynamic control of Ca²⁺ binding in C2 domains likely apply to other C2 domains that bind calcium ion.

8. Bacterial expression of the human oxidoreductase, pyroxd1: a new described cause of early onset myopathy in humans

Victoria Phan, Isaac Scott, Karen Karimi, Mark Stephens, R. Bryan Sutton

Mutations in the oxidoreductase, PYROXD1, have been linked to a newly described, early-onset recessive myopathy from five families with four different recessive variants. This new myopathy contains histopathology that is distinctive in that it combines multiple pathological hallmarks characteristic of different myopathies; central and minicore disease, centronuclear, myofibrillar and nemaline myopathies. Patients present in infancy of childhood with slowly-progressive proximal and distal weakness, facial weakness, nasal speech, swallowing difficulties, and mild to moderately elevated serum Creatine Kinase (CK) levels. The link between the mutations in the PyroxD1 gene and the disease phenotype are not understood. The 3D structure of PyroxD1 could be similar to other closely related oxidoreductases. This project involves expression, purification and crystallization of PyroxD1 for eventual characterization by X-ray diffraction. Prior to crystallization, preliminary characterization will involve spectroscopic and enzymatic analysis to determine the co-factors used by this enzyme, and eventual structure determination by X-ray crystallography. Understanding the co-factors and biophysical characteristic of this protein could help in developing new treatments in the future for this form of myopathy.

9. Importance of interprofessional collaboration abroad

Lisa Popp, William Sessions, Kayle Stevenson, Adham Shoujaa

The purpose of this project was to focus on the importance of Interprofessional team coordination abroad. We identified how students interact in this environment and how to improve Interprofessional collaboration in similar situations. In this study, students from multiple healthcare professional fields participated in a global health trip to Jinotega, Nicaragua. Students worked together to provide healthcare to a large, under-represented rural patient population. On a global health trip, a cohesive Interprofessional team, which combines a diverse background of knowledge and skills, is essential in providing well-rounded and optimized healthcare to the target population. Students participating in global health experiences are challenged to think differently and work together in order to develop innovative solutions to clinical problems. The experience gained by students on these trips allows them a live scenario to practice Interprofessional Educational (IPE) skills and learning. In order to assess the level of competency gained by these students, several steps were taken, including a pre- and post-trip Interprofessional Competency Questionnaire. When looking at the questions asked to these participants, three factors were considered: ability to work within an interprofessional team, perceived value of working with an interprofessional team, and comfort with working within an interprofessional team. These questionnaires were completed voluntarily. To ensure a cohesive interprofessional experience, we jointly defined roles and responsibilities, communicating on a regular basis, and performing iterative assessments and corrections to our approach. We researched and prepared for cultural differences prior to our trip to adjust our approach as necessary. When comparing the Interprofessional Competency Questionnaire data prior to the trip to the data of the same cohort after the trip, we expected to find a perceived improvement in interprofessional competency, which we did find with a significant increase in perceived ability and comfort for working within an interprofessional cohort.

10. Using and assessing ultrasound to teach physical examination and diagnosis: a self-directed learning activity in the family medicine accelerated track

Haley Banks, Dwight Bellingham, Dominique Foster, Dwight Johnson, Bradon Loya, Luis J. Ruiz, Rachel Wai, Kelsey Walker, Mikaela Wallace, Vaughan Lee, David S. Edwards, Jennifer Mitchell, Betsy Goebel Jones

Purpose: Our institution is currently implementing and assessing a 3-year accelerated medical school curriculum that culminates in the MD degree and prepares students for a standard 3-year family medicine residency. This program, which has graduated four classes of students and has another three classes in training, incorporates extensive use of ultrasound in training students for physical examination and diagnosis. While ultrasound has become increasingly common in medical education settings as a tool to enhance the teaching of anatomy and as a skill to enhance physical examination and diagnosis, assessment of ultrasound has been slower to emerge. The purpose of this initiative is to assess 1) whether students develop proficiency in the use of ultrasound equipment; 2) whether students can locate anatomical structures and use ultrasound appropriately in clinical settings or simulations; and 3) whether ultrasound is effective relative to other teaching modalities.

Methods: During the FMAT1 course in the summer of 2016, students in the FMAT Class of 2018 studied outcomes from educational activities that employ the use of ultrasound in physical examination and diagnosis. During the Musculoskeletal Week, students measured their own baseline knowledge and skills and participated in follow-up assessment of the use of ultrasound to locate structures and assist with examination and diagnosis.

Results: Concentrated use of ultrasound within the MSK week resulted in marked growth in student confidence about how to use devices, select probes, and manipulate images as well as to locate structures. From baseline to follow-up, on a test of knowledge, students demonstrated improved understanding of ultrasound imaging and use. From baseline to follow-up, on a practical exam, students demonstrated improved use of ultrasound devices and probes, imaging, and identification of structures.

Conclusions: An intensive experience such as FMAT1 offers an ideal opportunity to integrate and measure skills development with ultrasound imaging.

11. The long-term effectiveness of online learning modules for the study of anatomy

Ben Aziz, Vaughan Lee

Education has been evolving in the past decade to accommodate the application of electronic devices. With the use of newer advances in technology in their personal lives, students anticipate the implementation of these same forms of media in their studies. Shorter videos that convey broad understanding have become the standard from Kaplan, USMLE Rx, and Pathoma. This project aims to further establish the effectiveness, and student satisfaction of course-specific online learning modules for an entire medical school block at Texas Tech University Health Sciences Center School of Medicine (TTUHSCSOM). Interactive online modules were developed using Adobe Captivate 8™, which included interactive images, captions, and questions. The modules covered every lecture and laboratory component throughout the anatomy block in the 1st year medical school curriculum and were limited to no more than 15 minutes per module. The quality of the modules was measured by comparing exam scores for the class of 2020 to the class of 2016 (years with similar course structure). A post-block survey was also used to determine the usefulness of the modules via Likert scale. Upon comparing the exam grades between the class of 2016 and the class of 2020, there was no significant difference between the two. Results from the post-block survey completed by 53 students were overwhelmingly positive in total. There were some statistical differences between groups in categories involved with perceived level of difficulty, purpose, understanding, and how likely they would recommend these modules. We concluded that the interactive modules were a significantly beneficial study resource for the students during anatomy. The perceived value of the modules was very high, although that didn't reflect in the grades compared to the class of 2016. In response to the positive feedback, modules are being created for the second block in the medical school curriculum at TTUHSC.

12. Over-expression and longevity: too much of a good thing

Breanna Bates, Jessica Smith, Arsheen Rajan, Hui Hua, Brandt Schneider

Aging is an intricate, multifaceted process. Yeast is an ideal model for aging as many pathways are conserved between humans and yeast. The majority of our knowledge of the yeast genome and protein interactions comes from loss-of-function studies. Research has shown that manipulation of genes involved with the cell cycle can increase lifespan. Our lab has discovered that lifespan can correlate with cell size, which we use as a marker for vitality. Smaller cells often live longer and vice versa. Sir2, a histone deacetylase associated with longevity, was first discovered in yeast. Increased expression of Sir2 decreases cell size and increases lifespan while deletions increase cell size and decrease lifespan. Overall few studies have tested the effect of over-expression of genes on lifespan. Specifically, we have examined the impact of over-expression a select group of cell cycle control genes on both cell size and lifespan. We hypothesize that over-expression of longevity mutants will increase cell size and decrease lifespan. To test this, we amplified and ligated select target genes into a plasmid at a site behind a strong promoter and transformed them into yeast. Subsequently, cell size, proliferation rate, and replicative lifespan were measured in transformed strains. Our results suggest that longevity results from the fine-tuned modulation of the cell cycle. Several key cell cycle modulators were tested (e.g., Clns, a G1-cyclin, Whi5, a G1-cyclin transcription repressor, and Clb5, an S-cyclin). Our results suggest that proper regulation of cell cycle gene expression can have a profound impact on cellular lifespan.

13. Evaluation of the patient-centered medical home in a family medicine setting in Lubbock, Texas

Taylor H. Lindgren, David Trotter, Yan Zhang, Ron Cook

The Patient-Centered Medical Home (PCMH) healthcare model focuses on improving the patient population health, enhancing the patient care experience, and controlling the healthcare cost. This study aimed to assess whether PCMH implementation at the Texas Tech Physicians of Lubbock Family Medicine clinic (TTPFMC) improved some aspects of clinical practice and hence patient satisfaction and quality improvement. This clinic launched its PCMH model in July 2014 and included a point provider system, expansion of nurse responsibilities in preventive care, a new care planning process, and a primary care physician loop closure process. A Press Ganey patient satisfaction survey was used to assess six different clinical practice aspects: overall, access, Moving Through Your Visit, nurse/assistant, care provider (CP), and personal issues. The scores are reported on a 0 (very poor) to 100 (very good) scale. A score of 75 and above indicates that patients rated services as good or better. The satisfaction scores of aggregated monthly survey data from May 2013 to May 2016 were obtained and analyzed. Changes in the mean patient satisfaction scores of the six aspects before and after PCMH implementation were assessed. In general, patients were satisfied in all six aspects with scores above 80. Four aspects showed increased patient satisfaction: overall (pre-score 88.6, post-score 91.1, change 2.9%), access to care (pre-score 82.3, post-score 85.6, change 4.0%), care provider (CP) (pre-score 92.9, post-score 96.0, change 3.3%), and personal issues (pre-score 93.3, post-score 95.3, change 2.2%). Although with small magnitude, these results suggest that the PCMH model at the TTPFMC had a positive impact on some aspects of clinical practices as indicated by greater patient satisfaction. Additional research is needed to explore reasons that contribute to lower Press Ganey patient satisfaction scores.

14. Differential expression of microRNAs in the skeletal muscles of mice with aging

Justin Williams, Flint Smith, Subodh Kumar, Murali Vijayan, P Hemachandra Reddy

The purpose of our research is to identify peripheral biomarkers for aging and cellular senescence. Aging processes in many species are regulated by the expression of microRNAs (miRNAs). MicroRNAs are 18-25 nucleotides long, single-stranded RNA molecules that regulate gene expression. Skeletal muscles are key reservoirs of amino acids that maintain protein synthesis, and the loss of muscle mass is considered to be a key determinant of loss of strength in aging. As one of the systems impacted by aging the most, the skeletal muscle system has been heavily researched. However, underlying mechanisms of miRNA regulation in aging are not completely understood. To understand the regulation of miRNA in aging, we measured miRNA levels in the skeletal muscles of 2-, 6-, 12- and 24-month-old of C57BL/6 mice. We studied the following miRNAs: mmu-miR-17-5P, mmu-miR-22a-3P, mmu-miR-29a-3P, mmu-miR-133a-3P, mmu-miR-181a-5P, and 101a-3P. These miRNAs were selected based upon their previous identification as modulators of proliferative and senescent processes. In our preliminary study, we measured miRNA levels in the skeletal muscles of 6-month-old and 12-month-old mice. RNA was extracted from skeletal muscles, and miRNA expression levels were measured using quantitative real-time RT-PCR. MiR-17-5P was found to be significantly upregulated in skeletal muscles of 12-month-old mice relative to skeletal muscles of 6-month-old mice. MiR-29a-3P was found to be significantly upregulated in skeletal muscles of 12-months group compared to 6-month-old skeletal muscles. Expression levels of MiR-22a-3P and miR-101a-3P were found to be upregulated in 12-month-old mice, but not significantly. We will continue our miRNA studies of skeletal muscles from 2- and 24-month-old mice and critically assess the miRNA levels of skeletal muscles among 6-, 12- and 24-month-old mice relative to the skeletal muscles of 2-month-old mice. The outcome of our time-course miRNA levels will provide new insights about aging process.

15. Upregulation of microRNAs in the brains of mice with aging

Flint Smith, Justin Williams, Subodh Kumar, Murali Vijayan, P Hemachandra Reddy

The overall objective of our study is to identify microRNAs (miRNAs) as peripheral biomarkers in brain aging. Aging is one of the few truly universal phenomena we experience as human beings. As such, the understanding of the brain aging is of paramount importance. MicroRNAs are small, highly conserved non-coding RNA molecules involved in the regulation of gene expression. MicroRNAs have been identified as candidates that regulate aging process in all species. However, regulation of miRNAs in aging process, particularly in the brains is not completely understood. In the current study, we sought to determine miRNA levels in different ages, 2-, 6-, 12- and 24 months in the brains of a well-studied mouse strain, C57BL/6. We considered the following 6 miRNAs: mmu-miR-17-5p, mmu-miR-22a-3p, mmu-miR-29a-3p, mmu-miR-133a-3p, mmu-miR-181a-5p, and 101a-3p because these miRNAs are reported to involve in the processes of brain aging, cellular senescence and cell proliferation. In our preliminary study, we investigated miRNAs levels in the brains of 6- and 12-month-old C57BL/6 mice using real-time RT-PCR analysis. The levels of miR-29a-3p, miR22a-3p, miR133a-3p and miR-17-5p were found to be significantly increased in 12-month-old mice relative to 6-month-old mice. Expressions of miR-101a-3p and miR-181a-5p were also increased in 12-month-old mice relative to 6-month-old mice, but not significant. We will continue our miRNA studies of brain in 2- and 24-month-old mice and critically assess the miRNA levels in the brains of 6-, 12- and 24-month-old mice relative to 2-month-old mice. The outcome of our time-course miRNA levels will provide new insights about brain aging. The outcome of our study may have implications to age-related neurodegenerative diseases.

16. Histone deacetylase inhibitors suppress StAR, aromatase, and steroid biosynthesis in human adrenocarcinoma cells: indication of StAR acetylation

Ahsen U. Ahmed, Pulak R. Manna, Kevin Pruitt

Steroid hormones are critical in many important physiological processes. The rate-limiting and regulated step in steroid biosynthesis is the transport of the substrate of all steroid hormones, cholesterol, from the outer to the inner mitochondrial membrane, a process that is predominantly mediated by the steroidogenic acute regulatory protein (StAR). At the mitochondria, cytochrome P450_{scc} cleaves the cholesterol side-chain to form pregnenolone, which is then converted to various steroid hormones, including androgens and estrogens, by tissue-specific enzymes. Inappropriate regulation of steroid synthesis has been implicated in the pathogenesis and progression of numerous hormone sensitive cancers, including breast cancer, the most common women's malignancy, which is triggered by estrogen. Aromatase is the key enzyme in the biosynthesis of estrogens from androgens, and it is overexpressed in the majority of breast cancer tumors. Of note, epigenetic enzymes (histone deacetylases; HDACs) are frequently altered and dysregulated in human cancers. HDAC inhibitors, widely used as anti-cancer drugs, result in the acetylation of numerous histone and non-histone substrates. To gain more insight into these events, a human H295R adrenal corticocarcinoma cell line, expressing considerably both StAR and aromatase, was chosen as an experimental model. Treatment of H295R cells with different classes of HDAC inhibitors, including the FDA approved vorinostat and panobinostat, resulted in reduced StAR mRNA, StAR protein, aromatase mRNA, and aromatase protein levels, concomitant with progesterone synthesis, when compared with their respective basal values. Further studies demonstrated that StAR is endogenously acetylated in H295R cells and treatment with panobinostat showed induction of acetylated StAR, but not total StAR, in a time dependent manner. These results provide evidence, for the first time, that StAR is acetylated, and HDAC inhibitors affect StAR and steroid levels, in H295R adrenocarcinoma cells, and that StAR could be a novel target in the treatment and prevention of hormone responsive cancers.

17. The role of dishevelled at the i.1 aromatase promoter in mcf-7 breast cancer cells

Jena Deitrick, Meghan Den-Bakker, Kevin Pruitt

Wnt signaling is critically important for cancer initiation and progression, and the Wnt/Dishevelled/beta-catenin pathway is necessary for many hallmarks of tumors, such as maintenance of the dedifferentiated state, cancer cell self-renewal, and epigenetic silencing of tumor suppressor genes. However, the mechanism behind Wnt's role in malignancies remains unclear. One hypothesis suggests that, in breast cancer and other malignancies, members of the Wnt signaling pathway influence the transcription of aromatase, an enzyme required for estrogen synthesis and a critical target of current breast cancer therapy in post-menopausal women. Previous reports have demonstrated that in primary breast cancers, Dvl-1, a scaffolding protein in the Wnt signaling pathway, is over expressed due to epigenetic silencing of inhibitors. Other notable reports showed that beta-catenin, an important binding partner of Dvl, binds a specific promoter of the aromatase gene and regulates its expression. Given this, we reasoned that Dvl proteins might also be key regulators of aromatase transcription. Our primary goal was to determine the role of Dvl as a molecular scaffold on specific aromatase promoters and determine whether it acts as a regulator of aromatase transcription. To accomplish this chromatin immunoprecipitation (ChIP) assays were performed along with reverse transcription polymerase chain reactions (RT-PCR). We first determined which regions of the aromatase promoter Dvl binds. Then, we investigated whether SIRT1 pharmacological inhibition or Wnt inhibition alters Dvl binding to aromatase promoters and how this affects transcription of aromatase. Lastly, we investigated whether Dvl is also present at the aromatase promoter in non-malignant breast cells. This is the first time Dvl, a key mediator of the Wnt oncogenic signaling pathway, has been linked with transcriptional regulation of aromatase at the I.1 promoter.

18. SIRT1: target genes and wnt pathway regulation in triple negative breast cancers

Brian Zhu, Deborah Molehin, Kevin Pruitt

Past studies have shown that the Wnt/B-catenin pathway is a key driver for the progression of triple negative breast cancers (TNBCs). The Sirt1 histone deacetylase has been shown to play a key role in the regulation of the Wnt/B-catenin pathway, upregulating components of the pathway and promoting constitutive Wnt signaling in triple negative breast cancers. Thus, inhibiting Sirt1 in TNBCs may suppress the Wnt pathway, providing a way to limit the proliferation and metastasis of TNBCs. Preliminary experiments confirm the nuclear localization of Sirt1 in triple-negative MDA-MB231 cells. A comparison of breast cancer cell lines also seem to support the idea the TNBCs express higher levels of Wnt pathway components than do non-triple-negative breast cancers. Immunofluorescence experiments show a decrease in cytoplasmic beta-catenin with treatment of a Sirt1-specific inhibitor, though results were ambiguous for DVL1. In untreated cells, DVL1 was seen concentrated in the nucleus while beta-catenin was extensively distributed in both the nucleus and cytoplasm. RTPCR experiments demonstrated an increase in DVL2 and DVL3 transcript levels with Sirt1 inhibition. RTPCR screenings for suspected Sirt1-regulated genes suggested that FOXO4 transcript levels increased with Sirt1 inhibition, while MTAP transcript levels decreased with Sirt1 inhibition.

19. Adoptive transfer of allogeneic splenocytes into lymphopenic recipients induces acute graft vs. host disease in mice: a feasibility study

John Kelley, Kevin Bass, Kathryn Furr, Cynthia Reinoso Webb, Matthew B. Grisham

Acute graft vs. host disease is a common, multi-organ inflammatory complication in patients undergoing bone marrow transplantation to treat certain tumors or intractable autoimmune diseases. Mouse models of aGVHD require tedious and time-consuming protocols to obtain sufficient numbers of donor bone marrow cells for intravenous injection into MHC mismatched recipients. Thus, the objective of this feasibility study was to develop a simplified and more time-efficient mouse model of aGVHD. In order to induce aGVHD, 10, 20 or 30 million unfractionated splenocytes obtained from female Balbc mice were injected into lymphopenic C57Bl/6 recombinase activating gene-1 deficient female recipients. Because natural killer cells are present in RAG-1 mice and have been shown to destroy allogeneic immune cells, NK cells were depleted in the RAG-1 recipients by sub-lethal irradiation, 7 Gy. This protocol has been shown to reduce NK cells by greater than 80%. Control mice were generated via the adoptive transfer of 30 million allogeneic splenocytes into C.57Bl/6 RAG-1 recipients that did not receive irradiation. Clinical signs of disease were assessed daily during the 2 week observations period using an established scoring system that quantified weight loss, stool consistency, occult blood and appearance/behavior. We observed that adoptive transfer of 30 million allogeneic splenocytes accelerated the onset but not the overall severity of disease when compared to mice that received 1 or 2 million splenocytes. Loss of body weight, occult blood and alterations in activity/behavior were the major contributors to the overall disease scores. Little or no disease was observed in mice within the control group. We conclude that this relative simple and more time-efficient model can be used to define the immuno-pathologic mechanisms responsible for aGVHD as well as assess the therapeutic efficacy of new drug therapies.

20. Triage classification disparities in U.S. pediatric emergency department admissions, 2005-2011

Cheyene Bownds, Jeff Dennis

Some research suggests that triage for less critical presenting symptoms may be influenced by perceived stigma of patients' reasons for seeking care in the emergency department. This study explores disparities in triage classification of pediatric emergency department admissions in the United States using seven years of data from the National Hospital Ambulatory Medical Care Survey, 2005-2011 (N 59,356). The study sample is restricted to pediatric patients, with the aim of reducing potential bias or stigma relating to perceived criminality or medication seeking behaviors. Triage classifications range from 1 to 5, with 1 being the most urgent. Triage analysis is limited in scope of covariates given the fact that the triage score is based on presenting symptoms. The analysis sample was limited to the largest presenting symptom subgroup, which was those presenting with fever. Individuals with additional presenting symptoms were excluded. Among pediatric patients presenting with a fever greater than or equal to 101, Hispanic and African American patients were about 35-45% less likely to receive a triage score of 1-3 versus 4 or 5 compared to white patients. Approximately 75% of individuals presenting with symptoms of fever were given a score of 3 or 4, and findings remain consistent when analysis is limited to these individuals. Supplementary analysis suggests that this disparity is found primarily in patients 2 years of age or older. These findings indicate that certain biases may exist in the triage process, and additional research is needed to better understand what mechanisms drive these disparities.

21. Social disparities in pediatric pain management in United States emergency department admissions, 2005-2011

Camille Forbes, Jeff Dennis

Pain management in the emergency department is a widely criticized and polarizing subject. Patients reasonably expect to be treated fairly and made as comfortable as possible, while physicians must consider the possibilities of opioid dependence or death that can result from unnecessary narcotic prescriptions. Because of a widely publicized article on disparities in pain management in an African American adult population, we further explored this issue in a pediatric population. Past research is conflicting, where one study found no racial disparities in opioid analgesic among pediatric long bone fractures, another found African American pediatric patients to be less likely to receive an opioid analgesic for appendicitis than their NH White counterparts. We discovered issues of data quality in this line of inquiry, and a lack of analysis for additional conditions. Our study explores disparities in pain medications given to pediatric emergency department admissions in the United States using six years of data from the National Hospital Ambulatory Medical Care Survey, 2005-2011 (sample size: 59,356). Outcome variables examined include appendicitis, bone fractures, and lacerations. The seven year data span did not produce enough pediatric appendicitis cases for sound statistical measurement. No racial differences were found in fracture, or the smaller subsample of long bone fracture, although patients in the U.S. South were about 2 times more likely to receive opioids for fracture than those in the Northeast. Hispanic patients were more likely to receive opioid analgesic for laceration than whites, whereas the bivariate disparity between African American and white patients was explained statistically by insurance status. The results suggest that racial disparities in pediatric emergency department analgesics are not widespread, although the mixed findings suggest that some disparities may still exist. Sample size issues remain for rarer conditions, but additional research is needed to understand potential explanatory factors in these disparities.

22. Birth outcomes in Native American populations

Chelsea Potter, Jeff Dennis

Birth weight outliers, such as low birth weight and high birth weight, are associated with poor birth outcomes, and have potentially long lasting health and developmental implications for children. This project examines birth outcomes among Native American (NA) mothers in comparison to both white and black mothers. Past research has focused primarily on understanding white and African American mothers, although high rates of socioeconomic disadvantage and high prevalence of Type II diabetes in NA populations suggest that potential health and birth outcome risks need to be explored within this population in greater detail. This study uses the U.S. Birth Data File, a population data set of all births in the U.S. each year. Cases from the years 2000-2004 are aggregated to obtain an adequate analysis sample of NA mothers, a relatively small ethnic group in the population. Birth weights are categorized using established cutoffs - low birth weight (LBW) less than 2500g, normal birth weight (NBW) 2500g-4000g, and high birth weight (HBW) greater than 4000g. Results suggest NA births have higher rates of infant mortality at both normal and high birth weights than whites and African Americans. Further, among both diabetic and non-diabetic mothers, NA births are more likely to be HBW than white and African Americans. Birth outcome disparity research has primarily focused on African American mothers, a group with substantially higher LBW and infant mortality than other racial/ethnic groups. However, this study suggests that the relatively low LBW prevalence among NA mothers may mask potential health risks in this population. As such, LBW may not be a good marker of birth outcome risk in the NA population, and other outcomes should be used to understand health risks in this population at normal and high birth weights.

23. Vitamin D levels and UACR by race and diabetic status

Aaron Kruger, Jeff Dennis

In recent years, the role of vitamin D in metabolic functions beyond bone mineralization has been increasingly studied, and lower levels of vitamin D have been associated with morbidities like diabetes, hyperparathyroidism, and albuminuria. Understanding the link between Vitamin D deficiency and albuminuria, especially among at-risk populations like diabetics, has the potential to improve supplementation guidelines and diabetic well-being. The objective of this study is to determine how vitamin D levels are associated with urine albumin-to-creatinine ratio (UACR) levels by race/ethnicity in diabetic and non-diabetic patients. Data were taken from the National Health and Nutrition Examination Study (NHANES), including the years 2001-2010. Data are cross-sectional, collected in two year blocks. Analyses are weighted to account for complex survey design, and thus to approximate representativeness of the U.S. population. Albumin/Creatinine ratio is calculated using albumin (ug/mL) and creatinine (mg/dL) values provided in NHANES, with elevated UACR. Creatinine values between 2001-2006 were adjusted according guidelines recommended by NCHS. Vitamin D is provided in the data as a continuous measure (25(OH) D), but for analysis is categorized into cutoffs for deficient (below 20 ng/mL), insufficient (20-30 ng/mL), and sufficient (above 30 ng/mL). Analyses examine whether Vitamin D deficiency compounds differences in albuminuria for individuals with diabetes, exploring whether disparities are more pronounced in any racial/ethnic or age group. Controlling for diabetic status, Vitamin D deficiency and race/ethnicity are associated with elevated UACR. Interaction effects do not suggest disproportionate effects of Vitamin D by racial group, despite substantially higher Vitamin D deficiency in African American and Mexican American respondents. Additional research should examine factors associated with elevated UACR in African American and Mexican American populations.

24. Role of microRNAs in postpartum cardiomyopathy: a systematic review

Arpana Bansal, Nandini Nair

Purpose: Peripartum cardiomyopathy (PPCM) causes considerable morbidity and mortality in young women during their reproductive years. The presentation is usually in the month preceding delivery up to 5 weeks post-partum. It is a diagnosis of exclusion based on its coexistence with the later stages of pregnancy with no other identifiable cause. PPCM has been considered non-familial in many cases though its genetic basis is beginning to be uncovered with mutations in the titin gene and other genetic variants noted in some patients. Additionally race dependent variations and immunological changes exist in the pathogenesis of PPCM. This review will address some of the new developments at the molecular level in diagnosis and treatment of PPCM involving micro RNAs.

Results: Review of literature demonstrates the following - Reactive oxygen species (ROS) increases through gestation reverting to normal levels in the post-partum period. In the process the total anti-oxidant capacity also increases during pregnancy and continues to be elevated post-partum. This process appears to be disrupted in PPCM. Studies in a mouse model system with Stat3 deletion revealed a link between oxidative stress and prolactin. The increase in reactive oxygen species (ROS) in this murine model was associated with cleavage of the hormone prolactin (PRL) by ROS-activated Cathepsin D resulting in increased expression/activity of cathepsin D associated with the generation of a cleaved antiangiogenic and proapoptotic 16 kDa form of prolactin. At the molecular level the micro RNA mir146-a has been implicated in the regulation of the prolactin signaling pathway.

Conclusion: The identification of the role of mir-146a in the pathophysiology of PPCM could lead to a better definition of therapy for PPCM.

25. Digit ratios 2D:4D in physicians with or without routine operating room exposure

Joon S. Choi, Jeff A. Dennis, Alan N. Peiris

Inspection of the hands is a time-honored assessment which aids in the clinical diagnosis of several diseases. Turner's syndrome can be associated with short 4th metacarpals. High fetal testosterone exposure has been associated with a lower second to fourth digit length ratio 2D:4D. Lower 2D:4D ratio has also been correlated with better visuospatial awareness and motor skills. These skills may determine a physician's choice of specialty. No studies to our knowledge have included physicians when examining the 2D:4D ratio and factored in both the gender and procedural versus non-procedural medical specialties. We postulated that physicians having operating room exposure will have greater manual dexterity and as such have shorter 2D:4D ratios. We studied 114 right hand dominant physicians, and compared the 2D:4D ratios in both hands in physicians with specialties involving regular operating room exposure to physicians without such specialties. Male physicians had significantly lower 2D:4D ratios than female physicians. Residents with regular operating room exposure had significantly shorter 2D:4D ratios in their left hands than residents without such exposure. Physicians with regular operating room exposure had a trend to shorter 2D:4D ratios in their left hands than physicians without such operating room exposure. Adjusting for gender did not alter the relationship between operating room exposure and 2D:4D ratios. The lower 2D:4D ratios may reflect manual dexterity and other characteristics more prevalent in procedural specialties. If these preliminary findings are confirmed in larger populations, the 2D:4D ratio may prove a valuable adjunctive tool for health professionals considering career choices.

26. Connecting periodontal and coronary artery disease via the inflammatory state of the body

Niki Parikh, Chris Massey, Scott Shurmur

Cardiovascular disease is one of the leading causes of death in the United States and the world. Many interventions relating to prevention have been emphasized as more risk factors for this devastating disease are discovered. Periodontal disease is known to have a close association with cardiovascular disease, but its role as a risk factor is still not well understood. Inflammation is a driving force in both of these diseases, creating a potential bridge between the two. Specifically, periodontal disease can cause an inflammatory reaction in the body, which may predispose or even directly contribute to atheroma formation in the coronary arteries. In this study, we investigate the link between the inflammatory state of the body and correlate it with levels of coronary artery disease and periodontal disease. Inflammatory markers such as myeloperoxidase, erythrocyte sedimentation rate (ESR) and immunoglobulin G (IgG) levels in the patient's blood will be analyzed and correlated to clinical attachment loss. A definitive link between these disease processes will allow preventive measures to be taken earlier to prevent this lifelong disease.

27. Now you see it, now you don't: a case of spontaneous regression of hepatocellular carcinoma

Sean Kow, Catherine Jones

We report a case of spontaneous regression of hepatocellular carcinoma. A 45 year old male with history of obesity, hypertension, psoriasis, stroke, and congestive heart failure initially presented to the ER with three day history of increasing weakness in his left upper and left lower extremities. Laboratory testing revealed high total bilirubin of 2.3 mg/dL, alanine aminotransferase of 170 IU/L, and aspartate aminotransferase of 143 IU/L. An abdomen ultrasound revealed hepatomegaly and an echogenic mass measuring 4.5 cm x 2.8 cm x 3.7 cm at the posterior segment of the right lobe of the liver with small blood vessels. Computed tomography scan and needle guided biopsy confirmed the diagnosis of hepatocellular carcinoma. The patient did not wish for surgery or chemotherapy, and preferred supportive care. After a year, computed tomography scans reveals multiple lung metastases and multiple lesions in the liver, with the largest lesion in the liver measured 8.4 cm x 7.5 cm. Due to the size of the liver lesion and presence of metastatic disease the patient was deemed inoperable. He again refused further treatment with systemic or other local therapies. Continued monitoring over four years revealed clear lung bases and fatty changes in the liver with no lesions. The patient is still living.

28. Characteristics of patients with chronic obstructive pulmonary disease who are readmitted within 30 days following an acute exacerbation

Austin Castillo, Hawa Edriss, Kavitha Selvan, Kenneth Nugent

Background: The Hospital Readmissions Reduction Program targets Medicare patients with chronic obstructive pulmonary disease (COPD) and penalizes hospitals that have increased 30-day readmission rates for these patients. The main goals of this study were to determine the clinical explanations for readmissions within 30 days, to identify possible deficiencies in patient care, and to identify typical characteristics of patients who were readmitted to the hospital.

Methods: The medical records department at University Medical Center in Lubbock, TX, generated a list of patients with a primary discharge diagnosis of exacerbation of COPD who were readmitted within 30 days of discharge. Data collected from the electronic medical records included demographic information, clinical information, laboratory data, and radiographic information for the index admission and readmission hospitalization. The indication for readmission was determined after review of all clinical data.

Results: The final study cohorts included 27 admission-readmission events for acute exacerbations of COPD (16 patients). Patients had significant comorbidity and frequent admissions during the 12 months prior to their index admissions. The patients had predominantly an emphysematous phenotype, and were discharged on sub-optimal medicine regimens. Referral to outpatient rehabilitation programs was also low.

Conclusions: Patients with acute exacerbations of COPD who require readmission within 30 days have complex comorbidity. They appear to have typical clinical profiles (emphysematous type COPD patients), are frequently discharged on suboptimal medication regimens, and are not referred to outpatient rehabilitation. These patients had frequent hospitalizations prior to index hospitalizations. This information provides the basis for a focused review of patients admitted to the hospital to identify factors that might contribute to readmission.

29. Complex Lisfranc fracture in a professional athlete

Matt Ferguson, Kevin West, **Chris Lee**

The tarsometatarsal joint in the foot is known as the Lisfranc joint. Its proper alignment is important anatomically in the transfer of body weight while walking or running. Simple Lisfranc fractures are somewhat common in high-level soccer, rugby, and American football athletes and have been shown to have little effect on career length or performance. Complex Lisfranc fractures, usually a result of severe trauma, are much rarer in professional athletes and the rehabilitation, return to professional competition, and effect on career length and earnings potential after this more severe type of injury is not well documented. This case describes the traumatic foot injury of a professional bull-rider and compares the rehabilitation and return to sport to the more common, but less severe variant of Lisfranc joint injury.

30. Local antibiotics reduce postoperative infections in total joint arthroplasty: a retrospective review of 765 cases

Craig Winkler, **Joel Dennison**, Adam Wooldridge, Eneko Larumbe, Cyrus Caroom, Mark Jenkins, George Brindley

Background: Prosthetic joint infections (PJI) occur at a rate of 1.3% to 5.6% and have significant accompanying morbidity. Local antibiotics have been used successfully in orthopedics, but have not been studied in total joint arthroplasty (TJA). Questions/purposes: We reviewed TJA cases over 4-years to determine: (1) Do local antibiotics reduce postoperative infection rates in TJA? (2) Do local antibiotics have any systemic side effects in TJA?

Methods: Starting January 1, 2014, our primary investigator administered 2 grams of vancomycin powder in the surgical wound for all total hip and knee arthroplasties. We reviewed cases from two years prior and after this date and recorded rates of wound infections. To test for any systemic effects, blood urea nitrogen and creatinine were recorded postoperatively. Patient's wounds were checked postoperatively for 6 months. Superficial wound infections (SWI) were defined as a patient being placed on PO antibiotics. Deep wound infection (DWI) were defined as a follow up surgery for debridement or explant of the prosthetic joint. The groups were broken down into patients who did and did not receive antibiotics and by type of surgery.

Results: Six months post operation, patients in the antibiotic group had a significantly lower likelihood of deep infection (OR: 0.40, 0.17-0.93). When separated by type of surgery, only the revision total hip arthroplasty (RTHA) group had a significant difference in deep infection rate (p: 0.047). There was a lower, but not significant (p: 0.057), infection rate for patients receiving antibiotics with total knee arthroplasty. There were no significant differences between groups in regards to superficial wound infections, BUN, and creatinine levels postoperatively.

Conclusion: Local antibiotics significantly reduced deep wound infections after RTHA. No systemic side effects were seen with local vancomycin administration. More data and studies are required to accurately assess the effectiveness of local antibiotics for the prevention of PJI.

31. Gender/ethnic differences in seeking healthcare plus time of recovery from procedures for shoulder/knee/ankle conditions

John Chappa, Anudeep Dasaraju, Ali Ashraf, Adam Wooldridge, Mimi Zumwalt

Although a paucity of studies exists in the American literature, previous papers in North America have demonstrated that females, despite exhibiting more severe pain in more locations on the body than males, tend to wait longer to seek help for musculoskeletal issues (1,4,6,9,13,14,15), and that an unconscious bias exists within physicians/surgeons in terms of recommending specialist referral and/or surgery for male versus female patients (2,3,5,8,10). The purpose of this study is to determine the amount of disparity between males and females as far as access to healthcare is concerned (in terms of how long it takes before seeking care), along with discerning the length of time it takes to recover from musculoskeletal injury/surgery, primarily involving shoulders, knees, and ankles.

32. Association between maternal caloric and vitamin d intake on neonatal birth measures

Nancy Beck, Surendra Varma, Bhaskari Burra, Joy Le, Hannah Pham, Quynh Pham, Tuongvy Dang

Background/Objectives: While adequate caloric intake is vital during the gestational period, there have been an increasing number of studies demonstrating the importance of maternal intake of micronutrients for fetal growth. Research has shown that a low maternal level of 25-hydroxyvitamin D can be correlated with adverse outcomes for the fetus, including impaired bone development, multiple sclerosis, and cancer. Many women and children in Vietnam were found to have vitamin D insufficiency or deficiency. This study investigates the association between maternal caloric and Vitamin D intake during pregnancy and neonatal size within the Vietnamese population.

Methods: 65 postpartum mothers were surveyed at Tu Du Hospital in Ho Chi Minh City, Vietnam. Interviewers collected demographic data, average daily caloric intake, Vitamin D rich food intake, and fortified milk intake over gestational period, based on retrospective self-report from study subjects. Neonatal weight, height and head circumference were documented from hospital records. Stata 13.1 was used for statistical analysis.

Results: Initial analysis showed correlation between Vitamin D rich food intake and head circumference. Correlation did not reach significance between Vitamin D rich food intake and birth length and weight. Results showed that overall, the neonates surveyed had a smaller head circumference average according to WHO standards. Currently awaiting additional statistical analyses.

Discussion/Conclusion: There are key differences between Vietnamese and American culture, including, but not limited to differing diets, attitudes on sun exposure, and general developmental status of the countries themselves. With the initial analysis, there were no significant correlations between Vitamin D rich food intake and birth weight and height. However, there are more demographic factors to be considered, along with their connection to Vitamin D rich food intake and birth measurement outcomes.

33. Evaluation of waist circumference: length ratio as a predictor of metabolic profile in newborns of mothers with and without obesity or gestational diabetes

Victoria S Wang, Daina Dreimane, Eneko Larumbe

Recent literature have proposed waist circumference: length ratio (WLR) as a better measure of visceral adiposity in infants than waist circumference or body mass index (BMI) alone. The objective of this study is to compare the WLR in newborns of mothers who are non-diabetic obese (O), gestational diabetic (GD), and healthy non-obese (N), to analyze relationships between other anthropometric measures in mother-newborn pairs, and to evaluate whether or not WLR in newborns can serve as a neonatal assessment tool for future risk of developing metabolic disorders. This is a retrospective study with data gathered from 1000 consecutive medical records of mother-newborn (full-term, i.e. 37-42 weeks) pairs born in the University Medical Center, Lubbock, TX between August 2015 and May 2016. After applying exclusion criteria, three study groups were formed based on the mother's metabolic profile: N group (BMI <30; n=410), O group (BMI ≥ 30; n=144), and GD group (n=43). Using the standard LMS parameters acquired elsewhere, we calculated gestational age-adjusted values for the following newborn measurements: WLR, Ponderal Index (PI), BMI, and Weight-to-Length Ratio (WtLR). No statistically significant differences were found between the N group and the other two groups in newborn WLR-for-age. On the other hand, the z-scores for newborn-PI, -BMI, and -WtLR all showed a trend of N < O < GD. Maternal obesity and gestational diabetes are known risk factors for type 2 diabetes and metabolic syndrome in their offspring. However, our study population revealed no apparent differences of WLR between infants with varying degrees of maternally-derived metabolic risks. Critical period of infant visceral fat development has been reported to occur in the first 3 months. Therefore, future studies are warranted to evaluate WLR within this critical period to determine if and at which time point WLR can be most usefully applied in the clinical setting.

34. Continuity of care in pediatric residency clinics

Lara Johnson, Erin Burton

Introduction: The ACGME Program Requirements for Graduate Medical Education in Pediatrics states Developing the skills, knowledge, and attitudes leading to proficiency in all the domains of clinical competency requires the resident physician to assume personal responsibility for the care of individual patients. The ACGME also states that a longitudinal experience between each resident and a core group of faculty must take place, with a minimum of 32 half-day sessions for PGY-1 and PGY-2, and ideally take place at the same site for the PGY-3 residents. This is accomplished through a continuity clinic setting. However, one of the challenges in providing this experiential learning opportunity is achieving the goal of real continuity for the patients with their designated resident. The requirement for residents to have continuity of care experiences is necessary across primary care training programs.

Objective: We conducted a systematic review of the literature regarding training program strategies for continuity of care experiences. *Methods:* We searched the literature using various combinations the following terms: continuity of care, continuity clinic, resident continuity clinic, intern and residency continuity clinic, discontinuity, resident scheduling, patient scheduling, and missed appointments. We utilized six databases. Two independent investigators reviewed each article to determine eligibility to inclusion in the study.

Results: We reviewed 253 articles. There are many different models used by institutions to accomplish this continuity clinic requirement, with varying factors such as scheduling of residents and patients, type and location of clinic, and protocol for patient hand offs that all play into the amount of continuity a patient will experience with a resident.

Conclusions: Achieving high levels of continuity of care in primary care training programs continues to be challenging. Innovative approaches may be helpful.

35. Trends in the evaluation and management of pediatric constipation in the emergency department: data from a national sample

Sneha Raju, Michael Foreman, Lara Johnson

Purpose: Constipation is a common pediatric complaint and cause of abdominal pain in the pediatric population. We sought to characterize the epidemiology of ED visits for constipation and to examine resource utilization for the diagnosis and management of constipation in the ED setting.

Methods: We utilized data from the 2005-2012 National Hospital Ambulatory Medical Care Survey, a nationally-representative sample of ED visits. We generated descriptive statistics regarding patient characteristics and resource utilization. We utilized chi-squared tests and considered separately the population of patients presenting with a chief complaint of constipation and those with diagnosis of constipation at the time of ED disposition.

Results: During the study period there were an estimated 202,000 ED visits each year with a chief complaint of constipation (0.65% of ED visits). For those patients presenting to the ED with abdominal pain (n 4,263), 8.8% (n 391) received a diagnosis of constipation. At the time of disposition from the ED, 1.2% of pediatric visits had a diagnosis of constipation providing a national estimate of 366,000 patients per year. Patients with a diagnosis of constipation had an average age of 6.1 years (SD 5.5) and were more likely to have received imaging than other ED patients (55.9% vs 32.4%, p less than 0.001) and more likely to have received a CT scan (10.4% vs 5.8%, p 0.005). However, among patients who presented with a complaint of constipation, imaging and CT use were not increased and the average age was 3.5 years (SD 5.0).

Conclusions: Constipation is a common pediatric complaint in the ED. Patients diagnosed with constipation were older and had more imaging utilization compared to those with patient-reported complaints of constipation. Future studies should explore the role of imaging in diagnosing constipation. Opportunities may exist for patient education in order to avoid ED visits for constipation.

36. Epidemiology of pediatric dermatologic conditions presenting to the Emergency Department

Tara Bonilla, Laura Johnson

Many pediatric dermatologic conditions are managed in an outpatient setting and may often represent mild, self-limiting illness. However, pediatric patients with some dermatologic conditions may present to the ED. Our aim was to describe the epidemiology of pediatric visits to the ED for complaints of dermatologic conditions. We explore the presentation, management, and disposition for the patient visits to the ED. We utilized data from the National Hospital Ambulatory Medical Care Survey from 2007-2012. This survey provides a nationally representative sample of ED visits. We generated descriptive statistics regarding demographic characteristics for patients presenting with dermatologic complaints. We included all patient visits with a chief complaint of a rash or similar concern. We compared resource utilization patterns for those with dermatologic complaints to the general ED population via bivariate tests. There were 200,039 ED visits included in the sample. Overall, 2.9% of ED visits had a dermatologic chief complaint providing a national estimate of 3.7 million ED visits annually. A higher proportion of pediatric patients presented with dermatologic concerns (4.4% vs 2.4%). For those pediatric visits, patients with dermatologic conditions were less likely to have any testing performed (22% vs 55%), less likely to have any procedures performed (17% vs 35%), and less likely to be admitted (1.9% vs 4.1%) compared to the general ED population. Study data are limited to those data elements included in the survey. In addition, detailed clinical information is not available for these ED visits. Dermatologic conditions are more common among pediatric patients presenting to the ED compared with adults. These complaints were the primary concern in 4% of visits, and were less likely to be associated with procedures, diagnostic testing or admission. There may be opportunities for avoiding some non-emergent visits through patient education or availability of other avenues of care.

37. Knowledge and attitudes of pediatrics and family medicine residents about HPV vaccines in an academic center in Lubbock, Texas

Khan M, Nur M, Babb F, Levent F

Objectives: To address and evaluate the knowledge, attitudes and beliefs of Pediatric and Family Medicine residents in training about human papillomavirus (HPV) vaccination at Texas Tech University Health Sciences Center (TTUHSC) in Lubbock, TX.

Background: This study will evaluate HPV literacy amongst Pediatric and Family Medicine residents in training who are supposed to provide knowledge and guidance for patients and parents in choosing to complete this potentially life-saving vaccine. This project aims to assist residents in creating educational tools for the general population to become more aware of the benefits and importance of the HPV vaccine. Also, we will address differences in knowledge and approaches in two different primary care residency programs in an academic center.

Methods: An anonymous survey was created using Google Forms which was e-mailed to Pediatrics and Family Medicine residents at TTUHSC. Inclusion criteria included being a Pediatrics or Family Medicine resident currently in training who is affiliated with TTUHSC. After the survey, results will be received and the answers for each question will be analyzed in a response-collecting spreadsheet.

Results/Analysis: The survey will remain open until approximately 20 responses are collected, from a population size of 57 residents. Results from each question will be analyzed in a response-collecting spreadsheet. Descriptive statistics will be used to summarize the attitudes, knowledge and beliefs about HPV vaccine amongst Pediatric and Family Medicine residents. The data will be further analyzed to see if there is any association of attitudes and beliefs to age, gender, and specialty.

Conclusions: Attitudes, knowledge and beliefs of the Pediatric and Family Medicine residents about HPV vaccine will be updated after completion of the surveys.

38. Failure to thrive due to discitis osteomyelitis

Christopher Neel, Roy Jacob, Fatma Levent

Discitis is an infection of the intervertebral discs which is uncommon, however, can progress to vertebral osteomyelitis and failure to thrive in children less than five years old; the most common etiology of which is *Staphylococcus aureus*. We report the case of a 16-month old male who presented with a two-month history of abdominal pain, decreased appetite and oral intake, irritability leading to failure to thrive. He had weight loss and stopped walking. Two abdominal ultrasounds and upper gastrointestinal series (UGI) with small bowel follow through were within normal limits except renal pelviectasis without evidence of urinary tract infection. Inflammation markers including erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) were elevated. An urgent magnetic resonance imaging (MRI) of the neuroaxis indicated loss of intervertebral disc space between T11 and T12 vertebra, abnormalities within the T11 and T12 vertebral bodies, and edema, which was consistent with a diagnosis of discitis and vertebral osteomyelitis. Patient was placed in a brace and surgery was not performed. Empiric antibiotic treatment began with parenteral vancomycin and ceftriaxone since bacterial etiology was suspected. Blood cultures remained negative, after which intravenous (IV) clindamycin was resumed at home per home health services. Upon initial administration of the antibiotics, CRP levels returned to normal, however, ESR was still elevated until one-month after diagnosis. After four weeks of IV antibiotic treatment, the patient returned to the clinic for follow-up with improved appetite, no pain, returning of the ability to walk with slight anemia. A subsequent MRI showed improvement of edema and inflammation. Discitis, with vertebral osteomyelitis may be an uncommon clinical occurrence in childhood, this infection should not be one that is overlooked. This case is presented for the purpose of awareness of discitis with vertebral osteomyelitis in a toddler with discussion of the subtle presentation, diagnosis, and treatment of this disease.

39. Perfusion of medial pre-frontal cortex with BDNF agonist decreases pain response in acute arthritis model

S Ismail, V Neugebauer

Brain-derived neurotrophic factor (BDNF) is a dynamic protein that has many neural functions including promoting neuron growth, preventing neuron death, and allowing the creation of long-term memories. BDNF binds to tyrosine receptor kinase B (trkB). BDNF synthesis and signaling are increased in dorsal root ganglion neurons and in the spinal dorsal horn in models of chronic pain, increasing the responsiveness of spinal neurons, a process termed 'central sensitization'. This has led to the search for BDNF receptor antagonists or blockers that can be used as non-opioid analgesics. In contrast, loss of BDNF action in the brain has been implicated in the development of alcoholism and Rett syndrome among other psychiatric disorders in humans. Conversely, overexpression of BDNF in the hippocampus has been shown to protect against post-stroke depression. Here, we will test the hypothesis that increasing BDNF in the medial prefrontal cortex of rats can reduce depression and anxiety in a pain model. Acute arthritis will be induced in rats as a persistent pain model. A cannula will be implanted stereotaxically in the medial prefrontal cortex for the application of either a BDNF agonist alone, or a BDNF agonist with a trkB antagonist, or artificial cerebrospinal fluid (ACSF, vehicle control) by microdialysis. Changes in emotional responses (vocalizations) and anxiety-like behaviors (elevated plus maze) will be measured. Comparison of test results between the ACSF and treatment groups will determine beneficial effects of BDNF, and comparison of test results between groups of rats receiving treatment with a trkB antagonist will confirm that any effects are specific and receptor mediated.

40. 5-HT2CR blockade in the amygdala conveys analgesic efficacy to SSRIs in a neuropathic pain rat model

TV Dang, G Ji, TA Green, V Neugebauer

Neuropathic pain is a serious chronic condition associated with negative affective states, anxiety, and depression. Current treatments, including selective serotonin reuptake inhibitors (SSRIs), have shown only variable efficacy. Our hypothesis is that serotonin 5-HT_{2C} receptor (5-HT_{2CR}) in the amygdala accounts for the limited effectiveness of serotonin. The amygdala plays a critical role in the emotional-affective dimension of pain. 5-HT_{2CR} is widely distributed in the human and rat brain, particularly in the basolateral amygdala (BLA). A Gq/11 protein-coupled receptor, 5-HT_{2CR} has been found in GABAergic, glutamatergic, and dopaminergic neurons. 5-HT_{2CR} in the amygdala has been associated with anxiogenic effects. Here we tested the hypothesis that 5-HT_{2CR} blockage in the BLA improves the efficacy of an SSRI (fluvoxamine) in reducing emotional-affective behaviors in a neuropathic pain rat model (spinal nerve ligation, SNL). Spinal reflex thresholds, supraspinally organized audible (nocifensive response) and ultrasonic (emotional-affective response) vocalizations, elevated plus maze and open field test (EPM and OFT, anxiety-like behaviors), and immobility in the forced swim test (depression-like behavior) were measured in male Sprague Dawley rats, 4 weeks after ligation of the left L5 spinal nerve (SNL model). Behaviors were compared in rats with and without stereotaxic viral vector (shRNA-AAV) injection into the BLA for local knockdown of 5-HT_{2CR}. The protocol was as follows. Hindlimb withdrawal thresholds and vocalizations were measured before and after administration of fluvoxamine (30 mg/kg, i.p.). Elevated plus maze, open field, and forced swim tests were performed the next day after another administration of fluvoxamine. Compared to untreated neuropathic rats, neuropathic rats with 5-HT_{2CR} knockdown demonstrated increased reflex thresholds, decreased vocalizations, increased open arm preference (EPM), and increased center duration and decreased number of entries into the center (OFT) after fluvoxamine. The results suggest that 5-HT_{2CR} knockdown can enhance the pain inhibiting effect of SSRIs.

41. Are patients at risk of Wernicke's encephalopathy being identified or adequately treated? A case report and review of the literature

Medhat Guirguis, Stephen Manning, Sailatha Bobba, Ajufu Ijeoma, Ram Aynampudi, Jafren Ahmed, Regina Baronia, **Joshua Chang**.

Wernicke's Encephalopathy is related to thiamine deficiency and is predominantly associated with alcoholics, but increasing evidence shows the strength of other correlated factors (malnutrition, GI surgery, recurrent vomiting, etc.), as well as an under-diagnosed rate of up to 90%. Current treatment guidelines in the U.S. may not be sufficient for at-risk patients, and there is limited exploration and consensus in the particular area. Our retrospective study reviewed charts of psychiatric patients admitted to the Behavioral Health Unit at CMC from January to June 2013, and included patients with at least one of the classic triad symptoms (ophthalmoplegia/nystagmus, AMS, ataxia). We then assessed the study population for a host of different variables that might put them at risk, the choice of variables determined via a literature review of other studies. Our data suggests a high degree of inadequate management and prophylaxis of patients at risk and meeting diagnostic criteria for Wernicke's encephalopathy. Our future goals would be to determine guidelines and practices across the U.S. and to address clinician education towards the early detection, management, and prevention of Wernicke's encephalopathy.

42. Depression is associated with lower American National Adult Reading Test scores among rural dwellers aged between 50 and 64 years in Texas: A Project FRONTIER Study

Brady Miller, Gordon Gong, Cathy Hudson

Background: Previous studies have shown that depression is associated with cognitive impairment and a lower IQ score. However, others have shown that there is no significant difference in the scores of the National Adult Reading Test (NART), a test for IQ, between those with vs. without depression. The current study is to examine whether depression is associated with the American version of NART (AMNART) in a rural cohort of West Texas.

Methods: Participants with IQ and AMNART tests were selected from Project FRONTIER, an ongoing epidemiology study of rural residents in three West Texas counties: Bailey, Cochran, and Parmer. All residents 40 years of age or older were eligible for participation. Recruitment for the Project FRONTIER study was based on a community-based participatory research (CBPR) approach, and included flyer distribution, mail-outs, door-to-door solicitation, community presentations, and community recruiters.

Results: Of the 1210 participants from Project FRONTIER, 488 had taken AMNART tests. Those with dementia and/or stroke (n: 41) were excluded and the remaining 447 subjects were studied. Student t-test and Wilcoxon Rank Sum test were performed. AMNART scores were significantly lower in those with depression (23.3 plus/minus 9.2) vs. those without depression (25.9 plus/minus 9.9) (p less than 0.01). Analysis by age group showed that AMNART scores were significantly lower in those with depression (22.0 plus/minus 10.1) compared with those without depression (26.2 plus/minus 10.2) in the group aged between 50 and 64 years (P equals 0.0322). Although AMNART scores were lower in those with depression than those without depression in the age group between 40 and 49 years (25.0 plus/minus 8.6 vs. 26.2 plus/minus 10.2) and in the age group of 65 years or older (23.6 plus/minus 8.2 vs. 25.6 plus/minus 9.5), they were not statistically significantly different (p greater than 0.05). IQ and AMNART scores were highly correlated with R2: 0.9697.

Conclusion: Depression is associated with lower AMNART scores in rural residents aged between 50 and 64 years in West Texas.

43. Factors and technique associated with a high rate of successful graft take with cultured epithelial autograft: a case series

Daniel Hwang, Jennifer Kesey, Sharmila Dissanaiké, John Griswold

A case series highlighting protocolized burn wound management with cultured epithelial autograft (CEA) therapy on three burn patients at a regional burn center from 2015 to 2016 follows. Factors and technique contributing to high graft take are also documented and discussed. All three male patients (A, B, C) had total body surface area of full thickness burns greater than 60% (62%, 74%, 70.5% respectively) with a revised Baux score of 116 on average. Final graft takes were 93%, 84%, and 100%, elucidating the significance of standardizing treatment using the CEA overlay. Length of stay ranged from 52-109 days with no deaths in the group. Discharge disposition was to inpatient rehabilitation for 2 patients and home with outpatient therapy for the third.

44. Impact of time spent in the trauma bay on mortality outcomes among level 1 trauma patients

Logan Adams, Amber Tucker, Jeff Dennis, Sharmila Dissanaiké

Introduction: The majority of trauma related deaths occur within the first 24 hours of injury, and time elapsed until intervention of an injury is one of the greatest causes of preventable death in mature trauma centers. This study seeks to determine if there is a correlation between time spent in the trauma bay and mortality outcomes.

Methods: A retrospective analysis of Level 1 trauma patients from January 1, 2010 to January 1, 2016.

Results: Charts from 1678 Level 1 trauma patients with 1290 (76.9%) blunt and 388 (23.1%) penetrating injuries were analyzed. Of these, 345 patients died and 237 (68.7%) died within the first 24 hours. Multivariate analysis yields an inverse correlation between increased times spent in the trauma bay and mortality, with controls for injury severity, age, and race/ethnicity and with deaths in the trauma bay excluded (p less than 0.001). Each additional minute spent in the trauma bay increases odds of surviving by 1%. However, increase in ISS and decrease in TRISS was directly correlated with reduced time in the trauma bay for both blunt and penetrating traumas. Results did not differ based on mechanism of injury or destination after the trauma bay.

Conclusion: Reduced time spent in trauma bay was not correlated with improved mortality outcomes in Level 1 trauma patients. Findings do not necessarily suggest increased trauma bay time would reduce mortality, but rather current evaluation procedures may prioritize trauma patients appropriately. Instinctive adjustment by emergency care providers to move more severely injured patients out of the trauma bay quicker and other additional variables could account for the measured phenomena. This is the first study to examine trauma bay times and mortality outcomes.

45. Developing a database for forensic analysis: impact of exposure time and water temperature on scald burns in human skin

Natalie Tully, Sharmila Dissanaiké

Determining the time of exposure to a given temperature of water is important in forensic determinations of the etiology of scalds, especially in deciding if an injury was intentional e.g. suspected child abuse. It is known that scald severity is related to water temperature and duration of exposure; however since minimal study has been done on fresh human skin, the ability to apply these findings to practice is limited. Available data lack precision and do not account for differences in age, or ethnicity. Given the high stakes of these determinations, we sought to improve the accuracy of available data tables. Patients undergoing elective removal of healthy skin (e.g. abdominoplasty) donated the removed tissue for this experiment. Immediately after surgical removal, skin was cut into 2cm x 2cm samples and was exposed to water baths of varying temperature for intervals starting at 1 second, and increasing in length by 1 second per trial until second and third degree burns were visualized. In the pilot study, skin was obtained from four women of Caucasian and Hispanic descent. As seen in Table 1, time to 2nd and 3rd degree burn decreased rapidly as water temperature increased. Differences in time to burn were noted at lower temperatures, with variability decreasing with increasing temperature. There is variability in time to scald in human skin at lower temperatures, which narrows with increasing water temperature. We are expanding this pilot study to a larger sample size in order to build a robust reference tool for use by the burn community.

46. The impact of pre-operative irreversible antithrombotis on outcomes of urgent/emergent laparoscopic appendectomy

David Michaels, Sharmila Dissanaiké

Background and Objective: The aim of this project was to investigate non-elective laparoscopic appendectomies to determine whether or not irreversible antithrombotic therapy adversely impacts the patient.

Methods: A retrospective chart review of all UMC patients undergoing non-elective appendectomy between 2010 and 2014 was reviewed. Information regarding preoperative IAT use was obtained and patients were placed into 2 groups: (A) those who presented on IAT and (B) those who did not. The chart was reviewed for outcomes including hospital length of stay (broken down into pre-op and post-op days), intraoperative estimated blood loss, transfusion (PRBC, FFP, platelets), SSI, deep space infection, complications, 30 day re-admission rates, and mortality. Analysis was performed to compare outcomes between the two arms.

Results and Discussion: 1289 patients were reviewed that underwent non-elective laparoscopic appendectomy between 1/1/2010 and 12/31/2014. Out of this pool, 80 patients met the inclusion criteria (half IAT, half control) and were included in the study for review. The data does indicate that there is a statistically significant increased risk of blood loss in patients that were on an IAT. The control group lost an average of 20.3cc of blood while the IAT group lost an average of 37.43cc (84% increase).

Conclusion: The difference in blood loss between the control and IAT, though statistically significant, is unlikely to be of concern to physicians performing this procedure because 37cc of blood is a very small amount that is unlikely to affect the safety or efficacy of the procedure. A key limitation of this study is the small sample size, which made multivariate analysis impossible. This analysis was part of a larger, multicenter study that will be able to perform a more powerful statistical analysis and answer more specific questions.

47. Surgical irrigation fluid containing Next Science, a novel antimicrobial agent, inhibits *Staphylococcus aureus* infection of surgical wounds

Ellie He, Pradeep Attaluri, Kayla Bounds, Jane Colmer-Hamood, Sharmila Dissanaiké, John Griswold, Matthew Myntti, Abdul Hamood

Surgical site infection (SSI) causes a significant burden on the health care system. In the U.S., approximately 500,000 SSIs occur annually. SSIs cause increased hospital lengths of stay and increased morbidity and mortality rates. Surgical irrigation, an integral part of the operative procedure, is designed to reduce the risk of SSIs. Normal saline is the most commonly used surgical irrigation fluid (SIF). SIFs are enhanced by different additives including antiseptics, surfactants, and antibiotics. However, recent studies suggested that antibiotics within the SIF may have an adverse effect, as a SIF containing bacitracin caused severe anaphylaxis. Therefore, it is important to identify other broad spectrum antimicrobials to be used as SIF additives. Next Science (NS), a novel broad spectrum antimicrobial agent, is such an agent. We recently demonstrated the effectiveness of NS in inhibiting wound infection by various bacterial pathogens. Using the murine model of surgical wound infection, we examined the effectiveness of NS as an SIF additive to prevent *Staphylococcus aureus* infection. Two-cm skin incisions were introduced in the shaved backs of anesthetized mice. The skin was dissected from the underlying fascia, a low dose of *S. aureus* was injected, and anesthesia was maintained for 60 minutes. The wounds were then washed twice with one mL of one of three different SIFs - normal saline, normal saline containing bacitracin, or normal saline containing NS - and closed using surgical sutures. At 48 hours post-surgery, the mice were euthanized and the wound beds were excised, weighed, resuspended in one mL of PBS, homogenized, and serially diluted to determine the number of microorganisms present (CFU). Compared with normal saline-treated wounds, the CFU of *S. aureus* in bacitracin-treated wounds was significantly reduced whereas no CFU were detected in NS-treated wounds. These results suggest that NS is a potential antimicrobial agent to be incorporated into SIF.

48. Comparative analysis of the in vivo virulence of the *Pseudomonas aeruginosa* strains PAO1 and PA14 using the murine model of thermal injury

Eugene Nwankwo, Michael Tan, Nyaradzo Dzvova, Sharmila Dissanaiké, John Griswold, Jane Colmer-Hamood, Abdul Hamood

Pseudomonas aeruginosa is a gram-negative opportunistic pathogen that causes severe infections in immunocompromised patients including severely burned patients. Colonization of burned tissue by *P. aeruginosa* often leads to systemic sepsis and death. Damage caused by *P. aeruginosa* is due to the production of numerous cell-associated and extracellular factors. The *P. aeruginosa* strains PAO1 and PA14, which were originally isolated from infected wounds, have been used extensively in both in vivo and in vitro studies. Both strains are fully virulent in the murine model of thermal injury. Despite numerous studies, comparative virulence analysis of the two strains is missing. In this study, we compared the in vitro and in vivo virulence of PAO1 and PA14 using previously described assays and procedures. PAO1 produced more pyocyanin than PA14, while PA14 produced more pyoverdine and LasB than PAO1. There was no difference in biofilm development by either strain. We utilized the murine model of thermal injury to analyze their virulence in vivo. We examined local growth within the infected wound as well as systemic spread to liver and spleen by determining the number of microorganisms (colony forming unit CFU/gm of tissues). At 16 and 24 hours post injury/infection, the CFU/gm of tissues of PAO1 within the infected wound was three to four log₁₀ higher than that of PA14. At 16 hours post injury/infection, we detected 10³⁻⁴ CFU/gm of tissues within the livers or spleens of PAO1-infected mice only. At 24 hours post infection, the CFUs within the livers and spleens of mice infected with either strain were comparable. These results suggest that: 1) PAO1 and PA14 vary in the production of virulence factors, 2) to spread systemically, the CFU within the injured tissues must reach a specific threshold, and 3) PAO1 reaches this threshold earlier than PA14.

49. Inducing *P. aeruginosa* biofilm dispersion to increase the therapeutic efficacy of antibiotics

John Escobedo, Rebecca Gabriliska, Kendra Rumbaugh

Bacterial biofilms are communities of bacteria encased in a self-produced polymeric matrix. This matrix confers protection from the external environment (e.g. nutrient deprivation, pH changes, host defenses and antimicrobial agents) and increases the fitness of the microbial community. The biofilm communities are clinically relevant because they directly impact antibiotic efficacy. By forming a biofilm the microbes are better protected and less exposed to a large array of antibiotics yet they can effectively distribute nutrients and eliminate waste as a quorum. The bacteria also produce and distribute signaling molecules into the external environment that can initiate regulatory pathways for biofilm formation and biofilm dispersion. When the biofilm dispersion pathway is initiated, the bacteria within the biofilm transition from a protected sessile phenotype to a free-floating planktonic phenotype. This planktonic phenotype transition is no longer protected by a biofilm and is theoretically much more susceptible to antibiotics. *Pseudomonas aeruginosa* is an example of a bacterium that is capable of forming particularly virulent biofilms. It is of clinical importance because the regulatory mechanism behind its biofilm formation has been extensively studied and *P. aeruginosa* biofilms are a major culprit behind nosocomial, burn wound, and cystic fibrosis infections. The signaling molecule of choice for this project will be C4-Homoserine Lactone, which *P. aeruginosa* uses to regulate rhamnolipid production and biofilm dispersion. So far, no research has been published that used this molecular signaling molecule to induce bacterial biofilm dispersion in order to increase the efficacy of administered antibiotics.

50. Effects of vitamin E derivatives on wound healing

Rachel Slate, Rebecca Gabriliska, Kendra Rumbaugh, Chwan-Li Shen

Vitamin E contains tocopherols and tocotrienols that are known for their wound healing capability. Topical application of tocotrienol (T3) has been found to be efficacious for prevention of UV-irradiation and treatment of burns and scars; however, tocotrienol has not been evaluated for its efficacy in treating surgical wounds. A second compound, Geranylgeraniol (GG), an intermediate in the biosynthesis of Vitamin E, has not yet been tested for its wound healing capacity. Thus, this study was designed to evaluate the effects of T3 and GG on healing in a murine full-thickness surgical excision wound model. We hypothesized that both T3 and GG would promote healing. For 21 days, topical treatments of either 5 percent T3 (90 percent delta-T3, 10 percent gamma-T3), 5 percent GG, OTC Vitamin E oil (alpha-tocopherol; positive control) or tocopherol-stripped corn oil (negative/vehicle control) were applied daily to wounds. Wound healing was determined by measuring the area of the wounds with an ARANZ Medical Silhouette camera over time. Both the T3 solution and the Vitamin E oil were slightly more efficacious than the vehicle. The GG solution was poor in its wound healing ability and performed worse than the vehicle, along with showing signs of severe skin irritation. Overall, neither the T3 nor the GG solutions were more beneficial than other currently available OTC topical wound healing agents. Although no significant healing benefits were observed, it is possible that one, or both, of these compounds has antimicrobial properties, which could be beneficial in preventing or treating infected wounds.

51. Telemedicine Efficiency and Retention in HIV patients

John Myers, Richard Winn

Telemedicine is a two-way communication between a physician and their patient and is used instead of in person interaction. This method reduces patient costs because it eliminates the need for patient travel. As technology becomes a centerpiece in hospitals and clinics it would seem that telemedicine would take a center stage in care, however telemedicine use in hospitals and clinic are sometimes a barrier for reimbursement. This creates a cost issue on the side of the healthcare provider due to lack of reimbursement for using this emerging technology. The current strategy of treating HIV is the use of combined drug therapy to suppress the virus reproduction, since eliminating the virus itself is still not a viable option. As soon as the patient is diagnosed treatment needs to begin immediately. The treatment consisting of an integrase inhibitor plus 2 NRTIs, while other therapies suggest 2 NRTIs and one NNRTI or a protease inhibitor or integrase inhibitor. It is important for the patient to stay up to date with their vaccines since their immune system is weakened by the virus. Live vaccines should be avoided with the exception of the MMR vaccine. Managing a chronic disease requires the patient to take responsibility of their health and follow all of the doctors' recommendations. Unfortunately about fifty percent of patients do not take their medicines as prescribed or follow other recommendations. The purpose of this study is to see if HIV patients receive the same level of care using telemedicine versus a in person interaction and if there is a difference in patient compliance when comparing to the two methods. This study also seeks to determine if treating HIV using telemedicine is really cost effective for both the patient and the provider.

52. A Case of Simultaneous tibial tubercle fracture and full thickness periosteal avulsion associated with patellar tendon avulsion

Chase Anderson, Matthew Ferguson, Adam Wooldridge

Avulsion fractures of the tibial tubercle are rare injuries in adolescent athletes, accounting for only a small fraction of all physeal fractures. Fractures associated with simultaneous avulsion of the patellar tendon are even more uncommon, with very few cases reported in the literature. This case report details a 16 year old basketball player who suffered a simultaneous tibial tubercle fracture and full thickness periosteal avulsion that was associated with patellar tendon avulsion. The injury occurred upon forceful contraction of the knee extensor mechanism while completing a layup. This report quantifies the extent of the recovery progress 4 months postoperatively through use of the WOMAC knee score. Special attention is given to the return to full sporting activity and associated timeline.

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