Oral and Poster Presentations:

The 2024 Mercer University School of Medicine and College of Pharmacy Joint Research Conference

Atlanta, Columbus, Macon, and Savannah, Georgia

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Table of Contents

Oral Presentations

Zoom Link: https://mercer.zoom.us/j/8460884386?omn=92701305060

Oral Session 1

Oral – 1 – Atlanta

Microparticulate Vaccine patch that fights COVID-19

Tanisha Manoj Arte, Smital Patil, Martin J. D'souza

Abstract

Background
Emerging SARS-CoV-2 strains threaten global health, and the effectiveness of current vaccines targeting the rapidly changing spike protein is a concern against these new strains. Consequently, vaccines inducing cross-reactive immunity are urgently needed. This "proof-of-concept" study aimed to evaluate the effect of microparticulate vaccine against SARS-CoV virus using microneedles. Study investigated nucleoprotein and spike protein as a model antigen for bivalent vaccine in the microparticulate form delivered using minimally invasive vaccine formulations like dissolving microneedles (MNs). Microneedles are minimally invasive transdermal route of administration which may effectively deliver vaccine across the skin. We hypothesized that a vaccine formulation with both spike and nucleoprotein could induce a cross-reactive immune response against various strains of SARS-CoV-2. Furthermore, administration through transdermal route has multiple advantages, such as i) specialized immune cells in the transdermal and mucosal layers, ii) neutralizing antibodies at the virus entry sites, and iii) compliant than painful intramuscular route.

Objective – Aim to formulate a Universal vaccine for the emerging variants of SARS-COV-2

Methods
Our vaccination strategy involves emulsion method to form microparticles. Microparticles formed are suspended in microneedle base and using PDMS mold microneedles were formed.

Result
In vitro testing revealed that MPs were safe and immunostimulatory. In vivo testing indicated that an adjuvanted-bivalent microparticulate vaccine could produce robust humoral (antibody), cellular (helper and cytotoxic T cells), and mucosal (secretory IgA) immune responses. Immune responses were specific to the bivalent vaccine antigens (spike and nucleoprotein) and SARS-CoV-2 (delta and omicron variants). Thus, our vaccination strategy produced a robust immune response against the various SARS-CoV-2.

Conclusion
Therefore, our vaccination strategy will prove to be pioneer in providing a broader immune response and pain-free vaccination alternatives against the emerging strains of SARS-CoV-2. This vaccine candidate is critical for the development of a universal vaccine against COVID-19.

Oral – 2 – Columbus

Efficacy of Stand-alone Anterior Lumbar Interbody Fusion with PEEK Cages, rhBMP-2 and Allografts for Treating Discogenic Low Back Pain: Assessing Clinical and Radiographic Outcomes

Matthew Scott-Young, MBBS, FRACS, FAOrthA, David Nielsen, MBBS, FRACS, Sukhman Riar, BBiomedSc, Evelyne Rathbone, MSc, Gantt Miller, BSci

Background: Chronic low back pain caused by degenerative disc disease (DDD) is a global public health concern, resulting in significant healthcare costs and patient disability. Anterior lumbar interbody fusion (ALIF) has shown promise as a surgical option. This study examines the effectiveness of stand-alone ALIF using polyetheretherketone (PEEK) cages, structural femoral head allografts, and recombinant human bone morphogenetic protein-2 (rhBMP-2) for treating discogenic low back pain related to DDD.

Methods: A prospective study of 1,335 patients undergoing stand-alone ALIF with PEEK cages, structural femoral allografts, rhBMP-2, and anterior fixation by a single surgeon. Patient-reported outcomes (PROMs), such as Visual Analogue Scale (VAS) for back and leg pain, Oswestry Disability Index (ODI), Roland-Morris Disability Questionnaire (RMDQ), and patient satisfaction, were tracked over 12 months.

Results: The overall fusion rate was 99.6%, with a 0.2% rate of pseudoarthrosis, though asymptomatic. Another 0.2% of patients had insufficient radiological data. Significant improvements were seen in VAS, ODI, and RMDQ scores, with over 85% of patients reporting "Excellent" or "Good" outcomes.

Conclusions: This technique results in high fusion rates and significant improvements in pain and function, especially when paired with precise pain diagnoses and clinical assessments. Stand-alone ALIF, enhanced by rhBMP-2 and femoral head allografts, provides stability and improved outcomes for patients with persistent discogenic low back pain.

Oral – 3 – Macon

Anatomy for Your Health (AYH) - An Anatomy-based Education Outreach Workshop

Kirera, F., Cone, C., Holder, K., Kinder, C., Greene, L., Clary, S. & Chalk-Wilayto,

Abstract

The objective of the AYH workshop was to determine whether exposure to clinical anatomy and disease processes in pre-healthcare high school students impacted the students' lifestyle choices and acquisition of anatomy competency skills. Background: Anatomists can transform society by implementing community-based outreach programs connecting anatomy to real-world problems. By designing activities that create awareness and link anatomy to the participant's health and well-being, anatomy educators can empower the public to make informed decisions about their health and better manage health conditions. Methods: Students drawn from rural high schools in Georgia state and Kenya participated in an online outreach workshop offered by MUSM anatomy faculty and medical students. The workshop was conducted in 2 phases: a) Asynchronous learning component in the form of pre-recorded videos highlighting basic human anatomy and physiology of the heart, lungs and liver and their related disease processes. b) Synchronous interactive session conducted via the Zoom platform involving information sessions, case studies, quizzes, and jeopardy-type competitions. To assess the effectiveness of the AYH workshop, we conducted a cross-sectional survey. The participants completed pre-postworkshop quizzes and questionaries to evaluate their perception, attitude and mastery of anatomical knowledge. Results: A total of 106 students from five schools participated in the workshop and completed the questionnaires. There were significant differences between pre-post quizzes (P=0.003). Over 80% of the respondents indicated they were satisfied with the workshop. There was a 10% improvement in the knowledge of health-related issues. The common theme with open-ended questions was the opportunity the AYH workshop afforded the participants to interact with students from different countries. Most students recommended the introduction of additional modules. Conclusion: The AYH online workshop helped to sensitize high school students to healthy lifestyle choices. Besides improving the mastery of anatomy competencies, it promoted intercultural and international experience for the participants.

Oral – 4 – Savannah

Effects of H3K9me3 on DNA Damage Susceptibility in Premature Aging Syndromes

Paul Lee, Emma Palefsky, Emilye Eischeid, Dr. Jong-Hyuk Lee

Abstract

Background and Objective: Premature aging syndromes are rare genetic disorders that lead to accelerated cellular and organismal aging. Most of these disorders are consequence of defects in specific DNA repair genes. In many forms of premature aging, there is an increase in heterochromatin loss, which results in increased DNA damage. Consequently, unresolved DNA damage triggers the hyperactivation of poly (ADP ribose) polymerase (PARP). Unlike other types of premature aging diseases, Ataxia telangiectasia (AT) and Xeroderma pigmentosum (XP) exhibit an enhancement in the trimethylation of Lys9 of Histone 3 (H3K9me3). This epigenetic alteration promotes heterochromatinization. The main goal of this research project was to assess DNA damage susceptibility of Ataxia telangiectasia mutated (ATM) and Xeroderma pigmentosum-A (XPA) cells, and to explore the relationship between H3K9me3 and DNA damage susceptibility.

Methods: To assess for DNA damage susceptibility, mutated ATM and XPA cells and their respective control cells underwent varying H_2O_2 concentration treatment. Western Blot analysis was then conducted with Enhanced Chemiluminescence (ECL) solution to visualize poly ADP-ribosylation (PARylation) of chromatin. Results were then compared to basal PARylation levels in mutated ATM and XPA cells.

Results: At increasing concentrations of H_2O_2 treatment, ATM and XPA mutated cells exhibited decreased PARylation level compared to respective control cells. However, under normal conditions, there was a higher steady-state PARylation level in ATM and XPA mutated cells despite having higher H3K9me3 levels compared to respective control cells.

Conclusion: Our results indicate that there may be a strong inverse correlation between DNA damage susceptibility and H3K9me3. However, future studies are warranted to investigate the mechanisms underlying increased basal PAR despite decreased damage susceptibility in AT and XP patient cells. If additional studies were to confirm the significance of H3K9me3 in reducing DNA damage susceptibility, this would have tremendous implications on identifying the most effective treatment options for premature aging syndromes as well as cancers with H3K9me3 dysregulation.

Oral Session 2

Oral – 5 – Atlanta

Targeting the endothelin system for the treatment of drug-resistant hypertension

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Abstract

Background and objective: Despite the availability of several classes of antihypertensive medications, only <25% of patients have their blood pressure under control, highlighting the need for novel antihypertensive therapeutics with improved efficacy. Salt-sensitive (SS) hypertension (HTN) is particularly concerning as it often progresses to drug-resistant (DR) HTN, leading to significantly higher mortality rates. Research over the past three decades has established that augmented endothelin-1 (ET-1) production and signaling play a crucial role in the development of SS/DR HTN. However, currently available medications target ET-1 receptors (ETRs) but do not inhibit ET-1 production, limiting their effectiveness in treating SS/DR HTN and other ET-1-related diseases. Here we investigate the potential of indole-3 acetic acid (IAA), a metabolite derived from gut microbiota, to inhibit both ETRs and the endothelin-converting enzyme-1 (ECE-1), which is responsible for ET-1 biosynthesis.

Methods and Results: Our pressure myography, ROS measurement and Ca2+ imaging data demonstrate that IAA inhibits ETRs, suppressing ET-1-evoked vasoconstriction and reactive oxygen species (ROS) production in smooth muscle cells (SMCs), as well as ET-1-induced endothelial cell (EC) activation and leukocyte adhesion. Additionally, IAA dose-dependently inhibits purified human ECE-1 activity and reduces hypoxia-stimulated ET-1 production in vitro. Consistent with these findings, treating Dahl salt-sensitive (DSS) hypertensive rats, a model characterized by excessive ET-1 production and signaling, with a novel oral extended-release formulation of IAA (IAA-oragel) minimizes HTN, preserves SMC and EC function, prevents vascular remodeling and kidney dysfunction, and inhibits ECE-1 upregulation and ET-1 production in vivo. In silico analyses identified potential amino acid residues mediating the interaction between IAA and the binding pockets of ET_AR/ET_BR and the active site of ECE-1.

Conclusion: Overall, our study lays the foundation for understanding the biological actions of this gut microbiota-derived metabolite, particularly its efficacy as a novel antihypertensive drug for SS/DR HTN. Importantly, IAA could emerge as a first-in-class drug offering a dual-action solution for SS/DR HTN and potentially other ET-1-related diseases.

Oral – 6 – Columbus

Integrating a Unique Mindfulness-Based Stress Reduction Training into the First-year Medical Student Curriculum.

Dr. Robert Hodge, Sherry Meeks, Olivia Penela, Gautham Mudireddy, Zachary Brieck, Dr. Brad Lian

Abstract

Background: Medical school comes with many responsibilities and stressors. The stress from school and everyday life significantly affects medical students' mental health; especially those that do not know how to handle stress in a healthy way. Previous studies have shown that implementing a mindfulness program has decreased student burnout and overall stress levels. In this study, we evaluated the effectiveness of our unique mindfulness-based training program for first year medical students, MeditateMD. The program is a 14-week program that teaches mindfulness techniques like meditation to better equip first year students with the tools they need to handle their new stressful environment.
Methods: Pre-experimental design and quantitative research methods were used for the study. The students were recruited using a convenience sampling technique and 8 first year Mercer University School of Medicine students participated. All participants were given a pre-training Perceived Stress Scale (PSS) to determine their starting level of stress and confidence in handling it.
Results: After the training the students received another PSS and an evaluation of the training. A Wilcoxon signed-rank test was performed and found that there was a statistically significant decrease in stress and the post-training evaluation results were overwhelmingly positive. Students overall thought the course was helpful and worth their time and energy.
Conclusion: This study indicated that a mindfulness-based training program increases medical students' ability to cope with stress. Comparison between the pre and post training stress levels were significant, and showed that the mindfulness techniques taught by the integrated program were helpful in reducing stress and increasing confidence in their ability to cope with stress

Oral – 7 – Macon

Habit Training Intervention Based in Mindfulness to Reduce Stress and Burnout Amongst Medical Students

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[1] Mercer University School of Medicine
[2] Director and Founder of Jivika for Burnout Prevention (Outside Volunteer Consultant)

Abstract

Burnout is a type of stress syndrome that is acquired through chronic interpersonal stress while at work (or school). It is associated with feelings of emotional exhaustion, depersonalization, and a low sense of personal accomplishment [1-2]. For medical students, studies suggest that burnout and depressive symptoms related to stress may begin as early as the first year of medical school, with many of the symptoms increasing over the course of medical school [4-5]. Burnout at this stage is associated with poor academic performance, general distress, dropout intent, substance abuse, and suicidal ideation [6]. The current literature suggests that factors such as mindfulness training, breathing exercises, and social support satisfaction all seemed to be protective against the effects of chronic stress and burnout [6-10]. Our research study aims to use some of these principles to evaluate the efficacy of an eight-week wellness program consisting of mindfulness-based micro-habit training, incorporated breathing exercises, and weekly thirty-minute peer circle meetings. This study includes using a mobile micro-habit training application to attenuate burnout symptoms, which has the added benefit of allowing more flexibility and time efficiency when practicing mindfulness. We hypothesize that this intervention program will reduce burnout, decrease compassion fatigue, and increase self-compassion among medical students.

Oral – 8 – Savannah

From Trial to the Prescription Pad: Quality Improvement of SGLT-2 Inhibitor Prescription Prevalence for Patients with Diabetes and Heart Failure

Grace Fawcett, MS2, Victoria Blaisdell, MS2, Riley King, MS2, William Hannah, M.D., Eric Shaw, PhD

Abstract

Introduction: For the many patients across the United States diagnosed with both type 2 diabetes mellitus (T2DM) and heart failure with reduced ejection fraction (HFrEF), SGLT-2 inhibitors stand as a decidedly effective pharmaceutical option for lowering one's risk of mortality. Despite the data that supports this and the corresponding ACC guidelines, many patients remain without a prescription. The aim of this quality improvement project is to determine the prescription rate of SGLT-2 inhibitors within the eligible patient population at Memorial Health University Medical Center, with the goal of improving this rate if necessary through educational efforts in order to improve patient outcomes.

Methods: Analysis included patients with a diagnosis of T2DM and HFrEF that were admitted to the internal medicine inpatient service at Memorial from December 1st, 2023 through June 1st, 2024. Of these encounters, patient charts with a medication list containing a currently prescribed SGLT-2 inhibitor were flagged. Patients admitted more than once in this time period were included for each encounter that qualified.

Results: SGLT-2 inhibitors were prescribed in 454 (7.95%) of all 5709 eligible patient encounters. Further categorization reveals 263 out of 2793 male encounters (9.42%) and 191 out of 2916 female encounters (6.55%) demonstrate a prescription for an SGLT-2 inhibitor prior to admission. Prescription rates for encounters with documentation of self-identification as White, Black/African American, and Asian/Other were 8.35%, 7.16%, and 9.95% respectively.

Conclusions: Despite the risk minimization and improved outcomes for patients with T2DM and HFrEF on SGLT-2 inhibitors, implementation of this drug class in the treatment plans of eligible patients seems to remain stunted. In a quality improvement effort, resident education of current HFrEF management guidelines and SGLT-2 inhibitor side effects/contraindications will hopefully increase prescription, leading to decreased mortality, reduced hospitalizations, and fewer clinically adverse events in the future.

Oral – 9 – Atlanta

Formulation of Stat6 siRNA loaded gelatin nanocarriers (S6S-GNC-P) for targeting T cells for asthma treatment

Kotha, A.K., Kashikar R., Sterling Neill, Chougule, M.B.

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Abstract

Th2 cell-mediated asthma progression plays a major role in inflammatory mediator production and airway mucus hyper-secretion associated with chronic atopic asthma. The signal transducer and activator of transcription 6 (STAT6) is an essential transcription factor in asthma pathogenesis and progression via Th2 cells. RNAi is a naturally occurring gene silencing process with high specificity and potential to silence genes of interest. However, the clinical utility of RNAi therapies has been hindered due to poor cell penetration, nonspecificity, degradation, and short half-life. It was hypothesized that receptor-guided STAT6 siRNA-loaded gelatin nanocarriers (S6S-GNC-P) suspension will selectively deliver STAT6 siRNA to T cells and silence STAT6 mRNA and protein expression, thereby attenuating allergic chronic severe asthma. This study aimed to evaluate the efficacy of interleukin receptor targeting peptide conjugated and PEGylated S6S-GNC-P by comparing resistance to breathing between four treatment groups of mice. The siRNA dose for treatment groups was 20µg (1mg/kg).

The successful development of the asthmatic mouse model using HDM extract was confirmed since there is a significant difference in resistance to breathing between healthy mice with no treatment (Group G) and asthmatic mice with saline treatment (Group H) ($p < 0.05$). Based on the sRAW values determined via a noninvasive airway mechanics system, a significant difference is observed between asthmatic mice treated with scrambled siRNA (Group F) and asthmatic mice treated with S6S loaded IL4Ra peptide conjugated GNP (Group D) ($p < 0.05$). There was a similar significant difference between asthmatic mice with saline treatment (Group H) and asthmatic mice treated with S6S-loaded IL4Ra peptide conjugated GNP (Group D) ($p < 0.05$). Lastly, there was no statistically significant difference observed between healthy mice with saline no treatment (Group G) and asthmatic mice treated with S6S-GNC-P (Group D) ($p < 0.05$), demonstrating the efficacy of developed S6S-GNC-P.

Oral – 10 – Columbus

Molecular synergism between microRNAs and small molecules to convert human fibroblasts into medium spiny neurons: Comparison of MAP2 expression between chemical-and-viral-induced MSNs

Bryce M. Britt, Young Mi Oh, and Seong Won Lee

Abstract

Huntington's disease (HD) is a neurodegenerative disorder marked by involuntary movements, cognitive decline, and psychiatric symptoms. HD is caused by an excess of CAG repeats in the huntingtin gene, leading to a mutated protein. Current treatments focus on symptom management, as there is no cure. Because of the lack of cure, there is a need to establish a human neuron platform that allows for studies of neurodegenerative disease in their phenotypic background. This study compares two methods for converting human fibroblasts (FBs) into medium spiny neurons (MSNs), the cells critically affected in HD: a well-established, delicate lentiviral transduction method and a safer, simpler chemical induction method. Direct neuronal reprogramming, using brain-enriched microRNAs, offers a way to generate patient-derived neurons. FBs were converted into MSNs over four weeks using either lentiviral transduction (miR-9/miR-124 with transcription factors Ctip2/DLX1/DLX2/MYT1L) or chemical induction (PD032590, a MEK1/2 inhibitor, and SU5402, a fibroblast growth factor receptor (FGFR) inhibitor). Neuronal differentiation was assessed through MAP2 (pan-neuronal marker) and DARPP-32 (MSN-specific marker) expression using immunostaining and ImageJ software. Results showed that the chemical method achieved MAP2 expression levels comparable to or slightly higher than the lentiviral method, though statistical significance varied. DARPP-32 expression showed that the chemical method was nearly as effective as the lentiviral approach, with week three data showing statistical significance for the chemical method. Overall, the chemical approach presents a promising alternative to viral transduction, offering safer, non-viral techniques for generating MSNs in HD research, with potential implications for future therapies.

Oral – 11 – Macon

Nitrous Oxide-Induced Rhabdomyolysis in Substance Abuse Patients: A Case Report

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Abstract

Rhabdomyolysis is a serious condition characterized by the breakdown of skeletal muscle fibers into the bloodstream, often causing acute kidney injury (AKI). Although commonly associated with trauma, and medications, we present a novel case of substance abuse induced rhabdomyolysis from nitrous-oxide. A 22-year-old male with history of anxiety and polysubstance abuse was recently discharged from a rehabilitation center for opioid addiction. Post discharge he was abusing nitrous-oxide (appx. 1L per session). He was admitted to the ICU for AKI and originally presented with serum creatinine of 1.83 mg/dL, significant swelling in the right hand, left gluteal and thigh region. We ruled out compartment syndrome. On day 5, his serum creatine continued to increase and peaked at 12.31 mg/dL and his creatine kinase (CK) levels remained >45,000 unit/L for 3 days. Kidney ultrasound showed unilateral perinephric fluid. Urine sediment demonstrated muddy brown casts and no red blood cells, confirming diagnosis of AKI secondary to acute tubular necrosis from underlying rhabdomyolysis caused by nitrous-oxide usage. Despite IV fluids and supportive care, the patient became anuric and hemodialysis was initiated. He required inpatient hemodialysis for 2 weeks. 1-week post-discharge, his creatinine went down to 1.89 mg/dL and hemodialysis was discontinued and his permcath was removed. This unique case highlights the importance of considering nitrous oxide as a potential trigger for rhabdomyolysis, in addition to monitoring and discussing prevention of rhabdomyolysis in patients with nitrous oxide substance abuse. Since nitrous-oxide is increasingly becoming available and abused, this case presents vital data on AKI secondary to nitrous-oxide induced rhabdomyolysis to fill gaps in polysubstance abuse directed care. Further research is crucial to unravel the specific mechanisms involved and establish comprehensive guidelines for the prevention and treatment of nitrous oxide-induced rhabdomyolysis.

Oral – 12 – Savannah

Survey of Organ Procurement Organizations' Policy and Response to Pregnant Organ Donors in Abortion Restrictive States

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Background: Research regarding organ donors who are pregnant at the time of death is extremely limited. Organ Procurement Organizations (OPO) responses to these donors is not widely understood, particularly in states with restrictive abortion laws post Dobbs decision of 2022.

Methods: In an IRB exempt, qualitative study, we invited 25 OPOs from abortion restrictive states and 2 OPOs from non-restrictive states to participate in a confidential survey regarding management of potentially pregnant and deceased organ donors. The electronic survey inquired about jurisdiction and OPO demographics, OPO's process for handling pregnant and deceased donors, communications with external parties, and relevant laws and policies at the state and OPO level.

Results: We received completed surveys from 5 OPOs in abortion restricted states, and one completed survey from an OPO in a non-restricted state. 4/5 restricted OPOs did not have data on the number of pregnant donors they have been presented with in the past three years. None of the restricted OPOs have an official policy in place to handle such cases. The non-restricted OPO shared their specific policy for management of pregnant donors, which includes ethics and medical consults. The OPO comes forward for donation only after a separate decision is made regarding the life of the fetus, irrespective of donation.

Conclusion: Restrictive abortion laws have a chilling effect on OPOs even addressing the issue of organ procurement from potentially pregnant donors as evident in reasons cited for choosing not to participate, for example, stated discomfort with questions being asked and denial to participate per executive leadership. A transparent and proactive policy regarding pregnant organ donors could mitigate potential legal issues and overall discomfort for OPOs that are already under an exorbitant amount of pressure to save as many lives as possible, honor the deceased, and avoid legal repercussions.

ATLANTA Biomedical

Atlanta – 1

Development of Functionally Selective 5-HT1AR agonists for the treatment of Fragile X Syndrome

Hamad Alali, Richa Tyagi, Tanishka Saraf, Jessica Armstrong, Clinton Canal

Fragile X Syndrome (FXS) is known to be the most common monogenic cause of intellectual disability and autism spectrum disorder. The syndrome arises from the CGG repeat expansion in the promoter of the FMR1 gene, which encodes fragile X messenger ribonucleoprotein (FMRP). If the repeat expansion exceeds >200 CGG repeats, transcriptional silencing of FMR1 occurs leading to FMRP deficiency.[2,3]

Patients with FXS exhibit a range of symptoms including neuronal hyperexcitability, sensory hypersensitivity, and epilepsy among many other behavioral abnormalities.[2,7] Such phenotypes are well represented in the mouse model of FXS, FMR1 KO mice.[2] These mice are prone to having audiogenic seizures (AGS) when exposed to high dB alarm, which potentially highlights the underlying neuronal hyperexcitability and auditory hypersensitivity.

We had previously shown that administering 5-HT1AR agonists, such as NLX-112 and FPT, has a beneficial effect on reducing the prevalence of AGS in FMR1 KO mice.[1,8] Furthermore, when the administration of NLX-112 was preceded by 0.1 mg/kg of Way-100635, a selective 5-HT1AR antagonist, the beneficial effect of NLX-112 vanished.[8] This finding suggests that activation of 5-HT1AR is sufficient to prevent an AGS in FMR1 KO mice. Therefore, targeting the 5-HT1A receptor is a promising approach for the development of FXS treatment.

Activation of 5-HT1AR yields different outcomes depending on the brain region that expresses the receptor. Furthermore, there is compelling evidence that 5-HT1AR preferentially couples to specific subtypes of the Gi/o G-protein family; for example, Cortical 5-HT1AR couples to Go and Gi3, but hypothalamic 5-HT1AR couples to Go, Gi1, and Gz.[5] It is thought that cortical 5-HT1AR activation mediates the positive outcomes seen in FMR1KO after being treated with 5-HT1AR agonist, while activation of the receptor in different brain regions might increase the probability of having untoward effects. Therefore, developing a functionally selective 5-HT1AR agonist that targets cortical areas and avoids other brain areas, such as the hypothalamus, would be beneficial in selecting specific molecules to advance them to clinical trials for treating FXS. Hence, we functionally characterized a selection of 5-HT1AR agonists (5-CT, FPT, PFPT, NLX-112) and calculated bias factor toward seven different G-protein combinations (Gi1, Gi2, Gi3, GoA, GoB, Gz, and Ggust.) to identify a particular molecule that would target the cortical 5-HT1AR, and later test it in vivo for efficacy and safety when comparing it to non-functionally selective 5-HT1AR agonist.

Atlanta – 2

Spontaneous Seizure Prevalence and Neuroanatomical Changes in Male and Female Fmr1 KO Mice

Thomas T. Dick, Tanishka S. Saraf, Jessica L. Armstrong, Caylee L. Durden, Clinton E. Canal

Abstract

Fragile X Syndrome (FXS) is a neurodevelopmental disorder arising from a mutation in the X-chromosome, silencing of the *FMR1* gene and reducing or eliminating translation of Fragile-X Messenger Ribonucleoprotein (FMRP). FXS is the leading monogenic cause of autism. Additionally, about 10-40% of FXS patients also experience seizures. Audiogenic seizures caused by hyperexcitable auditory pathway circuits are prevalent in juvenile *Fmr1* knockout (KO) mice. Recently, we showed that adult *Fmr1* KO mice exhibit idiopathic spontaneous seizures during a defined age range (median age p95$\pm$46 days), yet there is nothing known about the pathophysiology of this phenotype. This study aims to identify neural systems that are altered in adult *Fmr1* KO mice that exhibit spontaneous seizures. Wild-type (WT) and *Fmr1* KO mice were assigned to 8 groups based on the criteria of sex, genotype, and presence of seizure. Coronal brain sections of the hippocampus were stained with cresyl violet to stain neuronal and glial cells. Female *Fmr1* KO mice with seizures showed increased cell dispersion in the dentate gyrus (116.7µm) compared to female WT control (93.85µm), female KO control (91.13µm), and male *Fmr1* KO mice with seizures (87.56µm). Male mice had no statistical variation in dispersion in the dentate gyrus regardless of the mice being KO, WT, or having had a seizure. We conclude that there is increased cell dispersion in the dentate gyrus of the hippocampus in female *Fmr1* KO mice that had seizures.

Atlanta – 3

Novel Role of a Gut Microbiota-derived Metabolite in Angiotensin II induced model of Hypertension

Ezewudo EM, Nguyen T, Simon PN, Jones EM, Menon SN, Zerin F, Chougule M, Hasan R

Abstract

The multifaceted roles of angiotensin II (Ang II) in hypertension (HTN) remain a subject of extensive investigation. Several research have highlighted the central role of Ang II-induced excessive endothelin-1 (ET-1) production and signaling in the progression of Ang II-associated HTN. ET-1 is the most potent known endogenous vasoconstrictor. Numerous studies suggest a bidirectional relationship between ET-1 and Ang II, wherein Ang II stimulates ET-1 production, and ET-1, in turn, facilitates Ang II conversion. Both peptides stimulate profound vasoconstriction, ROS production, and smooth muscle cell (SMC) proliferation, contributing to cardiovascular dysfunction and HTN. However, the relationship between gut microbiota, ET-1 production, and the pathogenesis of Ang II-associated HTN and cardiovascular dysfunction remains unexplored. Recently, our laboratory discovered that indole-3-acetic acid (IAA), a tryptophan-derived metabolite produced by gut-microbiota, can reduce ET-1 production by inhibiting endothelin-converting-enzyme-1 (ECE-1), the enzyme responsible for ET-1 biosynthesis, and can antagonize ET-1 receptors ETAR and ETBR. We therefore hypothesized that since IAA can inhibit the Activities of ET-1, and ET-1 play crucial roles in Ang II induced hypertension, IAA can potentially tackle Ang II-induced HTN. To investigate this, we formulated IAA as an Oragel with an extended-release profile and induced hypertension in Sprague Dawley rats by inserting osmotic pumps subcutaneously to deliver Ang II at a dose of 700ng/kg/min. The rats were randomly split into 5 groups of 6 animals each, 3 of which received IAA-Oragel treatment at doses of 5mg/kg, 10mg/kg, and 20mg/kg for two weeks. Their Blood Pressures were taken daily after 2-4 hours of IAA treatment. The rats were euthanized after two weeks and their plasma, mesenteric bed, aorta, heart and kidney tissues collected for further analysis. Our data demonstrate that IAA inhibits Ang II infusion-associated BP elevation, vascular-dysfunction, and attenuated Ang II-stimulated overproduction of ET-1. Hence, IAA was able to ameliorate Ang II-associated hypertension.

Atlanta – 4

Evaluation and Optimization of Doses for a Whole-Cell Inactivated Gonococcal Microparticulate Vaccine

Ferguson, Amarae; Bagwe, Priyal; Zughaier, Susu; D'Souza, Martin J.

Abstract

Background and Objective: Gonorrhea is a global health concern because of its high infection rates, growing resistance to antibiotics, and lack of a vaccine for prevention. In order to address this issue, we created a novel adjuvanted vaccine that was painlessly delivered by microneedles and contained whole-cell formalin-inactivated gonococcal microparticles. The major objective of this study was to determine the optimal immunization dose of our vaccine.

Method: Using four groups of mice, we administered the vaccine using 3 doses (50ug, 100ug, and 200ug), each combined with the adjuvants Alum and AddaVax™, while one group remained untreated as a control. Over 10 weeks, we collected biweekly blood samples and harvested the spleen and lymph nodes of the mice to assess the humoral and cellular responses respectively. The humoral responses were measured by indirect ELISA for IgG, IgA, IgG1, and IgG2a levels. Then flow cytometry was employed to quantify the cellular response from CD4+ and CD8+ expression.

Results: Our findings revealed that all vaccine doses elicited humoral and cellular responses and bactericidal activity, but the 100 and 200ug doses demonstrated the strongest responses with the fastest clearance when compared to other groups.

Conclusion: Overall, the data proves the superiority of the 100 and 200ug doses in eliciting a robust cellular and humoral immune response, as well as providing the best bactericidal activity and rapid clearance of the infection. The data also showed that our vaccine was effective in producing an immune response even at lower doses.

Atlanta – 5

Topical and transdermal delivery of 4-phenylbutyric acid through chitosan nanoparticles dispersed in a Foam formulation: a potential antidote for skin injury due to chemical warfare agents

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Background and Objective: The objective of this study is to develop topical antidote formulation of 4-phenyl butyric acid (4-PBA), an FDA-approved drug for urea cycle disorder, to reduce skin injuries caused by lewisite, an arsenic-based chemical warfare agent. To achieve sustained delivery of 4-PBA at the site of action, we developed a 4-PBA-loaded chitosan nanoparticle-incorporated foam (F39). We also compared low and medium molecular-weight chitosan for optimized delivery. The foam was designed to be easily spreadable, non-greasy, and suitable for inflamed skin.

Methods: Chitosan-nanoparticle formulations (NF1-NF38) were synthesized using ionic gelation method. After optimization, batches N31(LW) and N35(MW) were selected and incorporated into a topical foam (F39) containing Tween 20, oleic acid, ethanol, and propylene glycol. The N31 and N35-loaded foams were tested for *in vitro* permeation using Franz diffusion cells with porcine skin and compared to unencapsulated 4-PBA in PBS control.

Results: N31 and N35 were selected due to good yield, zeta potential (~±20-30mV), drug loading (3% and 5.5%), and particle size (141±26nm and 176±36nm). The PBS control demonstrated the highest 4-PBA delivery (1019.8±65µg/cm²), indicating high transdermal permeability. N31 (284.4±13.31µg/cm²) and N35 (570.61±56.13µg/cm²) in PBS exhibited sustained permeation, with N31 showing significantly lower delivery ($p=0.0012$) than the control, while N35 delivered less but not significantly. Medium molecular weight chitosan delivered more 4-PBA than low molecular weight. Nanoparticle incorporated foams (N31: 101.23±36.42µg/cm²; N35: 245.58±45.91µg/cm²) significantly reduced 4-PBA delivery ($p<0.05$) compared to the control, while 4-PBA in foam (354.65±51.03µg/cm²) did not. Foam provided easy application without further reducing 4-PBA delivery, confirming that sustained delivery was primarily achieved by the nanoparticles

Conclusion: We prepared and characterized 4-PBA-loaded chitosan nanoparticles and incorporated them into a topical foam (F39). This study shows the feasibility of a nanoparticle incorporated topical foam for sustained 4-PBA delivery to mitigate lewisite-induced skin toxicity.

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Atlanta – 6

Development and Characterization of Auxin-Encapsulated Nanoliposomes for Potential Therapeutic Use

Yashkumar Harsoda, John N. Le, Raquibul Hasan, and Mahavir B. Chougule

Background and Objective: Pulmonary hypertension is a significant medical concern and makes the heart harder to pump blood than normal. The outcome of current therapies are poor**.** Innovative inhaled therapeutic approaches are essential for effective management to overcome certain limitations of conventional pulmonary hypertension therapy. Recent explorations into therole of auxin, primarily recognized for its regulatory impact on plant growth, suggest possible applications in non-plant systems such as hypertension management. However, the therapeutic efficacy of auxin in hypertension treatment within animal models or humansubjects remains under-explored and lacks substantial clinical data. In response to these gaps, our research focused on developing nebulized nanoliposomes using DPPC, cholesterol, and DOPE-PEG 2000 composition, aiming to optimize auxin's delivery and efficacy in potential clinical applications. The formulation was extensively characterized, including an assessment of stability, delivery efficiency, and biological interaction, ensuring its applicability for further biomedical research. This initial study underscores auxin-loaded nanoliposomes' formulation and biophysical characterization and sets a foundation for their potential use in hypertension treatment. By addressing the current limitations in hypertension therapy and exploring novel uses of plant-derived compounds, this research could pave the way for new therapeutic strategies and enhance clinical outcomes in hypertension management.

Methods: The formulation was prepared via the ethanol injection method, a technique chosen to yield the stable and narrow distribution of Auxin-loaded nanoliposomal suspension. This method involved dissolving a carefully selected lipid composition of Dipalmitoylphosphatidylcholine (DPPC) (12.9mg), cholesterol (5.13mg), and DOPE- PEG-2000 (1,2-dioleoyl-sn-glycero-3-phosphoethanolamine-N-[amino(polyethylene glycol)-2000] (ammonium salt)) (1.5mg) and Indole Acetic Acid-3 (Auxin) (6.75mg) in ethanol, followed by injection (0.15 ml/min) into an aqueous buffer to facilitate spontaneous liposome formation. The particle Size and Polydispersity Index (PDI) were measured to ensure uniform liposome size distribution; Zeta Potential was analyzed to assess surface charge and colloidal stability; asays determined using HPLC method and entrapment Efficiency evaluations ascertained the effectiveness of auxin encapsulation. Furthermore, the aerodynamic properties were tested using the Next Generation Impactor(NGI), to examine the potential for aerodynamic properties.

Results: In the results of our study on auxin-encapsulated nanoliposomes, various optimization techniques were employed, leading to significant improvements. Adjusting the API concentration and using an ethanolic solution increased the entrapment efficiency to approximately 72.29% and include the assay value based on unentrapped drug efficiency i.e., indirect way of determination. The particle size was 181.5 ± 1.06 nm, with a PDI of 0.176 ± 0.0101), indicating uniform particle

size and Zeta Potential of -1.92 ± 0.17 mV. The aerodynamic properties were also favorable, with an average fine particle fraction (FPF) of 57.06 ± 2.77% and a mean mass aerodynamic diameter (MMAD) of 1.81 ± 0.17µm, suggesting effective pulmonary delivery potential. These results highlight the useof nebulized Auxin-loaded liposomal suspension product for potential use in pulmonary hypertension treatment.

Conclusion: The development and optimization of Auxin-encapsulated nanoliposomes using the strategic use of an ethanolic solution for the API facilitated improved entrapment efficiencyand assay consistency, crucial for effective therapeutic delivery. Additionally, the nanoliposome's rigorous characterization, including size distribution, charge, and aerodynamic performance, supports their potential for targeted localized pulmonary delivery. This research highlights the innovative application of nebulized Auxin loaded nanotechnology in medical therapy, specifically in managing pulmonary hypertension.

Atlanta – 7

Novel modulation of macrophage endothelin system for the treatment of drug-resistant hypertension

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Abstract

Background and Objective: Activation of macrophages plays a crucial role in the development of salt-sensitive (SS) hypertension (HTN), causes drug-resistance (DR), leading to significantly higher morbidity and mortality. Recently our laboratory has discovered that indole-3 acetic acid (IAA) profoundly inhibits blood pressure (BP) elevation in Dahl salt-sensitive (DSS) hypertensive rats via a novel dual action mechanism that involves both antagonism of endothelin-1 (ET-1) receptors ETAR and ETBR, and inhibition of the endothelin-converting enzyme-1 (ECE-1). Given that macrophages express ETRs and ECE-1, and are involved in the pathogenesis of SS HTN and kidney dysfunction, we aim to determine if two computationally screened IAA analogs 2-[5-(benzyloxy)-1H-indol-3-yl]acetic acid (IAAA1) and 2-(6-chloro-1H-indol-3-yl)-2-oxoacetic acid (IAAA3) could inhibit macrophage activation, kidney dysfunction and HTN in both male and female DSS rats.

Methods: In silico analyses and pressure myography were used to evaluate the activity IAAA1 and 3 in the inhibition of endothelin system.

Results: Our previous in silico studies showed potential interaction between the analogues (IAAA1 and 3) and human ETAR, ETBR and ECE-1. The ICM score of IAAA1 and IAAA3 is -29.5 and -19.60 for ETAR and -28.5 and -20 for ETBR, respectively, which showed stronger interaction compared to the standard Bosentan (ICM score -20 for ETAR and -14 for ETBR). Our preliminary data also demonstrated that IAAA1 and 3 inhibit ET-1-evoked vasoconstriction in resistance mesenteric arteries.

Conclusion: As part of this research, we will examine whether IAAA1 and 3, by antagonizing macrophage ETRs and ECE-1, inhibit ET-1-downstream activation of macrophages, their infiltration into the kidneys, oxidative stress and kidney dysfunction in SS HTN. This project is significant as it seeks to establish structure-activity relationships (SAR) for IAA/IAAAs and identify novel drug candidates with improved efficacy for treating SS and DR HTN.

Atlanta – 8

Novel targeting of macrophage activation with a derivative of indole-3 acetic acid and its implication in hypertension and kidney dysfunction

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Abstract

BACKGROUND: 3-{[2-(1H-Indol-3-yl)Ethyl]Carbamoyl}Propanoic Acid (IAAA2), an analog of Indole-3 Acetic Acid (IAA), is a metabolite in humans and plants, also known as auxin. A few previous studies suggest that IAA has antioxidant and anti-inflammatory actions. However, the effect of IAA in relation to macrophage-mediated immune responses and kidney function remains unexplored. In this study, we demonstrate that IAAA2 modulates immune cell function and downstream inflammation, resulting in a beneficial effect on cardiovascular and kidney health.

METHODS: To study the modulation of immune cell function and downstream inflammation, in silico analysis, pressure myography, western blot (IL-1, IL-6, TNF-Alpha, INF-Gamma) (Mac-1, LFA-1, VLA-1), and leukocyte adhesion assay was used.

RESULT: Our in-silico analysis data predicted the interaction between IAA/IAAA2 and human ET_AR/ ET_BR. Our pressure myography data demonstrates that IAAA2 produces a concentration dependent reversal of ET-1 constriction in rat resistant mesenteric arteries. Our western blotting and leukocyte adhesion assay revealed that IAAA2 suppresses macrophage activation by inhibiting ETAR/ ET_BR and ECE-1. ET_AR/ ET_BR are blocked individually to analyze cytokine production and integrin protein expression. Overall, our data suggested that IAAA2 is a novel modulator in the macrophage endothelin system and competitively blocks ET-1 receptors in macrophages.

CONCLUSION: Altogether, we demonstrate that IAAA2 holds the promise to be a next generation of hypertensive drugs with unique actions, which may explain profound antihypertensive action of IAAAs as reported by our lab.

Atlanta – 9

Developing and Evaluating a Three-Day Continuous Transdermal Delivery System of Lenvatinib Mesylate for Potential Cancer treatment

CS Akash Kalla, Meheli Ghosh, and Ajay K. Banga

Abstract

Background and Objective

Lenvatinib mesylate (LM), a receptor tyrosine kinase inhibitor, used for the treatment of cancer, is currently only available as oral capsules. Transdermal delivery of LM can minimize hepatic, systemic and gastrointestinal side effects associated with oral dosing, and provide prolonged drug action improving patient compliance.

Methods

The saturation solubility of LM in propylene glycol (PG) and in various penetration enhancers was screened. Using dermatomed porcine ear skin, we determined the transdermal flux of LM and calculated skin permeation parameters, from several formulations including propylene glycol (PG), and chemical enhancers in PG, such as 20% w/w oleic acid, 15% Isopropyl Myristate (IPM), 10% Oleyl alcohol (OA), 5% Transcutol, 20% Diethyl Sebcate (DS), 20% N-methyl-2-pyrrolidone (NMP), 45% dimethyl sulfoxide (DMSO), and 10% NMP with 10% IPM. A UPLC method was developed to analyze and quantify the amount of LM permeating into and across the skin.

Results

The saturation solubility of LM in PG, and in various penetration enhancers like, oleic acid (10%,20%w/w), Isopropyl Myristate(15%,35%w/w), OA (10%w/w), transcutol (5%w/w), DS (10%,20%w/w), NMP (15%,20%w/w), DMSO (20%,45% w/w), a combination of Oleic acid (10% w/w) and OA (10% w/w), a combination of NMP(10%w/w) and IPM(10%w/w) in PG were found to be 2.10±0.003, 1.85±0.003, 1.78±0.011, 2.14±0.007, 1.74±0.004, 2.29±0.000, 2.12±0.01, 1.70±0.006, 2.57±0.016, 1.94±0.002, 2.15±0.005, 1.77±0.009, 2.68±0.004, 1.91±0.004, 2.66±0.003 mg/ml respectively. PG, 20% oleic acid, and 45% DMSO significantly enhanced LM permeation across dermatomed porcine ear skin, with DMSO achieving the highest delivery of 66.66 ± 13.38 μg/cm² over three days.

Conclusion

This study serves as a model to demonstrate the feasibility of a transdermal delivery system for Lenvatinib Mesylate over a continuous three-day period, for potential cancer treatment.

Atlanta – 10

Pharmacological inhibition of vascular dysfunction by a gut microbiota metabolite indole-3 acetic acid

Sreelakshmi N. Menon, Morgan Jones, Taufiq Rahman and Raquibul Hasan*

Abstract

Background and Objective: Endothelin-1 (ET-1), a 21-amino acid peptide, is the most potent vasoconstrictor in the body. High ET-1 levels activate ETAR and ETBR receptors, leading to macrophage activation and subsequent production of reactive oxygen species (ROS), integrins, and inflammatory cytokines. These responses promote vascular inflammation, kidney dysfunction and sustained hypertension. Indole-3-acetic acid (IAA), a plant growth hormone and gut microbiota metabolite from dietary tryptophan, has been identified in our lab as an inhibitor of blood pressure elevation in Dahl salt-sensitive hypertensive rats. IAA's dual mechanism includes antagonism of both ETAR/ETBR receptors and inhibition of endothelin-converting enzyme-1 (ECE-1). Since macrophages express ETAR, ETBR, and ECE-1, and play a role in vascular dysfunction, we aim to investigate whether IAA inhibits macrophage activation and reduces vascular inflammation.

Methods: In silico analyses, Cell culture, Western blotting (WB), Leukocyte adhesion assay

Results: Our Ca^{2+} imaging data unveils that IAA inhibits ET-1 stimulated, ETAR- and ETBR-mediated increases in cytosolic Ca^{2+}. Our in-silico analysis unveils that IAA exhibits distinct modes of interaction with the orthostatic binding pockets of both ETAR and ETBR. This analysis demonstrates that IAA acts as a blocker of both ETAR and ETBR. IAA, by inhibiting macrophage ETAR/ETBR, inhibits ET-1-evoked functional activation of RAW264.7 cells, characterized by increased production of inflammatory cytokines and overexpression of integrins. Using Western blotting we found that IAA inhibits ET-1-mediated production of inflammatory cytokine, including IL-1, IL-6, TNF-α and integrins like LFA-1 and MAC-1. Leukocyte adhesion experiments show that ET-1 treated wells have a robust increase in leukocyte attachment and IAA-treated wells show a reduction in leukocyte attachment as compared to ET-1 treated group.

Conclusion: Overall, our data suggest that IAA competitively blocks ET-1receptors and ECE-1 in macrophages, thereby suppressing vascular dysfunction. This project may identify novel mechanisms whereby IAA modulates immune cell function and downstream inflammation, leading to beneficial effect on cardiovascular health.

Atlanta – 11

Formulation, characterization, and HPLC analysis of parenteral Nicardipine HCL dextrose-based solution for intrathecal administration in angiographic vasospasms

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Abstract

Nontraumatic subarachnoid hemorrhage (SAH) is an uncommon but often devastating cause of stroke that causes high mortality and morbidity. One common catastrophic neurological effect of SAH in patients is angiographic vasospasm. Angiographic vasospasm can be alleviated via intravenous administration of Nicardipine HCl solution. However, severe hypotension can occur. Currently, three intravenous Nicardipine HCl products are approved by the FDA, containing buffer solutions with an acidic pH of < 3.5, which induces inflammation at the injection site and has poor patient compliance. These systemic side effects can be avoided via intrathecal administration of Nicardipine HCl. Also, administering higher doses using higher volume is not feasible with a lower drug strength of <2.5 mg/ml. This research aims to develop and characterize parenteral Nicardipine HCl dextrose-based solution with higher strength (5 mg/ml) in dextrose solution with a pH of > 4.5 for intrathecal administration to treat vasospasm and overcome systemic side effects. The Thermo Scientific Ultimate 3000 HPLC was used to develop the method and validation with an assay range of 90-110%. Solubility was determined using increasing concentrations of Dextrose solution (5%, 6%, 7%, and 8%). Finally, pH of the final product was measured, and visual observations were taken at day 0, 2 weeks, 1 month, 3 months, 6 months, and 12 months. It was observed that with increasing concentration of dextrose, the solubility of Nicardipine HCl was significantly increased. The pH of the final formulation was 4.54. On day 0, all the samples appeared clear light yellowish. The formulation stored at 40oC±2oC/RH 75± 5% contained particles after 2 weeks, the formulation stored at 30oC±2oC/RH 65±5% contained fine particles after 1 month, and the formulation stored at 25oC±2oC/RH 60± 5% contained fine particles after 3 months. The formulations stored at 2-8oC were acceptable in assay and visual results at all time points.

Atlanta – 12

Vaccine Formulations through the Bovine Serum Albumin (BSA) and Poly (lactic-co-glycolic acid) (PLGA) Particles

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Abstract

Developing effective vaccine formulations often involves using particulate carriers to enhance antigen stability, delivery, and immunogenicity. Bovine serum albumin (BSA) and poly(lactic-co-glycolic acid) (PLGA) particles are notable for their biocompatibility and potential as vaccine carriers. This study compares BSA and PLGA particles, focusing on their physicochemical properties and antigen encapsulation efficiency. Vaccines for Zika, Delta, and Omicron viruses were prepared using double emulsion, while Gonorrhea bacterial antigens were prepared using spray drying. BSA particles were synthesized via spray drying, and PLGA particles via double-emulsion solvent evaporation. The formulations were categorized into eight groups: Zika MP (PRVABC59), Delta MP, and Omicron MP (virus antigens via double emulsion); Gonorrhea MP (CDC F62), Gonorrhea MP (FA19), and Gonorrhea MP (FA1090) (bacterial antigens via spray drying); Blank PLGA MP (double emulsion); and Blank BSA MP (spray drying). Particle size, poly-dispersity index (PDI), and zeta potential were analyzed using Zetasizer Nano ZS, and encapsulation efficiency was assessed with the Pierce™ BCA assay kit and scanning electron microscopy. Stability under various storage conditions and in vitro release profiles were evaluated. BSA particles showed a smaller size distribution (150–200 nm) and higher encapsulation efficiency (85% vs. 70%) compared to PLGA particles (200–300 nm). BSA particles were more stable at lower temperatures, while PLGA particles exhibited better stability under physiological conditions. Both particle types demonstrated sustained release profiles in vitro. This study highlights the strengths of BSA and PLGA particles as vaccine carriers. BSA offers superior encapsulation efficiency, and PLGA better control over antigen release, supporting future advancements in vaccine formulation.

Atlanta – 13

Pioneering the Targeted Brain Delivery of Aspirin to Elicit COX-1&2 Inhibition, Protecting from Ischemic Stroke and Neurodegeneration

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Abstract

Introduction and Purpose:

Aspirin, a small molecule NSAID, exhibits anti-inflammatory properties through cyclooxygenase inhibition in the arachidonic acid and prostaglandin pathways. While effective, current oral and intravenous administration routes have limitations, such as poor blood-brain barrier (BBB) penetration and systemic side effects like gastric bleeding. We identified that a brain-targeted delivery system could enhance aspirin's potency in the brain with precise dosing while reducing side effects. We developed a brain-targeting intranasal nanoparticle (NP) delivery system using microfluidics and Rabies Virus Glycoprotein (RVG29) ligand conjugation to enhance brain delivery and reduce systemic exposure. To determine the drug deposition profile of brain-targeted Aspirin NPs in mice blood serum and organs (brain, liver, lungs, heart), at 3 hours post-intranasal administration, blood serum and organs were analyzed for Aspirin using LC-MS/MS. We also aimed to establish the pharmacokinetic parameters of Aspirin NPs when administered via non-traditional routes of administration like intranasal route and compare with oral administration.

Methods: Aspirin NPs were formulated via the nanoprecipitation method using microfluidics then conjugated with RVG ligands. The NPs were characterized for size, zeta potential, encapsulation efficiency, and drug release. Mice were administered 50mg/kg of Aspirin NPs intranasally and orally. After 3 hours, brain and organ samples were analyzed using LC-MS/MS.

Results: After intranasal administration, the highest brain concentration (159.4 ng/mg) occurred at 3 hours, with significantly lower levels observed after oral administration (12.6 ng/mg). Aspirin concentrations in non-brain organs were lower with intranasal delivery compared to oral administration, indicating more targeted delivery to the brain and reduced systemic exposure.

Conclusion: Intranasal delivery of brain-targeted Aspirin NPs enhanced drug deposition in brain tissue while minimizing systemic exposure, showing promise for treating central nervous system conditions like stroke and neurodegeneration.

Atlanta – 14

Evaluating T-Cell Proliferation in Response to In-House Generated Nanoparticluated Vaccine Candidates Targeting Various Pathogens

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Abstract

Purpose:
Evaluating vaccine formulations for T-cell activation and proliferation is essential in early vaccine development stages. To effectively evaluate our in-house formulated particulate vaccine candidates, we have created a high-throughput, cost-effective in vitro assay that mimics the immune system. The platform uses CFSE dye and flow cytometry to measure T-cell proliferation, effectively screening efficient candidates for further in vivo preclinical testing, thus minimizing reliance on animal models and accelerating the successful development of particulate vaccines. Our approach enables faster identification of effective candidates, propelling them into preclinical testing and advancing vaccine innovation.

Methods: In this assay, DCs were overlaid with CFSE-stained T-cells after being stimulated by vaccine formulations. T-cell proliferation was quantified using flow cytometry. We tested the robustness of this assay using nanoparticulate vaccines targeting pathogens such as Neisseria gonorrhoeae, measles, H1N1, canine coronavirus, and Zika. Adjuvants included Alum and AddaVax™. The assay showed robust T-cell proliferation across all vaccine groups, with early onset and sustained proliferation through day 6, compared to blank controls. There were notable differences in the proliferation patterns between bacterial and viral candidates, and a dose-dependent relationship was observed.

Results: T-cell populations exposed to bacterial and viral vaccine candidates exhibited significant clonal expansion, as indicated by diminished CFSE dye intensity. By day 6, there was a marked increase in daughter cell populations across all treatment groups. Vaccine-treated groups demonstrated significantly higher proliferation compared to blank controls. Additionally, a dose-dependent increase in T-cell proliferation was observed, further establishing the effectiveness of the formulations.

Conclusion: This in vitro assay demonstrated its ability to mimic immune activation and differentiate between bacterial and viral vaccine candidates. Our future studies will explore the effects of cytokines, such as IL2, on T-cell clonal expansion and further assess the T-cell repertoire in response to live antigen challenges.

Atlanta – 15

Discovery and structural activity relationship of synthetic cathinone-derived M2 muscarinic receptor antagonists

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Abstract

There are five genetically-encoded muscarinic-type acetylcholine receptors (mAChRs), M1, M2, M3, M4, and M5Rs, widely expressed in the periphery and in the central nervous system. Although there are hundreds of FDA-approved muscarinic receptor-targeting medications, none has high selectivity (≥15–fold) for binding one muscarinic receptor over the other four; this off-target liability leads to a panoply of side effects. We previously discovered that the synthetic cathinone α-pyrrolidinohexiophenone (α-PHP) has ~7–fold selectivity for M2R over the other mAChRs. α-PHP, however, elicits potent psychostimulant effects via its inhibitory activity at the monoamine transporters, NET, SERT, and DAT. This project aims to use medicinal chemistry and molecular pharmacology structure-activity relationship approaches to discover a highly-selective M2R. We conceived, designed, and synthesized five compounds, PAW-1,2,3,4, & 5, and assessed their mAChR activity. PAW-1 and PAW-2 were M2R antagonists with nanomolar affinity for M2Rs, and 10–18-fold selectivity for M2Rs over the other mAChRs, making PAW-1 and PAW-2 the most selective M2R ligands relative to M1-M4Rs, reported. The affinity and functional activity of PAW-1 and PAW-2 at the monoamine transporters DAT, NET, and SERT were assessed and compared to α-PHP; PAW-1 and PAW-2 exhibited ~20–30-fold lower affinity for NET, ~2.5–3.5-fold less affinity for DAT, and no appreciable affinity for SERT. Our discoveries provide the infrastructure to refine further and develop the first highly selective M2R antagonist. As presynaptic M2Rs regulate acetylcholine release and are essential modulators of physiological functions impaired in various diseases, our drug discovery program may yield clinically safer and effective M2R-selective medicines.

Atlanta – 16

Targeting the endothelin system for the treatment of high salt-induced tau phosphorylation and Alzheimer's disease

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Abstract

Background and Objective

Cognitive impairment and neuronal dysfunction associated with Alzheimer's disease (AD) has been attributed to the hyperphosphorylation of tau (p-tau) instigated by high salt diet (HSD). HSD was shown to activate adaptive immune response orchestrated by T_h17 lymphocytes producing high levels of interleukin-17 (IL-17) within the brain and systemic circulation. This inhibits endothelial nitric oxide synthase, lowers the vascular production of nitric oxide (NO) and increases phosphorylated tau (p-tau) in rodents. Our laboratory has discovered that indole-3-acetic acid (IAA), suppresses HSD-induced hypertension by inhibiting ET-1 receptors (ETRs) and ET-1 biosynthetic enzyme, ECE-1. Since HSD promotes immune dysregulation, leading to AD, we hypothesize that IAA may potentially restrain HSD-stimulated p-tau and the pathogenesis of AD by inhibiting immune cell activation. Macrophages and dendritic cells, both expressing ETAR and ETBR, and ECE-1 are activated by high levels of ET-1 which upregulates reactive oxygen species, cytokines, and integrin overexpression. The resultant immune dysregulation impairs NO production and causes oxidative stress, ultimately leading to AD.

Methods

Pressure myography will be used to assess endothelial and smooth muscle cell function in cerebral vasculature. Western blot and ELISA will be used to measure p-tau in neurons and plasma. Meso scale discovery will be employed to analyze cytokines in the brain and plasma. Flow cytometry will be used to quantify the infiltration of immune cells into cerebral tissue, together with their polarization. To assess memory function, elevated plus maze and Morris water maze will be used.

Results

Our in-silico analyses predict interaction between IAA and the ET targets, ETAR, ETBR and ECE-1. Our Ca2+ imaging experiments demonstrate that IAA inhibits ETR-evoked Ca2+ release in cells containing either ETAR or ETBR.

Conclusion

Our future studies will unveil the role of this gut microbiota-derived metabolite in HSD-induced p-tau, leading to the development of AD, potentially unlocking another important aspect of the gut-brain axis.

Atlanta – 17

Role of a novel compound in obesity-induced diabetes and hypertension

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Abstract

A recent study from our laboratory has identified that indole-3-acetic acid (IAA), a metabolite produced by the gut microbiome, inhibits endothelin-1 (ET-1) overproduction by targeting endothelin-converting enzyme-1 (ECE-1), the primary enzyme for ET-1 biosynthesis, and also attenuates ET-1 signaling by antagonizing its receptors, ETAR and ETBR. This unique dual action, not reported in currently available drugs, significantly reduces blood pressure elevation in Dahl salt-sensitive (DSS) rats, a model of enhanced ET-1 production and signaling. Given the link between obesity and increased ET-1 activity, this study aims to explore whether IAA can mitigate obesity-induced type-2 diabetes (OT2D) and hypertension (HTN). Our preliminary data using methods like random blood glucose measurements (RBG), oral glucose tolerance tests (OGTT), tail cuff plethysmography, pressurized arterial myography show that daily administration of an extended-release formulation of IAA (IAA-ER) in a rat model of OT2D effectively suppresses the development of T2D, insulin resistance (IR), HTN, and vascular dysfunction respectively. Also, as obesity is a disorder of chronic hypoxia leading to increased plasma ET-1 production we demonstrated that ET-1 levels were reduced after IAA treatment in hypoxia-induced mouse endothelial cells (MECs). Overall, our study investigates the efficacy of IAA in counteracting high-fat diet-induced OT2D, HTN and vascular dysfunction. This study promises to provide new insights into the role of this gut microbiome-derived metabolite in OT2D and supports the broader application of IAA as a novel antihypertensive agent.

Atlanta – 18

Targeting the endothelin system for the treatment of preeclampsia

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Abstract

Preeclampsia is the major medical complication and risk factor for perinatal mortality during pregnancy in the United States and worldwide.
A large body of evidence suggests that endothelin-1 (ET-1) is involved in the pathogenesis of preeclampsia. Studies show that augmented ET-1 production and signaling are associated with the pathophysiology of preeclamptic patients. ET-1 elevation is believed to happen through placental ischemia which results in increases in cytokines and inflammatory mediators that eventually activate the ET-1 system.
Currently ET-1 receptor antagonists are clinically available, but there is no medicine available that targets both ET-1 receptors (ETRs) and ET-1 converting enzyme (ECE-1). Our lab has recently discovered a dual action gut microbiota-derived metabolite, indole-3-acetic acid (IAA), which acts both via antagonism of ET-1 receptors, ETAR and ETBR, and inhibition of ECE-1, that can reduce ET-1 production and signaling.
Here we hypothesize that IAA as a dual inhibitor of both ETRs and ECE-1 may restrain the pathogenesis of preeclampsia in a leptin-induced rat model of preeclampsia. To test this hypothesis, we will analyze blood pressure, smooth muscle and endothelial cell function in isolated vessels, ET-1 concentrations in plasma and vessel lysates, and the expression of ET-1 receptors ETAR and ETBR, and ECE-1.
Our in-silico analysis predicts the mechanism of interaction between IAA and the orthosteric binding pockets of ETAR and ETBR. Ca^{2+} imaging results demonstrate that pretreatment with IAA causes significant inhibition of ET-1-evoked Ca^{2+} fluorescence in HEK-293 cells, manifesting that IAA is indeed a dual antagonist of both ETAR and ETBR.
Further, our in-silico analysis shows that IAA interacts with the catalytic pocket of human ECE-1, and inhibits purified human ECE-1 in vitro in a concentration-dependent manner.
Overall, our study suggests that IAA is a novel dual inhibitor of ETRs and ECE-1, a feature that could potentially revolutionize the treatment of preeclampsia.

Atlanta – 19

The Involvement of Free Fatty Acid Receptor-4 in Atherosclerosis: Inflammation and Therapeutic Insights

Razan L. Teyani and Nader H. Moniri

Abstract

Background and Objective: Free-Fatty acid receptor-4 (FFA4), previously termed GPR120, is a G protein-coupled receptor that belongs to the rhodopsin-like family of 7-transmembrane receptors that binds medium and long-chained free-fatty acids, including omega 3-, 6-, and 9- fatty acids (e.g., DHA, EPA, α-LA). FFA4 elicits anti-diabetic and anti-inflammatory responses upon agonism and exhibits prominent expression in immune cells, particularly in macrophages. Previously, we have demonstrated that FFA4 expression and agonism can modulate reactive oxygen species (ROS) in RAW 264.7 macrophages. Since macrophage-induced ROS generation contributes to foam cell formation that lead to the inflammatory etiology of vascular diseases including atherosclerosis, we hypothesized that FFA4 may regulate this process.

Methods: Human carotid artery tissues were stained to visualize FFA4 and macrophage markers. Tissues were stained at stages 2 and 4. L-012, a luminol based chemiluminescent probe, detected oxidative stress in RAW 264.7 macrophages following cholesterol induction. Oil Red O staining assessed lipid droplet formation in cholesterol-induced RAW 264.7 macrophages. FFA4 agonists were utilized to assess its potential anti-inflammatory effects and role in lipid droplet formation. Additionally, a stable RAW 264.7 cell line overexpressing WT-S FFA4 was also employed to validate these findings.

Results: FFA4 and macrophages co-localized in human carotid artery tissues at both stages. FFA4 agonists (DHA, compound A, and TUG-891) significantly reduced ROS generation and lipid formation in RAW 264.7 macrophages. The FFA4-overexpressing cell line confirmed the anti-inflammatory response and reduction of lipid droplet formation.

Conclusion: In brief, our ongoing study provides further insight into the involvement of FFA4 in modulating immune and inflammatory responses in macrophages, as well as understand the potential role that FFA4 contributes to foam cell formation. Our study on FFA4 further intends to provide insight into potential therapeutic propositions in understanding the intertwining of inflammation and metabolism.

Atlanta – 20

The Role of Peripheral α2-Adrenergic Receptors in Xylazine-Induced Skin Necrosis

Mary Vu

Abstract

In the past decade, there has been an increased use of xylazine as an adulterant in illicit drugs in the United States. Xylazine in an α2-adrenergic receptor (α2AR) agonist and chronic intravenous xylazine use has been associated with detrimental clinical outcomes such as overdose and skin necrosis. Currently, there is no antidote for xylazine overdose, and naloxone treatment only reverses the effects of a co-administered opioid. Despite the increased usage, lack of information regarding xylazine and its implications on severe tissue injury has become a major public health concern. The objective of this project is to investigate the potential mechanism of action of xylazine at α2-adrenergic receptors. We hypothesize that xylazine-associated skin necrosis is caused by persistent vasoconstriction leading to hypoxia via activation of α_{2C} adrenergic receptors in vascular smooth muscle cells. Using radioligand competition binding assays, we have determined xylazine's binding affinities (K_i) at each α2-adrenergic receptor subtype. Briefly, HEK293 cells were cultured and transfected with α2A, α2B, or α2C adrenergic receptors. Competition binding assays were performed using the agonist radioligand, [3H] Clonidine, and a dose response of clonidine and xylazine at each α2AR subtype. Xylazine's K_i at α_{2A}, α_{2B}, and α_{2C}AR was found to be 1730 nM, 508 nM, and 44.2 nM, respectively. This project seeks to advance the pharmacological knowledge of xylazine and explore mechanisms causing skin necrosis.

ATLANTA Clinical

Atlanta – 21

A cup of comments: spilling the tea on a faculty development program for new hires

Tonya F. Pearson, Kenric Ware, Tyler Boyd, Philip S. Mensah, Jill M. Augustine

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Abstract

Background and Objective: Faculty College is a year-long program for new faculty to aid their learning of academic roles and responsibilities. The objective is to determine which development topics within Faculty College were most beneficial to faculty members.

Methods: An eight-question survey was administered to all faculty members at the college and requested respondents to provide feedback on Faculty College. Background questions queried respondents' primary department and when they completed Faculty College. Questions assessed the impact of Faculty College on their development, what they recalled from their Faculty College experience, and which topics should be continued, removed, and/or added. Frequencies were reported for all responses. This research was deemed exempt from the university's institutional review board.

Results: 100% faculty members (n=28) completed the survey, with 36% (n=10) from pharmaceutical sciences and 64% (n=18) from pharmacy practice. Eighteen (64.3%) of respondents indicated the topic of "overview of the curriculum" should be continued. While eleven (46%) respondents indicated that no topics should be removed, the topic of class technology was suggested by four respondents (15.4%). Suggested topics to include in future iterations were: specific teaching technology (e.g., ExamSoft, MyDispense), promotion and tenure (e.g., timeline, process, requirements), research components (e.g., writing, grants, scholarship of teaching and learning), and writing good test questions and learning objectives.

Conclusion: Faculty College was created to help new faculty assimilate to academia. This research provides a brief glimpse into how schools/colleges of pharmacy can orient new faculty to academia. Feedback from faculty members can provide an opportunity to assist in the further development of new faculty. Research on the impact of Faculty College or other faculty development programs for new faculty members should be conducted.

ATLANTA Medical Education

Atlanta – 22

Supporting Newly Admitted Students' Transition to Pharmacy School

C. Lea Winkles, PharmD, Candace W. Barnett, PhD, Jordana Berry, MBA, Tennesha Frierson-Ali, Med, Reid Proctor, PhD

Abstract

Objective: To provide pre-matriculation intervention in areas of basic need to newly admitted Doctor of Pharmacy students and to determine post-intervention changes made by students in the transition areas.

Methods: Six transition areas were identified as basic needs that should be addressed by students prior to matriculation that are related to their potential for academic success. These areas included: housing, commute, non-school responsibilities and commitments (e.g., childcare, excessive extracurricular activities), work, finances, and study approach. A pre-matriculation survey was administered to 24 students enrolling in January 2024. Based on survey responses, members of the College's transition team contacted students to intervene in one or more of the six transition areas when plans had not been made or when plans were seen as a potential barrier to academic success. A post-matriculation survey was administered during New Student Orientation to identify changes students made based on interventions.

Results: Twenty-four students (100%) completed the pre- and post-surveys. Based on pre-survey data, 14 students were contacted (seven video conferences, seven email exchanges). Interventions made included: work (36.8%), study approach (31.6%), finances (15.8%), non-school related responsibilities (10.5%), and housing (5.3%). Students made a total of 54 changes in the transition areas. Thirty-three (61.1%) of the changes were made by students who received intervention, and 21 (38.9%) were made by students who had not been contacted for intervention.

Conclusions: Pre-matriculation intervention for students in areas of basic need is one way to assist them in the transition to pharmacy school and proactively address academic success.

COLUMBUS Biomedical

Columbus – 1

Altered Ultrasonic Vocalization in a $Na_V1.2$ Mutant Mouse Model of Autism Spectrum Disorder

Shaymaa Abdalla#, Zachary Thomas Carman#, Hossam Ismail, and Ahmed Eltokhi*

# equal contribution

Abstract

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by impaired social interaction, communication deficits, and repetitive behaviors. A prominent feature of communication challenges in ASD is echolalia, a behavior where individuals repeat words or phrases, reflecting altered speech patterns and difficulties in spontaneous communication. In animal models, ultrasonic vocalizations (USVs) are commonly used as a proxy for studying communication, particularly in mouse models of ASD. Here, we present findings from a novel $Na_V1.2$ mutant mouse model carrying an autism-associated mutation (R854Q), aimed at investigating alterations in communication behavior. Using a pup isolation protocol, we recorded and analyzed USVs emitted by the heterozygous $Na_V1.2$ mutant pups during separation from the dam. Compared to wild-type controls, the $Na_V1.2$ mutant pups displayed a significantly increased number of ultrasonic calls with prolonged call duration. Additionally, the time intervals between successive calls were reduced, indicating a more rapid emission of vocalizations. Interestingly, the peak frequency of these calls was lower in the mutant mice, while the peak power was elevated. These characteristics—particularly the increased call frequency and altered temporal and acoustic properties—mirror the repetitive and abnormal speech patterns observed in individuals with ASD. Our findings suggest that this $Na_V1.2$(R854Q) mutation contributes to altered communication patterns, as evidenced by changes in vocalization behavior, which may serve as an analog to the echolalic behaviors observed in ASD patients. These results offer valuable insights into the molecular mechanisms underlying communication deficits in ASD, providing a foundation for further studies into therapeutic targets for managing these core symptoms.

Columbus – 2

Identification of age-associated upstream regulator to promote neuronal resilience in HD patient-derived neurons.

Emily Bacallao, Dr. Seong Won Lee

Abstract

Huntington's Disease (HD) is a dominantly inherited neurodegenerative disease with adult-onset clinical symptoms, but there are currently no curative treatments available. The exact mechanism by which this disease causes neuronal damage in patients with HD remains unclear, but it is known that the medium spiny neuron (MSN) is the primary cell type that is mutated in the HD pathology. The reprogrammed MSNs derived from symptomatic HD patient (HD-MSN) was examined in this study through the conversion of adult fibroblasts into MSN using the lentiviral method. A previous study discovered four age-related upstream regulators that have a possible HD rescue when knocked down, which include REST, NFKB1, IRF3, and SOD1. This study aims to determine which of these four candidates have the strongest neuroprotective effect in HD pathology when downregulated in HD-MSNs. Once each of the upstream regulators were downregulated in HD-MSNs, we performed the Sytox-Green assay and 53BP1 counting assay to determine the level of neuronal cell death and DNA damage recovered by each candidate's knockdown. After validating our reprogrammed MSNs, we found that NFKB1 has the strongest ability to rescue the HD pathology when downregulated, in the Sytox-Green and 53BP1 counting assays, compared to the other upstream regulator candidates. With these results, there is a need to further investigate NFKB1 in its role in HD progression in order to potentially discover novel treatments for HD.

Columbus – 3

Characterization of Antimicrobial Peptide WAM-1 and its Interaction with Clinical Isolates of *Acinetobacter baumannii*

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Abstract

Acinetobacter baumannii is prevalent in health care settings, commonly causing life-threatening disease in immunocompromised individuals with mortality rates approaching 35%. Known for its resistance to commercially-available antibiotics, research into treatment with antimicrobial peptides (AMPs) has proven promising. Our lab has previously shown that the AMP WAM-1 exhibits potent bactericidal activity against *A. baumannii*, but its full therapeutic value and mechanism of action have not yet been elucidated. To evaluate the potential therapeutic applications of WAM-1, we characterized its antibacterial effects, whether that activity was inhibited by the presence of exogenous lipopolysaccharide (LPS), and its cytotoxicity against eukaryotic cells. Additionally, we explored WAM-1's mechanism of action by visualizing structural changes induced in *A. baumannii* by treatment with WAM-1 and evaluating its ability to permeabilize the bacterial outer membrane. A standard microbroth dilution assay was used to determine the minimum inhibitory concentration (MIC) of WAM-1, and MICs comparable to those of efficacious antibiotics were observed. This activity was not inhibited by the presence of exogenous LPS. Low hemolysis by WAM-1 indicated potentially low toxicity in vivo. *A. baumannii* treated with WAM-1 was visualized using scanning electron microscopy and evidence of membrane disruption, cellular content leakage, and cell lysis were observed. The ability of WAM-1 to permeabilize the outer membrane was determined using the fluorescent probe 1-N-phenylnaphthylamine (NPN), and structural damage to the bacterial outer membrane was indicated. Overall, our data indicate that WAM-1 is a promising therapeutic option for *A. baumannii* infections and may act, at least in part, by damaging the outer membrane. Ongoing work to characterize the mechanism of action of WAM-1 by examining bacterial membrane depolarization, cytoplasmic membrane damage, and reactive oxygen species production will further elucidate its efficacy and clinical relevance.

Columbus – 4

Role of Reactive Astrocytes Activated and Microglia Activated by Sleep Interruption in the Onset of Sensorimotor Deficits in Mice

Ebonie Crittenden, Chang Chung

Abstract

On average, an individual dedicates around 26 years of their life to sleep. Nightly restoration is vital for the body, supporting essential functions such as immunity, metabolism, and cognitive performance. The circadian rhythm functions as the body's internal clock, governing our sleep and wake cycles and playing a crucial role in overall sleep health. Disruptions to the circadian rhythm can lead to a range of health problems, both short-and long-term, including various sleep disorders. Uninterrupted sleep becomes nearly impossible in a hospital setting since inpatients are frequently awakened for vital checks, medication, blood draws, and other assessments. While studies have explored the effects and eventual consequences of severe sleep deprivation and stress on the mammalian system, there remains a lack of mechanistic understanding regarding how sleep interruption impacts regions throughout the brain. The central hypothesis in this study proposes that the activation of microglia and astrocytes in targeted regions of sleep-interrupted mouse brain leads to the manifestation of sensorimotor deficits. Our study employs mouse models to investigate sleep interruption on brain function. The study utilizes immunofluorescence staining on cryosectioned brain slices, for visualization and quantitative analysis of images of CD68, GFAP, IL-23, IL-6 and TNF-α stainings, which identify activated microglia, astrocytes, and inflammatory cytokines respectively. Preliminary results indicate significant increase in activated astrocytes and microglia in the Optical Tract, Cerebral Peduncle, Internal Capsule, and Globus Pallidus of sleep-interrupted mouse, areas a part of the basal ganglia. The basal ganglia play an important role in controlling the body's voluntary movements. Mice treated with ABT888, a microglia activation inhibitor, indicate less microglia activation in sleep interrupted mice. Expected results of behavioral and sensorimotor will reveal that astrocyte or microglia activation leads to a decline in sensory-motor proficiency in sleep-interrupted mice.

Columbus – 5

Investigating Gating Pore Currents in $Na_V1.2$ Mutations Across Clinical Phenotypes

Tamer M. Gamal El-Din, Brian Nils Lundstrom, and Ahmed Eltokhi*

Abstract

Voltage Sensor Domains (VSDs) are integral and common regions within various voltage-gated ion channels, which play a crucial role in cellular signaling and excitability. They respond to altered membrane voltage across the cell membrane by undergoing conformational changes, thereby modulating the opening or closing of associated ion channels. They are composed of four transmembrane (TM) segments (S1–S4). Our previous findings demonstrated that mutations in the Arginine (Arg) gating charge residues of S4 in Domains II and IV of the $Na_V1.2$ brain sodium channel induced a pathogenic leak known as gating pore current, which is associated with autism spectrum disorders (Eltokhi et al., *PNAS*, 2024). The current study extends our investigation to three other Arg gating charge mutations in Domain I of the $Na_V1.2$ channel, identified in patients with other distinct clinical phenotypes. Our goal is to assess whether these mutations induce gating pore currents and characterize their biophysical properties, shedding light on the possible reasons for the heterogeneity of phenotypes. Identifying gating pore currents as a potential shared pathophysiology across diverse clinical presentations paves the way for unified therapeutic interventions.

Columbus – 6

Novel Spinal Cord Stimulation Technique Using Non-Invasive Temporally Interfering Electric Fields

Miller L. Gantt, Richard Hou, Emma Acerbo, Claire Anne Gutekunst

Introduction: Temporal Interference (TI) is an innovative, non-invasive technique used to stimulate brain and peripheral nerves in humans and animal models. This method applies two high-frequency electric fields (>1 kHz) that intersect at a focal point, stimulating tissue at a differential frequency (Δf). Neuronal responses at Δf have been documented in both brain and peripheral nerves. Despite its potential, TI has not yet been applied to spinal cord stimulation, which could be transformative in rehabilitation following traumatic injuries. This study aims to evaluate the efficacy of TI in spinal cord stimulation in mice, building on established effects observed in peripheral nerve stimulation.

Methods: We conducted seven trials stimulating the spinal cords of anesthetized mice (isoflurane) using two pairs of skin electrodes. Initially, we replicated peripheral nerve stimulation on the sciatic nerve (n=4) based on previous studies (Botzanowski et al., 2022), followed by spinal stimulation at the L4-L5 vertebrae (n=3). We gradually increased Δf and assessed the induced leg movements to determine whether spinal cord stimulation responds at the Δf frequency and if the resultant movement amplitudes are comparable to those of peripheral nerve stimulation. Movement frequency and amplitude were quantified using ImageJ with a motion tracking plugin.

Results: Our findings demonstrate that spinal cord stimulation via TI induces movements with frequencies and amplitudes similar to those observed in sciatic nerve stimulation (P-value from Kruskal-Wallis Test: 0.339311), indicating no significant differences between the two stimulation sites.

Conclusion: This study is the first to show that spinal stimulation via TI can induce controlled movements, confirming that the effects observed in peripheral nerve stimulation are due to TI rather than muscular responses to electrode contact. Additionally, to confirm neuronal engagement, future studies will include c-fos staining, providing essential validation of TI's stimulatory effects. This will provide corroborative evidence that the neural pathways are being activated in a manner analogous to that observed in brain tissues. Finally, these results have significant implications for rehabilitation therapies for patients with nerve damage or traumatic injuries and may provide a non-invasive alternative to deep brain stimulation systems for Parkinson's disease patients.

Columbus – 7

Translational Literature Review: Inhibiting Gut-to-Brain Alpha-Synuclein Transmission With Emerging Deep Brain Stimulation Strategies

Haley R. Channell, Miller Gantt

Abstract

Parkinson's disease (PD) is a widespread neurodegenerative disorder, characterized by progressive deterioration of motor functions, psychological well-being, and cognitive abilities. This review focuses on research led by Dr. Richard Karpowicz and colleagues, which examines the pathological spread of PD through a prion-like, cell-to-cell transmission. Further, it discusses potential future research aims, in conjunction with my current research at Emory Department of Neurosurgery.

Central to the discussion are the Braak and dual-hit hypotheses, which suggest that the disease initiates in the vagal nerve endings of the gastrointestinal (GI) tract and gradually spreads to the brain through the vagus nerve. Aggregates of misfolded alpha-synuclein proteins, known as Lewy bodies, are the primary agents of neurotoxicity and disease progression in PD. These aggregates possess prion-like properties, enabling them to induce the misfolding of neighboring healthy alpha-synuclein proteins.

Understanding the thermodynamic laws governing protein folding and stability, especially in the context of alpha-synuclein, is critical for future research. This review delves into the mechanisms of alpha-synuclein misfolding, its physiological and pathological roles, and how it propagates from the gut to the brain. Moreover, the review explores the implications for treatment, including novel forms of deep brain stimulation (DBS) and the challenges associated with neuronal grafts, which are susceptible to the same pathological processes.

Lastly, novel AI-driven diagnostic tools that quantify enteric neuron populations may offer early detection and intervention opportunities, potentially halting the disease before its full progression to the brain.

Columbus – 8

Progressive Dopaminergic Neuron Loss and Neuroinflammation in Diet-Induced Obesity in Parkinson's Disease Pathogenesis

Vanessa Martinez Lenis, Dr. Chang Y. Chung

Abstract

Parkinson's disease (PD) is a progressive neurodegenerative disorder marked by the degeneration of dopaminergic neurons in the substantia nigra, leading to significant motor and non-motor symptoms. Recent research suggests that obesity, characterized by excessive body fat accumulation, may influence the risk and progression of PD through several mechanisms. Many studies explore how diet-induced obesity (DIO) affects dopaminergic neuron integrity and neuroinflammation in a mouse model. We hypothesized that obesity exacerbates dopaminergic neuron loss and increases neuroinflammation as evidenced by changes in microglial activation and inflammatory cytokine levels. To test this, we analyzed brains from DIO mice over six weeks, focusing on three key brain regions: the substantia nigra pars compacta (SNpc), globus pallidus (GP), and ventral tegmental area (VTA). We used immunofluorescent methods to assess tyrosine hydroxylase (TH) levels, microglial activation (CD68), and interleukin-23 (IL-23) intensity. Our results revealed a progressive decline in TH signals in the SNpc from weeks 2 to 6, indicating significant dopaminergic neuron loss. Concurrently, microglial activation increased, with a notable rise in the ratio of activated to total microglia, particularly by week 6. IL-23 intensity in the VTA also increased over time, highlighting a sustained inflammatory response. These findings support our hypothesis that obesity contributes to progressive dopaminergic neuron loss and heightened neuroinflammation. The results underscore the detrimental impact of obesity on brain health and suggest that targeting inflammation might mitigate obesity-related neurodegenerative changes. Future research should focus on translating these findings to human contexts and exploring potential therapeutic interventions to address obesity-induced inflammation in Parkinson's disease.

Columbus – 9

Rescue of blood brain barrier compromise after ischemic stroke by PAR-1 antagonist

Sarah A. Monteiro, Chang Y. Chung

Abstract

Ischemic strokes are known to have devastating effects, often leading to cell death, neuroinflammation, disability, or even mortality. Simulation of Protease Activated Receptor-1 (PAR-1) increases the release of microglia exosomes, exacerbating damage to the blood brain barrier (BBB) and increasing neuronal injury, especially after oxygen deprivation. This disruption causes morphological changes in endothelial cells lining the BBB, increased monocyte recruitment, and abnormal fibrinogen deposits, all contributing to increased cerebral vulnerability. Although the exact mechanism of neuroinflammation secondary to PAR-1 signaling is not well understood, administering an antagonist of the receptor may offer insights to vascular and brain tissue changes that may mediate post-stroke cellular damage and inflammation.

To investigate how PAR-1 signaling affects the BBB integrity, we used a PAR-1 antagonist to compare microglial activity and BBB integrity with normal PAR-1 function post-stroke in an MCAO mice model. Immunofluorescence staining was used to measure markers such as CD31, (endothelial cells), CCR2, (monocyte chemokine), and fibrinogen deposits in mouse brains following MCAO with reperfusion at 6 and 12 hours. Additionally, we compared these BBB markers between brain slices with normal PAR-1 signaling and antagonized PAR-1 signaling over the same time intervals. Our findings suggest that PAR-1 activation led to a trend in increased neuroinflammation and BBB compromise, with higher levels of fibrinogen, CD31, and CCR2 staining in both 6- and 12-hour ischemic groups. However, PAR-1 antagonism reduced BBB permeability in brains reperfused after 6 hours in comparison to regular PAR-1 action. This suggests that PAR-1 antagonism may reduce BBB disruption within the first 6 hours post-stroke. In future research, more PAR-1 antagonist groups should be included to provide a more accurate understanding of its effects. An examination of the pharmacokinetic effects of PAR-1 antagonists would also be beneficial to understanding its potential therapeutic usage and optimal therapeutic window.

Columbus – 10

Feeling in the Dark: How Leukocytes Sense the Rigidity of the Endothelium

Madeline Smith, Patrick Kho, Arsha Moorthy, Dr. Chamaree de Silva, Dr. Alireza Sarvestani

Abstract

Leukocyte rolling over the vascular endothelium is critical for many physiological processes. Atherosclerosis is characterized by the stiffening of vascular walls due to lipid-rich lesions. Leukocytes are the keepers of the immune system and are found in abundance within atherosclerotic aortas. Leukocyte adhesion begins with rolling due to the specific binding between endothelial selectins and leukocyte ligands. Binding to P-selectin regulates the capture of leukocytes in the face of dislodging hemodynamic forces during their random encounters with endothelium. Progression of atherosclerotic plaques leads to stiffening of the aortic wall. The effect of substrate stiffness on leukocyte rolling is not well-documented in literature. Previous students designed a novel flow chamber containing a reservoir for hydrogel of tunable stiffness. Using this chamber, we were able to mimic the hemodynamic flow conditions within human arteries by passing leukocyte cells through the chamber. Migration velocity and capturing efficiency of flowing leukocytes was obtained through videomicroscopy. Microbeads similar in size to leukocytes were used to separate hydro-mechanical effects from the effects of leukocyte internal signaling while still modeling leukocyte motion. A marked decrease in average rolling velocity of leukocytes upon entering the region of high stiffness was observed, indicating that the sensitivity of rolling velocity to substrate stiffness was attributed to the net positive elasto-hydrodynamic lift force generated by the deformed substrate. Additionally, both beads and the hydrogel were functionalized to assess the motion of ligand-coated microbeads and leukocytes on E-selectin coated hydrogels of varying stiffness *in vitro* to determine the mechanical nature of cellular adhesion. The velocity of the microbeads was reduced in functionalized conditions due to the force of ligand-receptor interactions. Currently, we are modeling this experiment with leukocytes rather than functionalized beads to confirm that this trend of decreased rolling velocity over stiff substrates holds true, following Navier-Stokes equation of fluid dynamics.

Columbus – 11

Investigating How Sleep Interruption Modulates TLR2 and Sepsis

Mackenzie Morgan MS-2, Anjali Patel MS-2, Wendy E Walker

Abstract

Background/Objective: Patients who are ill in the Intensive Care Unit often have fragmented sleep, which makes them experience effects of sleep deprivation. Sleep is needed for circadian patterns of production and expression of cytokines and leukocytes that affect inflammation and sepsis. However, it is unknown what exact mechanism controls the expression of these cytokines and leukocytes. Our study aims to find what mechanism mediates inflammation and sepsis.

Methods: TLR2-KO mice were subject to sleep interruption (SI) or allowed to sleep normally (NS), and then sepsis was induced by cecal ligation/puncture (CLP). These mice were monitored for their condition. Blood samples were obtained to stain leukocytes and prepare serum for cytokine quantification. Additionally, peritoneal lavages were performed on TLR2-KIGFP reporter mice with SI and NS groups to observe resident large and small peritoneal macrophages, B cells, and T cells that contribute to the inflammatory response. We used these mice to observe the expression of TLR2 in the peritoneal cavity.

Results: With cohorts of SI mice (n=7) and NS mice (n=7), we saw the overall survival rate of these mice was the same, but the median survival time of SI mice was less than the median survival time of the NS mice. We observed the disease score of SI mice was notably higher than their NS counterparts, although not statistically significant. Our data found a trend that sleep interruption lessened TLR2 expression in large and small peritoneal macrophages, but it was not statistically significant. There was another trend of higher TLR2 expression in B cells in the peritoneal cavity, but these results were not statistically significant.

Conclusion: We observed trends suggesting sleep interruption may influence sepsis through mechanisms partly dependent on TLR2. In the future, due to the small number of mice utilized in these experiments, they will need to be repeated to subs

Columbus – 12

Determination of the Optimum Volumetric Area Projection for Cannulated Screw Internal Fixation of Femoral Neck Fractures in Porcine Animal Models

Kha Minh Nguyen Ha Vo, D.P.M., M.D., Ph.D.

Background and Objective

Femoral neck fractures carry a higher mortality rate amongst elderly individuals and pose significant social and economic burdens. Depending on severity of fracture and patient candidacy, orthopedic surgeons opt for joint arthroplasty or open reduction internal fixation methods such as percutaneous cannulated screw fixation (PCSF). There is currently no general consensus on the optimum screw configuration for femoral neck internal fixation for PCSF. This research aims to investigate the biomechanical stability of three-screw and four-screw prismatic or pyramidal screw configurations in porcine animal models, evaluating maximum axial load and shear stress prior to failure of bone to provide conclusive data to improve fixation longevity and patient quality of life following surgery.

Methods

Thirty-two porcine femora were cleaned of soft tissue, measured, and potted in epoxy resin prior to fracture generation and fixation with triangular base prism (TBPRISM), rectangular base prism (RBPRISM), triangular base pyramid (TBPYR), or rectangular base pyramid (RBYPYR) volumetric area configurations. Ramp, cyclic fatigue, and failure testing was used to obtain data on maximum axial force and failure shear forces.

Results

RBPYR configurations sustained the highest maximum axial force on average prior to failure, followed by RBPRISM, TBPRISM, and TBPYR configurations. Shear stress data revealed that the RBPRISM configuration sustained the most shear stress prior to failure, followed by the RBPYR, TBPRISM, and TBPYR configurations. Single factor ANOVA analysis of the maximum axial force and shear stress found $p < 0.119$ and $p < 0.256$, respectively, and unpaired t-tests of the same parameters revealed no statistical significance between any sets of groups.

Conclusion

No configuration provided greater biomechanical stability for femoral neck fracture fixation. Future studies should include a control group to establish baseline data for comparison, increased sample size, and failure rate analysis for each configuration to make definitive conclusions regarding superiority between three-screw and four-screw pyramidal and prismatic configurations.

Columbus – 13

Viral Protein R's Role in Inducing DNA damage and driving Senescence in HIV-1 Replication

Imeisha Rountree[1], Timothy Hanley [2]

Abstract

Background: Macrophages play a crucial role in the replication of HIV-1, although the exact mechanism behind their contribution to viral persistence is not fully understood. We hypothesize that the viral protein R (Vpr) induces DNA damage, leading to the production of type 1 interferon (IFN). Several different HIV-1 variants were used to map the contributions of different Vpr functions to virus replication and cellular senescence affects. These included HIV-1 ΔVpr, which lacks Vpr, HIV-1 Vpr Q65R, which does not interact with DCAF-1 which does not induce DNA damage, and the S79A variant, which does not interact with the kinase TAK-1, that initiates the type 1 interferon response.

Methods: CD14+ monocytes were isolated using magnetic beads and the purity was confirmed with flow cytometry. These classical monocytes were used to generate monocyte-derived macrophages (MDMs). MDMs were infected with wild type (WT) HIV-1, HIV-1 ΔVpr, HIV-1 Vpr Q65R, or HIV-1 Vpr S79A expressing GFP to analyze the contributions of various Vpr functions to viral replication as measured by flow cytometry. ELISA was used to measure phosphorylated histone H2AX as a measure of DNA damage in cell lysates at days 3 and 8 post-infection. Western blot was used to detect the cellular senescence protein markers, CDK1 and p21.

Results: VPR mutants can infect macrophages like the WT, although Q65R is less efficient at promoting HIV replication compared to other variants. ΔVPR and Q65R do not induce DNA damage as proficient as the WT virus. ΔVPR and Q65R do not induce CDK1 like the WT does.

Conclusion: Together the data suggest that VPR is important at inducing DNA damage which promotes viral replication and senescence providing a new pathway to study cellular senescence and HIV-1 replication. Future directions include assessing the role of cGAS/STING pathway by using inhibitors or knocking it out with CRISPR technology.

Columbus – 14

Feline leukemia virus: kinetics of viral assembly

Lilah Widner

Abstract

Retroviruses incorporate RNA into a host cell's DNA via reverse transcription. Two important components of feline leukemia virus (FeLV), the Gag (group-specific antigen) protein and nucleocapsid (NC) domain of Gag, play a vital role in these processes. Retroviral assembly relies on the Gag protein, including the interaction between the matrix (MA) domain of the virus and phospholipids. It also heavily relies on the NC to recruit the RNA genome and promote Gag multimerization. In this study, biolayer interferometry was utilized to measure FeLV NC's interactions with different sequences of DNA. Interestingly, unlike NC proteins from other retroviruses, FeLV's DNA binding was characterized by complex kinetics. Further study to determine the source of these differences is underway. Understanding the details of genome packaging helps develop new antiviral strategies and improves the effectiveness of retroviral vectors used in human genome therapy.

Columbus – 15

MUSM Medicinal Plant Genome Project

Cameron Wulfsohn, Drema Beavers, Leslie Goertzen, Kevin Burgess

Abstract

With the rapidly evolving field of genomics in healthcare, the development of a skill set focusing on assembling, analyzing, and classifying genomes will become an essential skill in the future of medicine. With the goal of fostering the development of such skills, this project, in partnership with the American Campus Tree Genomes (ACTG) and Auburn University, was developed to provide an approachable method of educating MUSM students. In this project the target species, *Magnolia virginiana*, was selected due to both its historical and scientific significance, as well as its prolific presence on the MUSM campuses. This also provides a unique opportunity as chloroplast genomes are much smaller than their nuclear counterparts allowing for quicker analysis and identification. After identifying an individual of the species, it was sampled and processed to extract the raw DNA. This raw DNA is then sent off for isolation and sequencing with the ACTG. Utilizing forward and reverse reads of the chloroplast DNA, the chloroplast genome was then able to be assembled utilizing an open-source program. This program processed 111,570,460 reads, each containing 151 base pairs, into a genome based on pattern overlap. The resulting file containing the assembled 141,053 base pairs was then able to be inserted into a genomic annotation program for classification and identification through comparison with related species. This resulted in a labeled chloroplast genome for *Magnolia virginiana* containing 4 major coding regions and 124 identified genes. These results not only provide the classified chloroplast genome of *Magnolia virginiana* for the first time, but also act as template to be used in future genomic endeavors such as mitochondrial and nucleic analysis of human genomes. Thus, furthering the proliferation of analytical and computational skills needed to navigate the usage of genomics in the future of health care.

COLUMBUS Clinical

Columbus – 16

A Study of the Efficacy of the Fruit and Vegetable Prescription Program at MercyMed Wellness Center

Morgan Bickers, Dr. Kimberly Klaus, PhD

Background: MercyMed is a healthcare facility located in Columbus Georgia that aims to meet the healthcare needs of the underinsured community there. Their wellness center provides services in topics like fitness, nutrition, mental, and spiritual health, as do other similar wellness centers around the country. It is important to understand which services provided by wellness centers are effective so as to promote ongoing quality care. The focus of this project was to determine the efficacy of the "Fruit and Vegetable Prescription Program" for improving individual participants' blood pressure (BP), hemoglobin A1c, and body mass index (BMI).

Methods: A list of patients who participated in the program was obtained. BP, BMI, and A1c (for those who qualified as having DM) had been measured before starting the program and then at intervals of 3, 6, 9, 12, 18, and 24 months; this data was located in the EMR. For each parameter, changes during the specified time intervals were calculated, and T-tests were generated from this information. Additionally, the mean change, percentage of positive outcomes, and percentage of negative outcomes were calculated for each parameter and time frame.

Results: The mean values of BP, A1c, and BMI all decreased over time. The percentage of participants with positive change was over 50% in BP, A1c, and BMI and sustained over time. The p values for the t-tests were all statistically insignificant except for the change in systolic and diastolic blood pressure at the one-year mark.

Conclusion: Despite the statistical insignificance of the data collected, greater than 50% of the patients in this program experienced decreases in their BP, A1c, and BMI by participating in this program. The hope is that this data can be taken into consideration and some changes to the program can be made to maintain these changes long term.

Columbus – 17

"Patient Health Outcomes Following Participation in MercyMed of Columbus' Five Weeks to Fitness Course"

Dr. Kimberly Klaus PhD, MMSc, PA-C, Jared Boldt, BS

Background: MercyMed of Columbus is a non-profit medical clinic that serves the underserved population of Columbus, GA. The MercyMed Wellness Center course "Five Weeks to Fitness (5W2F)" encourages incorporating physical activity into daily life and teaches healthy eating habits, weight management, and stress management. The purpose of this study was to assess data on patient outcomes following their participation in the 5W2F course to determine if this program has positive outcomes and knowledge gains for the patient population and to identify strengths and weaknesses of the program to allow for MercyMed to bolster their programs accordingly.

Methods: Secondary data was extracted from: A) a database which contained FoodMed surveys and fitness assessments from 187 participants in 5W2F classes, B) individual fitness assessments from an additional 18 patients, C) class attendance lists, and D) FoodMed surveys for participants not in the original database which were extracted from Athena EMR. All data were combined and cleaned to exclude those without pre- and post-class datasets. A Two Sample T test was completed for fitness assessments and the FoodMed survey was analyzed according to percent respondents for each question pre- and post-class.

Results: Preliminary analysis of FoodMed results (n=53) showed an increase post-class percentage of those who self-reported healthy eating behaviors including utilizing nutrition labels and adjusting meals to be healthier. Fitness assessment analysis indicated an improvement in mean step test (n=55), walk test (n=28), sit to stand (n= 67), lift from the floor (n=44), and lifting overhead (n=23), with only the last 3 tests being statistically significant.

Conclusion: 5W2F has resulted in some positive physical health outcomes and knowledge gains for many participants. It should be noted that some modifications to the class may increase the percentage of participants who indicated positive change and the amount of change sustained.

Columbus – 18

Improvement in Fracture Blister Management with Negative Pressure Wound Therapy (NPWT)

Stephen Durkee BS, Daniel Gentry MS, Nicholas Cavil MD, Conli Schwarz DO, William Judson DO, Robert Harris MD, Brent Ponce MD, John Floyd MD

Abstract

Fracture blisters occur in 2.9% of acute fractures, particularly in lower extremity injuries. Classified as hemorrhagic or serous, these blisters can delay surgical intervention and extend hospital stays. Hemorrhagic blisters involve deeper skin layers than serous blisters, potentially leading to more severe complications. There is no consensus on the optimal management, with current methods including soft dressings, deroofing, and the use of silver sulfadiazine. Negative pressure wound therapy (NPWT) is a newer technique in orthopedic trauma care, but its use for fracture blisters has been minimally documented. This study retrospectively evaluates NPWT's efficacy in trauma patients, focusing on time to definitive surgery, reepithelization time, and infection rates.

A review of 60 patient charts was conducted, collecting data on injury characteristics, blister type, time to open reduction and internal fixation (ORIF), postoperative complications, hospital stay duration, and blister resolution. NPWT systems were applied over intact bullae, with the dressing set to -50mmHg continuous suction when possible. Readiness for surgery was assessed clinically.

Fracture blisters were predominantly in the lower extremities (97%), with serous blisters (n=44) more common than hemorrhagic (n=16). The average time to definitive surgery was 11.6 ± 9.1 days, with hemorrhagic blisters taking longer (14.3 ± 13.3 days) compared to serous blisters (10.6 ± 7.2 days). Reepithelization time was longer for hemorrhagic blisters (17.4 ± 6.3 days) versus serous (10.1 ± 6.4 days). Five patients (8%) developed deep infections requiring further surgery, with four having serous blisters.

NPWT for fracture blister management resulted in an average delay to definitive fixation of 11.6 days, blister resolution within 12.1 days, and 92% of patients healed without infection. This method may offer outcomes comparable to traditional approaches, with potential to streamline wound care and improve patient outcomes.

Columbus – 19

One Step Further: Advancing the Proposed Mechanism of Pioglitazone's Relationship to Bladder Cancer

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Introduction

Bladder cancer is a significant health concern, particularly among men. One potential risk factor for bladder cancer is pioglitazone, a thiazolidinedione (TZD) used to treat type II diabetes mellitus (T2DM). Despite initial findings suggesting an increased risk of bladder cancer with pioglitazone use, subsequent research has yielded conflicting results. Pioglitazone's role as a peroxisome proliferator-activated receptor γ (PPARγ) agonist complicates its relationship with bladder cancer, as PPARγ has been implicated in both pro- and anti-tumorigenesis.

Methods

This study utilized the cBioPortal database, analyzing a dataset of 411 bladder urothelial carcinoma samples from The Cancer Genome Atlas (TCGA). We investigated the gene expression levels of subtypes of the PPAR class, focusing on their associations with survival rates in bladder cancer patients. We explored the PI3K-Akt signaling pathway, identifying relevant genes such as *FOXO3*, *RICTOR*, and *RPTOR*, to understand their roles in bladder cancer progression.

Results

Our analysis confirmed a statistically significant association between increased *PPARG* expression and improved survival in bladder cancer patients (HR: 0.534; 95% CI: 0.322 – 0.884). We also identified a significant relationship between decreased *FOXO3* expression and increased survival, highlighting the role of the PI3K-Akt pathway in bladder cancer. Increased expression of *RICTOR*, a gene downstream of *FOXO3*, showed a positive correlation with survival.

Conclusions

This study underscores the complex role of PPARγ in bladder cancer, suggesting that pioglitazone, despite its potential risk, may offer therapeutic benefits in specific contexts. The findings reinforce the importance of further investigating the PI3K-Akt pathway and PPARγ's anti-tumorigenic effects. While certain associations, such as with β-arrestin2 signaling and *PLEKHS1* gene expression, were not significant, the study advances our understanding of the molecular mechanisms underlying bladder cancer and highlights the potential of PPARγ agonists in its treatment.

Columbus – 20

Pyogenic Vertebral Osteomyelitis Treated with Minimally Invasive Lateral Intradiscal Debridement, Interbody Fusion, and Percutaneous Posterior Segmental Fixation

John Dorchak, MD, JK Burkus, MD, Tristan Melton, MS3, Miller Gantt, MS3

Background: Pyogenic vertebral osteomyelitis (PVO) is a potentially fatal infection with an overall mortality being reported up to 20 percent. Approximately 30 percent of the patient will develop PVO following a spinal intervention procedure. Non-surgical management commonly involves long-term intravenous antibiotics. Surgery usually encompasses anterior debridement, interbody and fusion and posterior spinal instrumentation.

Methods: We conducted a retrospective single surgeon cohort study to identify clinical and radiographic outcomes in patients who developed PVO following spinal a prior spinal intervention and who were treated surgically for the infection. Patients were identified between 2015 and 2023. Diagnostic studies included radiographs, MRI scan, blood cultures and markers of infection including C-reactive protein (CRP), erythrocyte sedimentation rate (ESR) and white blood count (WBC). Clinical outcomes including neurologic status were recorded in addition to radiographic outcomes and adverse events.

Results: Five patients were retrospectively identified who developed PVO following prior surgery and failed medical therapies. All had CT-guided spinal biopsies to determine etiology and application of parenteral antibiotics. Two patients had undergone prior posterior spinal decompression surgery; three had undergone previous instrumented anterior and posterior fusion surgeries. In the surgical treatment of these 5 POV cases, intradiscal titanium metallic implants were used for sagittal correction and stabilization of the infected lumbar motion segment and rhBMP-2 was used as a stand-alone bone grafting option. All revision surgeries were performed through a minimally invasive surgical approaches that included anterior debridement and posterior segmental stabilization. Clinical resolution of infections and normalization of lab values were seen in all patients at three month following surgery. At six months, radiographs demonstrated bony fusion. Improved sagittal alignment was seen at the last follow up. There were no deaths, and none had any neurological deterioration. No patients showed a recurrence or persistence of infection; none had an additional surgery.

Discussion: Surgical treatment of spinal osteomyelitis follows the basic principles for the management of any infection. Intradiscal debridement, drainage of any abscesses, spinal canal decompression and stabilization are the foundation of surgical treatment. Metallic implants and posterior segmental fixation can achieve improved sagittal realignment and stabilization of the motion segment and encourages interbody fusion.

Conclusions: Following adequate debridement and appropriates parental antibiotics, intradiscal titanium metallic implants can achieve sagittal correction and stabilization of the infected lumbar motion segment. rhBMP-2 is a viable graft option for the surgical treatment of vertebral osteomyelitis. Minimally invasive surgical techniques are a viable surgical approach.

Columbus – 21

Understanding Low-Level Viremia in HIV: A Modern Perspective

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Abstract

Low-level viremia (LLV) persists as a significant clinical challenge in the era of modern antiretroviral therapy (ART) among people living with HIV (PLWH). Though specific definitions may vary LLV is commonly characterized by detectable viral loads that remain below the threshold for virologic failure (VF), typically ranging between 200-1000 copies/mL. LLV can be further categorized into intermittent LLV (iLLV) and persistent LLV (pLLV) based on its occurrence patterns. This study aims to evaluate the various definitions and underlying causes of LLV, with a focus on differences by sex and gender. Given the increasing prevalence of LLV, it is critical to assess its impact on clinical outcomes, including VF, mortality, ART regimen efficacy, and serious non-AIDS events (SNAEs).

We conducted a systematic literature review of original research articles published between 2019 and 2024, excluding review articles, to examine the associations between LLV, VF, and SNAEs. The review highlights an elevated risk of VF and SNAEs in individuals with both iLLV and pLLV, with pLLV conferring a higher risk. Compared to men, women with LLV demonstrated a higher likelihood of developing SNAEs and VF. LLV within the range of 50-199 copies/mL was associated with a 2.2-fold increased risk of mortality, while this elevated risk was not significant for those with LLV ranging from 200-999 copies/mL. Additionally, several studies suggest that integrase strand transfer inhibitors (INSTIs) may offer protective effects against LLV and subsequent VF, in comparison to protease inhibitor (PI) or non-nucleoside reverse transcriptase inhibitor (NNRTI) regimens.

Our findings underscore the association between the degree of LLV and adverse health outcomes in PLWH. As LLV continues to be prevalent in the modern ART era and given its implications for negative clinical outcomes such as VF and SNAEs, there is an urgent need for updated research to inform effective management strategies.

Columbus – 22

Prevention of Oronasal Fistula in Palatoplasty with Acellular Dermal Matrix

Julia C. Stager BS, William R. Clifton BS, Emily V. Clifton BS, Spencer R. Anderson MD

Abstract

Background*:* This systematic review aims to update the current trends in acellular dermal matrix (ADM) utilization during palatoplasty procedures and evaluate its effectiveness in reducing postoperative oronasal fistula formation.

Methods*:* A comprehensive literature search was conducted via PubMed, Embase, Cochrane, and OVID for relevant studies published between July 2016 and June 2024 involving patients undergoing primary or secondary cleft palate repair with ADM versus without. The primary outcome of interest was postoperative oronasal fistula formation. All records were screened by two independent investigators using Covidence. Studies were excluded if they were not published in English, did not use ADM, were nonhuman, or had no outcome.

Results*:* Eight studies met the inclusion criteria. The meta-analysis found a nonsignificant decrease in risk of postoperative fistula formation with the use of ADM; however, when combined with data from the latest prior systematic review, a statistically significant decrease was found. Overall, patients undergoing primary and secondary palatoplasty with ADM had a 47% lower risk of developing fistulas than those without. When combined with the latest prior data, the pooled estimated fistula rates for primary and secondary palate repair were 6.58%, which is favorable compared to previously studied fistula rates without ADM.

Conclusion*:* This review found a statistically significant decrease in postoperative fistula recurrence when using ADM for both primary and secondary palatoplasty. Therefore, ADM can be considered as a reliable adjunct to palatoplasty for reducing the risk of oronasal fistulas.

Columbus – 23

Harmless Bleeding: Assessing the Impact of Preoperative Anticoagulant Continuation on DVT/PE Rates in Trauma Patients

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Background and Objective

In the United States, deep vein thrombosis (DVT) and pulmonary embolism (PE) rank high in terms of preventable hospital deaths. Victims of trauma are at a higher risk of developing thromboembolic complications. There is mixed consensus on whether holding anticoagulation affects clot risk. Saint Louis University Hospital historically held anticoagulation prior to surgery; however, the Trauma Registry identified the DVT/PE rate as greater than acceptable, prompting policy change to continue anticoagulation preoperatively as of June 2022. The aim of this study is to compare DVT/PE rates pre and post policy change.

Methods

A retrospective cohort study was conducted to compare DVT/PE rates in orthopedic trauma patients requiring surgery from January 1, 2018, through December 31, 2023. Clinical information relating to trauma date, surgery date, injury type, anticoagulant administration, DVT/PE development, and death, if applicable, was obtained from patient charts. Additionally, we assessed the bleed risk.

Results

DVT/PE development was 14.553 times more likely pre-policy change when anticoagulation was held prior to surgery compared to post-policy change when anticoagulation was administered before surgery (X^2 (3, N=374) =14.553, p=.002). Additionally, we did not see a significant increase in bleed risk as measured by documented blood transfusions.

Conclusions

Findings suggest that the policy change was a success at Saint Louis University Hospital as DVT/PE rates significantly decreased without a significant difference in bleed risk. Limitations include the presence of comorbidities in patients, varying trauma mechanisms and injury severity, and missing documentation. Future research will include additional chart.

Columbus – 24

Decreasing Minimal Blood Donor Interval with Iron Supplementation

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Abstract

Blood donation depletes iron stores within the body, which must be replenished. Current clinical guidelines recommend waiting 8 weeks between whole blood donation to allow the donor to replenish hemoglobin to a safe level. Several clinical trials have been conducted throughout the years to examine if iron supplementation following whole blood donation helps the body recover more quickly. This literature review aims to analyze these studies to determine if a shorter interval between whole blood donation could be safely implemented by the military as a contingency to increase the blood supply when needed in order to decrease preventable hemorrhagic deaths during combat. Evidence showed that blood donors who receive iron supplementation recover hemoglobin more quickly and increase their total iron stores over time. Additionally, the mean total hemoglobin mass recovery time following blood donation for men is 36 days which approximates the shelf life of cold stored whole blood (35 days). These results indicate that a shorter interval between whole blood donations might be plausible for military operations. In the future, more research needs to be conducted in order to evaluate the safety of shorter donation intervals in both male and female whole blood donors.

COLUMBUS Epidemiological

Columbus – 25

Health perceptions and motivation in rural communities: Application of a theory-structured blinded focus group (TBFG) process for targeted message development and program design

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Equal contribution between Tahiya Anwar and Davis Kidd.

Background: Rural health is a significant issue when comparing the health of urban and rural communities. Rural areas have fewer programs for smoking prevention, drug rehab, healthcare infrastructure and nutritional education, and higher rates of childhood obesity. Hospital closures have further put rural populations at risk.

Methods: To assess health perceptions and needs 2 theory-structured blinded focus groups, as well as farmer's market interviews, were conducted in Hancock County, Georgia. Participants included 5 users of the health department services, 18 participants from the senior center, and 10 farmer's market interviews. Using a form of nominal group process, means and standard deviation were evaluated to identify potential target areas using a 0-9 scale.

Results: Focusing on health perceptions among the senior center group, chronic pain (M=7.0; SD=2.54) stood out as a particular health threat. Although variance was high, 50% reported scores of 8 or 9, with 3 participants rating depression and risk of suicide as a 9. The largest perceived health threat was high blood pressure (M=7.71; SD=1.86). The highest mean related to benefits of a healthy lifestyle was reducing diabetes risk (M=7.88; SD=2.36). The greatest perceived barrier was too much pain, preventing adoption of healthy actions (M=6.69; SD=2.91). Faith and spirituality were noted in the discussion phase as playing a large role in their life, as well as the potential opportunity for church involvement in developing community health programs.

Conclusion: Initial recommendations include incorporating opportunities for seniors for an evidence-based walking and tai chi for balance program, which have shown benefits for pain, arthritis, blood pressure, mental wellness, and fall prevention, among other benefits. Perceived threats, benefits, barriers and motivators differed depending on the population. Rural health programs and providers can also consider faith and religion to better address biopsychosocial aspects. Future work will address additional findings.

Columbus – 26

Trauma-Informed Care: A Focus on African American Men

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Abstract

African American males experience higher rates of lifetime trauma including fatal violence. In 2019 we reviewed this relationship as homicides per violence events (H/V) from the 2017 CDC WISQARS database. In this study, we tracked the years surrounding the COVID-19 pandemic to evaluate socioeconomic factors and increased trauma on H/V across gender and race. Compared to 2017, we hypothesized that all group's H/V would increase up to 2021 and hopefully plateau or decrease afterwords. We also specifically monitored the H/V for African American men.

The methods included tracking total deaths, violent deaths, and homicides through the WISQARS database for the following groups: total population, males only, White males, and Africanmerican males. H/V for all groups was calculated and compared year over year.

Population-wide H/V increased from 2017 to 2019, rose in 2020 and 2021, and decreased in 2022. White male H/V increased more sharply from 2017 to 2020, and the rate of decline from 2020 to 2022 was lower than black males. All 2022 H/V were above pre-pandemic ratios. African American men's H/V ratios remained highest every year and were responsible for more than 30% of homicides.

African American males were less sensitive to H/V increases during the pandemic and recovered more quickly; however, baseline levels are already uncomfortably high. This contradicts the stated hypothesis and challenges the nature of disproportionate COVID-19-related trauma. This work serves as a starting point for future exploration into the lasting association of trauma and violence for African American Men.

Columbus – 27

Suicide of detained youths: Investigating differences in mental health treatment between incarcerated and nonincarcerated youths

Kara Patrick, Bronson Pierce, & Jack Borkovich

Abstract

Psychiatric standard of care in the state of Georgia mandates that young people that are suicidal or who have made a suicide attempt, be hospitalized in a psychiatric unit for crisis stabilization. However, oftentimes when the youth in question is in police custody they are instead sent to jail, or detention facilities. Incarcerated youth die by suicide at a rate of two to three times higher than that of youth in the general population. Comparatively, the estimated rate of suicide among inpatient psychiatric units is much lower. However, the DOJ and penal systems across the country maintain that the level of care provided is adequate.

Georgia has four Child and Adolescent Crisis Stabilization Units that provide acute psychiatric stabilization services. These facilities require that all services be provided under an appropriately trained physician who is present in the facility or on call on a twenty-four-hour basis. Additionally, each patient has an individualized care plan that includes patient participation, measurable goals, and regular reviews of the patient's progress towards the established goals. The care provided to incarcerated youths in juvenile detention facilities is less clear and varies between facilities.

Given the discrepancy in suicide outcomes listed above, there is an apparent lapse in detection and treatment for mental health concerns for incarcerated use. There remains significant gaps in the literature investigating why this is the case.

Our project explores the differences in treatment between these two groups to seek a clearer understanding as to why the incarcerated juvenile population fares worse. It also aims to explore if the two systems are providing equitable care, and if not, explore what changes would be beneficial.

COLUMBUS Medical Education

Columbus – 28

Needs Assessment for Simulation Training Programs at Mercer-Affiliated Hospitals in Columbus

Richard Andrew Callahan Jr., B.A. Biology

Background; Objective: Simulation training in medicine has grown to become an essential resource for learning new clinical skills or sharpening those already possessed. With the time commitment that all practicing physicians commit to, it is critical to ensure that time spent in medical simulation labs is used efficiently. To do this at the Columbus campus of Mercer University School of Medicine, we planned to conduct a needs assessment to better serve the residents and faculty utilizing the Columbus simulation lab.

Methods: A three-step process previously described in related literature was adopted to perform the needs assessment. First, a survey was drafted that outlined areas that we wanted the participants to consider. A focus group with faculty was then held to fine-tune the survey draft. Secondly, the survey was sent out to all residents and faculty that currently utilize the Columbus simulation lab for medical simulation training. Third, after subsequent survey responses, data analysis on the responses was performed.

Results: IRB approval through Mercer University has been optained and the final needs assessment survey has been completed. Once it is distributed, data analysis will begin as soon as responses are recorded.

Conclusions: We anticipate that the data from the needs assessment will allow Mercer simulation training leaders to best utilize simulation training lab time for residents and faculty. The direct responses from the participants will give insight into what skills most are comfortable with, and which ones could have more time dedicated to them. Following the completion of the data analysis, expansion into other Mercer simulation labs at other campuses could also be done.

Columbus – 29

Changes in the Ranked Order Lists of Obstetrics and Gynecology Residency Applicants in the Wake of the Dobbs Decision

Jordan Davis BSA, Edson Jean-Jacques, Donald Carter DBe

Background and Objective:

The Dobbs Decision eliminated the national right to an abortion in June of 2022. Since then, there have been cascading policy impacts on patients, physicians, and those involved with medical education. The impacts on applications and admissions to residency programs are being evaluated nationally, but there has not been an examination of changes seen in Ranked Order Lists. These are
a crucial step in an application and a reflection of applicant decision making that has not been explored. While adherence to the principles set out by ERAS will not be universal, we believe most students utilize the ROL as intended and in the process are making decisions relevant to the Dobbs Decision available for analysis

Methods:

We analyzed public data from the NRMP's annual report on ERAS applications and observed the frequency of applicants selecting Obstetrics and Gynecology as their "First Choice", "Only Choice", and "Not First Choice" while accounting for the number of positions available per U.S. Senior.

Results:

Only Choice was the largest cohort and remained mostly stable over the past 2 years with a slight net decrease. First Choice decreased more significantly. Those selecting Not First Choice increased from where it was 2 years ago.

Conclusion:

These trends mirror developments in applications submitted as well as qualitative research which reflects disapproval and trepidation of applicants regarding state policies which restrict abortion training and access. We explored the context surrounding these trends including ROL lengths and selection criteria, ACGME guidelines, competencies between programs with existing training gulfs, etc. We were unable to obtain additional ERAS data to go beyond the preliminary data analysis and literature and policy review conducted. This project is thus an initial examination of how ROL data compares to established metrics and a synthesis of existing literature on the responses of residency applicants to institutional changes caused by Dobbs.

Columbus – 30

Journey to Medicine: The Resilience Behind Georgia Medical School Admissions

Kimberly P. McElveen, Ketsia S. Dimanche, Kim Meeks, Aman Anant Patel, Sarah Anne Monteiro, Jimmy Dang Pham, and Olivia Grace Penela

Abstract

An individual's resilience refers to the ability to adapt and overcome stressors while sustaining mental and physical well-being. Resilience is a pivotal trait that aspiring medical students must have to be successful in the competitive landscape of medical school admissions. Gaining insights into how these students build resilience requires a holistic view of their journey. For this reason, our research aims to uncover key themes arising from the students' experiences in overcoming challenges, navigating roadblocks, developing support systems, and maintaining motivation to succeed. Through this investigation, we hope to shed light on the importance of resilience in the pursuit of a medical career, providing invaluable insights for both aspiring physicians and admissions committees. In our study, we conducted a cross-sectional survey using Qualtrics. The survey was distributed through snowball sampling with the use of social media. The goal of this method was to target participants who fell under our inclusion criteria of Georgia medical students who began their studies within the past two years. Our preliminary results revealed several common themes across the participants. Students with strong family support and cultural backgrounds fostered effective growth in resilience and perseverance. Additionally, those in positive learning environments had more access to resources and support systems, thus enabling them to overcome adversaries and achieve success. Lastly, students who practiced positive thinking were more likely to engage in healthy behaviors, leading to improved self-care and usage of positive coping mechanisms. Our initial findings highlighted the significance of resilience in medical school and how it develops among those driven to attend. The results of this study are vital for aspiring medical students and admissions committees to consider during the evaluation of an individual's background. Future research may expand our scope by gathering additional data from students outside of Georgia to create a more comprehensive analysis.

Columbus – 31

"Physician Perspectives on Compassionate Care"

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Background and Objective: Compassionate care has been discussed in terms of patient outcomes and nursing practices, but there is less focus in the existing literature on physicians' perspectives on the topic. Identifying how compassionate care affects physicians themselves, as well as the facilitators and barriers to compassionate care that physicians experience, can serveas groundwork for future research and interventions. The objective of the "Physician Perspectives on Compassionate Care" study was to uncover common themes and benefits of compassionate healthcare and to explore physician perspectives on its facilitators and barriers.
Methods: A mini thematic literature review was conducted using academic databases. The Sinclair Compassion Questionnaire (SCQ)1 was distributed to Mercer School of Medicine faculty by email, and results were collected anonymously. Interviews with six local physicians were conducted via phone and thematically analyzed to investigate physician perspectives on compassionate care.
Results: Compassionate care was found to have benefits for both the patients and the providers, including better clinical outcomes, improved physician satisfaction, and reduced malpractice suits. Physician perspectives on facilitators to providing compassionate care included personal life experiences, workplace culture and support, and proper training. Many levels of barriers were described, including personal, interpersonal, and systemic challenges. Medical education was also identified as a potential barrier.
Conclusion: Implementing compassionate care into medical practice has been shown to have a plethora of positive impacts on both the patient and the providers themselves. This study uncovered physician perspectives on barriers and facilitators to performing compassionate care, including ways in which medical education could empower students to become comfortable with the practice. By identifying these elements, this study helps lay the groundwork for future studies and educational interventions.

MACON Biomedical

Macon – 1

The Neuroprotective Role of p21 in Huntington's Disease

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Background and Objective

Huntington's Disease (HD) leads to the degeneration of striatal medium spiny neurons (MSNs) as a result of a trinucleotide expansion of the cytosine-adenine-guanine (CAG) codon in the huntingtin gene (HTT) on chromosome 4. The specific cellular and molecular mechanisms behind the disease's progression are not fully understood at this time. The use of MSNs converted from patient-derived fibroblast samples allows for the opportunity to study the changes in MSNs in patients of different disease stages compared to healthy individuals. Previous studies have shown the neuroprotective role of CDKN1A (p21) and that the gene expression of p21 is downregulated in HD patients compared to pre-symptomatic HD patients. Here, we investigate whether changes in levels of p21 impact the neurodegeneration of HD.

Methods

To investigate the level of HTT aggregation and 8-OHdG in the cells, we performed immunostaining. Cells were fixed with 4% paraformaldehyde, permeabilized with 0.2% Triton X-100, and blocked with 5% BSA and 1% goat serum. They were then incubated with primary antibodies at 4°C overnight, followed by secondary antibodies at room temperature for 1 hour.
For the SYTOX assay, 0.1 μM SYTOX gene nucleic acid stain and 1 μL/mL of Hoechst 33342 were added into the cell medium and incubated for at least 30 minutes at 37°C before live cell imaging.

Results

p21 knockdown in pre-HD-MSNs induced neuronal cell death and increased HTT aggregation. Additionally, there is a gradual increase in DNA damage from healthy individuals to those with pre-HD-MSNs to those with HD-MSNs. p21 knockdown significantly increases the amount of oxidative DNA damage present in both healthy and pre-HD patients.

Conclusion

These findings suggest that p21 may play a role in controlling oxidative DNA damage in general. Furthermore, p21 downregulation in HD induces neuronal cell death and increases HTT aggregation, thereby contributing to HD neurodegeneration.

M**acon – 2**

Altered Ultrasonic Vocalization in a $Na_V1.2$ Mutant Mouse Model of Autism Spectrum Disorder

Shaymaa Abdalla#, Zachary Thomas Carman#, Hossam Ismail, and Ahmed Eltokhi*
# equal contribution

Abstract

Autism spectrum disorder (ASD) is a neurodevelopmental condition characterized by impaired social interaction, communication deficits, and repetitive behaviors. A prominent feature of communication challenges in ASD is echolalia, a behavior where individuals repeat words or phrases, reflecting altered speech patterns and difficulties in spontaneous communication. In animal models, ultrasonic vocalizations (USVs) are commonly used as a proxy for studying communication, particularly in mouse models of ASD. Here, we present findings from a novel $Na_V1.2$ mutant mouse model carrying an autism-associated mutation (R854Q), aimed at investigating alterations in communication behavior. Using a pup isolation protocol, we recorded and analyzed USVs emitted by the heterozygous $Na_V1.2$ mutant pups during separation from the dam. Compared to wild-type controls, the $Na_V1.2$ mutant pups displayed a significantly increased number of ultrasonic calls with prolonged call duration. Additionally, the time intervals between successive calls were reduced, indicating a more rapid emission of vocalizations. Interestingly, the peak frequency of these calls was lower in the mutant mice, while the peak power was elevated. These characteristics—particularly the increased call frequency and altered temporal and acoustic properties—mirror the repetitive and abnormal speech patterns observed in individuals with ASD. Our findings suggest that this $Na_V1.2$(R854Q) mutation contributes to altered communication patterns, as evidenced by changes in vocalization behavior, which may serve as an analog to the echolalic behaviors observed in ASD patients. These results offer valuable insights into the molecular mechanisms underlying communication deficits in ASD, providing a foundation for further studies into therapeutic targets for managing these core symptoms.

M**acon – 3**

The involvement of the noradrenergic system in re-exposure to food seeking after a period of forced abstinence without mPFC Fos neuronal ensembles.

[1]Caroland-Williams, AJV., Callan, LN., Modi, UA., Arant, CE., Arant CA, Patel, AD., Patel, HR., Belflower, J., Belflower, JT., Rudd, C., & Gheidi, A.

Abstract

Both norepinephrine and mPFC Fos neuronal ensembles have been linked to the resumption of drug-seeking behaviors after a period of abstinence. However, their roles in the return to palatable food seeking following abstinence have been less explored. This study required male and female Fos-LacZ transgenic rats to self-administer sugar across 10 sessions. *Fos-LacZ* transgenic rats also express the bacterial enzyme β-galactosidase in strongly active neurons. When the prodrug Daun02 is infused into the mPFC of these animals, it is converted to daunorubicin by β-galactosidase, leading to apoptosis of only Fos-expressing neurons. On the last day of sugar self-administration, animals were injected with 50 mg/kg/i.p. of the adrenergic neurotoxin DSP-4 or saline. Rats were then placed into their home cages (forced abstinence) for 10 days. On day 11, they were given a single exposure to the self-administration chambers, and their mPFC was infused with Daun02 (0.2 µg/0.5ul/hemisphere) 90 minutes later before returning to their home cages for 3 more days. On the second exposure, the discrete stimulus was omitted to increase the difficulty in recalling the self-administration memory. Lastly, vaginal lavage from the females was taken to determine their estrus cycle. Preliminary results showed that rats increased their lever presses over days and could remember the active lever from the inactive one on both re-exposure days. Interestingly, the DSP-4 group could not distinguish the active from the inactive on re-exposure day 1. We are running more animals and quantifying Fos with immunofluorescence in the mPFC.

Macon – 4

Role of MRP3 and MRP5 in export of mercury glutathione complexes

Maria Eduarda A. Galiciolli, Lucy Joshee, Christy C. Bridges

Abstract

Multidrug resistance proteins, as MRP3 and MRP5, act as transporters for metabolic wastes and xenobiotics and are known to export a wide range of substances out of renal tubular cells. This study aimed to define and characterize the transport of mercuric conjugates of glutathione (GSH-Hg-GSH; 50, 100µM), [^{3}H]-estradiol (100 nM) and 5-6-carboxy-2′,7′-dichloro-fluorescein (CDCF; 100 µM) in inside out membrane vesicles containing MRP3 and MPR5. Uptake of GSH-Hg-GSH, containing radioactive mercury, was measured for 1, 5, 15, and 30 min in the presence and absence of ATP. Saturation kinetics were analyzed by measuring the uptake of 10µM GSH-Hg-GSH in the presence of 25, 50, or 100µM unlabeled GSH-Hg-GSH for 5min at 37°C. The results revealed a significant increase in estradiol uptake by MRP3 in membrane vesicles after 5, 15, and 30 minutes, with peak uptake occurring after 5 minutes. Analysis of Michaelis-Menten kinetics of GSH-Hg-GSH transport by MRP3 demonstrated saturable uptake by MRP3. The V_{max} was 25.579 and the K_m was 2.8. The uptake of CDCF in MRP5 vesicles was significantly greater than that in control vesicles and time-dependent. Also, a significant increase was observed in uptake of GSH-Hg-GSH in MRP5 vesicles after 5 minutes. Based on substrate specificity data, the V_{max} was estimated to be 4.76 ± 2.4 nmol.mg protein^{-1} 30 s^{-1} while the K_m was calculated to be 36.4 ± 46.8 for MRP5, For the control, the V_{max} was estimated to be 2.8 ± 1.0 nmol.mg protein^{-1} 30 s^{-1} and the K_m was 25.58 ± 29.2. These data are the first to report a role for MRP3 or MRP5 in the export of any mercuric conjugate. These data will form the basis of refining therapeutic regimes for mercury exposure.

Macon – 5

Constructing Multi-sgRNA Vectors for Heritable LINE-1 Epigenetic Silencing Using CRISPR dCas9

Julia Florentino, Pamela Cook

Abstract

LINE-1 is a retrotransposon that makes up ~17% of the human genome with >500,000 copies. LINE-1 has two open reading frames, ORF1 and ORF2, which encode the proteins ORF1p and ORF2p. ORF1p is an RNA binding protein, and ORF2p has both endonuclease and reverse transcriptase activity. LINE-1 uses both proteins to replicate itself via a copy and paste mechanism, resulting in genome expansion. In healthy cells, LINE-1 is mostly silenced by a variety of cellular mechanisms. However, LINE-1 is reactivated in many pathological phenotypes such as autoimmune disorders, cancers, and neurological diseases. Past research has largely focused on LINE-1's mutagenic effects on the genome, but it is also thought that LINE-1 proteins affect cellular function. However, it has been difficult to assess the effects of LINE-1 proteins in cells due to challenges in knocking down LINE-1 expression. Conventional genomic editing techniques are not feasible for use with LINE-1 due to the large number of LINE-1 copies in the genome. We therefore aim to use CRISPR interference to establish genetically heritable epigenetic LINE-1 silencing in order to evaluate the effect of LINE-1 proteins on cellular homeostasis. As part of this effort, my project was to generate a multi-sgRNA carrier plasmid containing 4 sgRNA cassettes, each targeting a different region of ORF1. We successfully PCR-amplified each of the DNA fragments that will be used to assemble this plasmid using Golden Gate cloning. In addition, we identified a potential problem with the template and receiving plasmid backbone, pLenti-Multi-Guide, and we are now in the process of re-amplifying the sgRNA cassettes for insertion into a new carrier plasmid.

Macon – 6

The contribution of Norepinephrine in mPFC mediated reinstatement to stress induced food-seeking behavior

Joseph Gaines

Abstract

Stress-induced reinstatement of food-seeking after a period of abstinence remains a critical issue in treating food addiction. If effective treatments are to be found, the neurobiology of reinstatement must be elucidated. The medial prefrontal cortex (mPFC) is a critical area involved in the reinstatement of both food and drug seeking. However, it is unclear which neuromodulators are involved in the mPFC during reinstatement. One candidate is adrenergic input from the locus coeruleus (LC). In this study, we manipulated norepinephrine (NE) levels in the mPFC using chemogenetic methods while rats were subjected to a mild footshock (0.6-0.75 mA 40s for 10 min) to induce stress induced reinstatement. We chemogenetically excited NE in the mPFC by first infusing DREADDs into the LC and then activating its terminals in the mPFC using the DREADD ligand clozapine-N-oxide (CNO). Results showed that rats were able to distinguish between the active and inactive levers, but CNO treated animals performed at vehicle levels. We are currently increasing our sample size, performing Nissl staining to confirm cannula placements, and verifying DREADD expression using immunofluorescence in the mPFC.

Macon – 7

A walk in the country: Potential unique effects of slower paces of walking on cellular respiration and opportunities for chronic conditions and rural health.

P. Anthony Gryffin, Jesurebor I. Ivbaze

Background and Objective: A growing body of research notes a lack of understanding in the differences between the physiological effects of slower and faster paces of walking. Slower paces of walking may be more characteristic of exercises such as tai chi (TC) than higher intensity exercises. Documenting commonalities in physiological measurements between slower paces of walking and TC may help in the research and promotion of an exercise particularly accessible to rural populations with chronic conditions.

Methods: SpO2 and HR were measured using an oximeter for 1-minute before walking, during 20 minutes of treadmill walking at 1.5 and at 3.0 mph, and for 5 minutes after walking. Results were then compared to a previous study comparing Yang style tai chi and running.

Results: Preliminary results showed a large momentary drop in Sp02 during the 5-minute post walking period (M=87.67%; p<0.001) before returning to resting levels. TC measurements had also resulted in a significant post exercise drop, with a mean of 90.78% (p<0.001), both of which differed from running at 5.0 mile-per-hour (post M=96.16%).

Conclusion: The current study suggests distinct differences in oxygen metabolism and cellular respiration during slower paces of walking and TC compared to aerobic exercise. A physiological understanding of slower paces of walking and TC may enhance benefits for health, particularly for chronic conditions complicated by hypoxia (oxygen deficiency in the tissues) and for those with limited mobility. Related physiology is discussed, and implications for rural health by addressing the uncertainty factor related to diffusion of innovation theory. Additional research is needed to better understand potential unique physiological effects.

Macon – 8

Food-Seeking Behavior Effects from Prefrontal Cortex Infusion of α1-Adrenergic Receptor Antagonist Terazosin in Male and Female Rats

Seth Johnson, Carson Edwards, and Ali Gheidi

Abstract

The noradrenergic system and norepinephrine are known to play a role during food and drug-seeking behavior. However, adrenaline and the adrenergic system related to food-seeking behavior after forced abstinence are not as understood. In this study, terazosin, an α 1 adrenergic antagonist, was infused to block adrenergic receptors in the prefrontal cortex with the hope to decrease food seeking behavior. In this project, male and female Sprague Dawley rats will be food trained for 10 days with banana flavored sugar pellets. After the food training, there will be 2 weeks of forced abstinence. During abstinence, all rats will receive a canula placement surgery in the prefrontal cortex. Then the experimental group will be given terazosin infusion through the canula and compared to a control group who are given aCSF through the cannula. Lastly, the rats will be placed in the operant cages and lever presses will be recorded for 1 hour. The results showed no significant difference in food seeking behavior between the rat's given terazosin and aCSF. Data did show learning after re-exposure with more active lever presses compared to inactive lever presses. The female rats did press the active lever more than the males which requires further investigation. Future research in this area could lead to understanding relapse through the adrenergic system and possibly medication to decrease the chance of relapsing.

Macon – 9

Dual inhibition of ALDH1A and MEK1/2 causes synergistic cell death in high-grade serous ovarian cancer triggered by enhanced DNA damage and diminished DNA repair

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Abstract

High-grade serous ovarian cancer (HGSOC) has a high recurrence rate and acquired chemoresistance which leads to poor prognosis. MEK1/2-ERK1/2 signaling pathway is hyperactive in HGSOC despite lack of mutations in upstream BRAF/KRAS genes and inhibition of MEK1/2 pathway with specific inhibitor trametinib revealed arrest in cell proliferation in HGSOC. However, trametinib treatment in HGSOC cells has no cytotoxic effects and promotes cancer stem-like characteristics, specifically enriching bright aldehyde dehydrogenase (ALDH)+ cells. In our previous work, we demonstrated that ALDH1A inhibitor (ALDH1Ai) 673A especially targets CD133+ ovarian cancer stem-like cells (CSCs) triggering necroptotic cell death. As such, we decided to combine ALDH1A and MEK1/2 inhibitors to evaluate their effect in ovarian cancer. Trametinib+673A (Combo) treatment caused a decrease in viable cell number as well as cell percentage ($p<0.001$) and exhibited cytotoxic properties ($p<0.05$) in OVCAR8 and PEO4 HGSOC cell lines. Combo treatment significantly reduced ALDH+/CD133+ positive subpopulations ($p<0.001$) as assessed by flow cytometry analysis. Interestingly, combo treatment triggered time-dependent DNA damage as assessed by ϒpH2AX Western blot analysis whereas DNA damage repair (DDR) was diminished as assessed by breast cancer gene 2 (BRCA2) protein level. Time-dependent combo-induced DNA damage was also validated by single-strand and double-strand comet assay. Furthermore, combo treatment enhanced ϒpH2AX foci and reduced BRCA2 protein as assessed by immunofluorescence in OVCAR8 cells observed by confocal microscopy at 24h. To summarize, a novel combination therapy consisting of ALDH1A and MEK1/2 inhibitors causes a highly synergistic effect due to a dual effect on the DNA damage and repair pathways. This treatment is effective across primary tumors and ovarian cancer cell lines specifically targeting chemoresistant CSC that can initiate and propagate ovarian cancer.

Macon – 10

Impact of mercury exposure in hyperglycemic proximal tubular cells

Purva Lotwala, Christy Bridges, Lucy Joshee

Abstract

Mercury is a toxic pollutant that is found ubiquitously in the environment. Humans, all around the world, are exposed to various forms of mercury through ingestion of contaminated seafood, inhalation of mercury vapor from dental amalgams or coal powered power plants, and dermal absorption through mercury-containing cosmetic products. Mercury ingestion has been associated with severe health issues in humans, including renal, neurological, and cardiovascular dysfunction. Due to the role of the kidney in excreting toxicants and wastes, it is one of the most susceptible organs to mercury toxicity. Diabetes mellitus is a prevalent metabolic disorder affecting approximately 10% of the global population, with type 2 diabetes being the most common form. Chronic hyperglycemia in diabetic patients is a key factor contributing to the onset and progression of diabetic nephropathy, a leading cause of end-stage renal disease. The pathophysiology involves glomerular hyperfiltration, thickening of the glomerular basement membrane, and mesangial expansion, all of which contribute to progressive kidney damage. The purpose of this study was to test the hypothesis that exposure of hyperglycemic proximal tubular cells, as in the case of diabetic nephropathy, to mercury accelerates oxidative stress and mitochondrial dysfunction in these cells. To test our hypothesis, cultured proximal tubular cells (TH1 cells) were grown in normal culture media (normoglycemic) or media containing high glucose (hyperglycemic) and were subsequently exposed to different concentrations of HgCl2. An MTT assay was utilized to identify the specific concentrations of mercury that lead to decreases in cellular viability in hyperglycemic and normoglycemic conditions. Quantitative PCR was used to analyze the mRNA expression of kidney injury molecule-1 (KIM-1), hypoxia-inducible factor 1 (HIF-1), and PTEN induced putative kinase 1 (PINK-1) to determine if mercury induces injury characterized by mitophagy and hypoxia in the exposed cells. Interestingly, our findings show that at the cellular level, hyperglycemia appears to improve cell function and exposure to inorganic mercury in those cells had little effect. The impact of inorganic mercury exposure in patients with diabetic nephropathy cannot be fully understood at the cellular level. While a more robust study of the intracellular processes and compensatory mechanisms at an organ system level is required to fully elucidate the impact of mercury on hyperglycemia induced diabetic nephropathy, the existing data provides a valuable foundation for this investigation.

Macon – 11

Immunologic Link Between Sleep and Sepsis

Anjali Patel, Mackenzie Morgan, Wendy E. Walker

Introduction

Death from sepsis is a common occurrence in hospitals. Patients are deprived from sleep which can deteriorate their health severely. We utilized TLR2-KO and TLR2-KIGFP mice models to investigate the factors associated with sleep interruption and sepsis. This research builds on previous findings that sleep interruption increases sepsis progression and mortality rates. We hypothesized that TLR2 expression will be increased in sleep-deprived mice causing sepsis to get worse.

Methods

There were various tests and protocols performed such as cecal ligation and puncture, peritoneal lavage, ELISA, and other laboratory procedures.

Results

However, our results did not show significant differences in TLR2 expression or other cytokine levels between the normal sleep and sleep interrupted mice. This suggests that TLR2 might not be a main factor in how sleep deprivation causes sepsis to worsen.

Conclusion

Further research would require a larger sample size and should include other pathways to better understand what the mechanism between sleep disruption and sepsis is.

Macon – 12

Isolation of Leishmania Flagella.

Dhruv Rana, Dr. Sung-Jae Cha.

Abstract

Leishmaniasis, caused by Leishmania parasites transmitted by infected sand flies, is a significant global health concern. The parasite's life cycle involves several developmental stages, during which its flagellum plays critical roles in motility, adhesion, and signal transduction (Gossage et al., 2003). The work done over the summer focused on the isolation of the flagella from Leishmania infantum and Leishmania amazonensis promastigotes, which are the motile form found in the sand fly vector. A pre-existing protocol (Michels et al., 2020) was modified to isolate intact flagella while preserving both the 9+2 microtubule axoneme and the paraflagellar rod. The method utilized calcium shock, mechanical shearing, and separation by density gradient centrifugation to yield highly enriched flagellar fractions so that the species-specific proteins can be compared. Proteomic analysis of the isolated flagella will ideally identify many proteins, including cytoskeletal components and integral membrane polypeptides, that may serve as potential targets for a vaccine. This work will hopefully also provide a foundation for further studies on the roles of flagellar proteins in the pathogenesis of leishmaniasis.

Macon – 13

Noradrenergic excitation of the medial prefrontal cortex (mPFC) and food-seeking behavior

Robert Rudd, M.S., B.S.

Abstract

Relapse to addiction (whether food or drug) is a hallmark of the disorder. Animal models where relapse or reinstatement could be measured are useful for delineating addiction neurobiology. Norepinephrine (NE) from the Locus Coeruleus (LC) may regulate food or drug-seeking behavior. Rats learned to self-administer banana flavored sugar pellets for 10 days, followed by 10 days of forced abstinence in their home cages. After this, they were presented with a re-exposure session where they were exposed again to the cues that predicted sugar pellet delivery. We chemogenetically excited NE in the mPFC at this time. Preliminary data show that rats are able to learn to press the lever that delivered sugar pellets. On re-exposure day, rats were still able to distinguish active from inactive levers, however NE excitation did not alter responses. We are currently increasing the sample size, staining for cannula placements and running a separate group with cocaine instead of sugar.

Macon – 14

HUMORAL IMMUNE RESPONSIVENESS IN VIVO DURING LONG-TERM SPACE FLIGHT.

Peter N. Uchakin[1], Clarence F. Sams[2];

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Abstract

It is well-established that chronic stress can suppress immune responsiveness. Immune function following space flights, as well as in ground-based analogs, has been extensively studied. Cumulative data show a consistent trend in the suppression of T-dependent, cell-mediated immune reactivity. The primary objective of this experiment was to determine whether crewmembers could mount an antibody response to T-independent antigens during space flight. Five astronauts who participated in long-term (up to 6 months) space missions aboard the space station were included in this study (FLT group). Ten healthy, age- and gendermatched volunteers formed the control group (CTRL). All participants were vaccinated with the single dose of Pneumovax 23 vaccine intramuscularly in the deltoid region by either a fellow astronaut or a trained nurse. Blood samples were collected seven days prior to vaccination, immediately after vaccination, and at 7-day intervals thereafter. Levels of anti-pneumococcal antibodies, as well as the concentration and functional state of T cells, NK cells, B cells, and monocytes, were analyzed using flow cytometry and ELISA. No significant changes were observed in the distribution of immune cells in peripheral blood after vaccination compared to pre-vaccination time points. However, the functional state of the immune cells was altered following immunization. Although the dynamics of antibody concentration in peripheral blood were similar between astronauts and control subjects, indicating an increase in immune reactivity, the response was significantly higher in the FLT group than in the CTRL group. These findings suggest that T-independent immunity is not suppressed but rather activated by the complex stressors of long-term space flight. Such immune hyperreactivity could predispose astronauts to a number of potential pathological outcomes, such as hypergammaglobulinemia, persistent low-grade inflammation, and an increased risk of B-cell lymphomas during more extended space missions.

Macon – 15

Comparative Analysis of Viral DNA Extraction Protocols from Saliva for Multiomics Assessment of Immune Status (Proof of Concept)

Timothy J. Weehunt, MSBMS, Katatrina J. Amelchenko, BS, Miit A. Patel, Rachel N. Paturi, Peter N. Uchakin, PhD

No Abstract Submitted

MACON Clinical

Macon – 16

Salivary biomarkers of chronic stress-induced immune response mechanisms

Katarina Amelchenko

Abstract

Individuals who are caregivers to children with chronic illnesses are at greater risk for increased levels of stress, anxiety and depression. These factors can influence health in a multitude of ways, including activating viruses. If chronic, conditions such as these may play a role in promoting damage to organs such as the heart. The present study aims to assess the effects of chronic psychological states (stress, anxiety, and depression) on the presence of viral reactivation (HSV, VZV, CMV, EBV) and an immune response, which could identify a chronic inflammatory state that leads to organ damage. Although data collection is still ongoing, a total of 12 caregivers are in the process of being surveyed to evaluate psychological states and collect saliva samples to be processed for viral load and immune factors (cortisol, DHEAS, Interferons Type I and II, and troponin). Based on previous research, it is hypothesized that the caregivers with increased levels of stress, anxiety, and/or depression will have greater levels of salivary viral load as well as immune factors, putting them at greater risk for a chronic inflammatory state that could lead to end-organ damage.

Macon – 17

Drug Induced Pneumonitis from Hyaluronic Acid Penile Filler Injections

Sahaj Bhimani MS, Briana Birdsong MD, Muhammad S Khan MD, MPH

Introduction:

The lungs are a target of variety of toxic substances because of their large surface area. Drugs can induce inflammatory reactions in lungs and more than 380 medications are known to cause drug induced respiratory diseases. We present a rare case of hyaluronic acid induced pneumonitis from a penile filler injection.

Case:

A previously healthy, 42-year-old non-smoker male presented to the emergency department with acute onset shortness of breath after self-administering a penile hyaluronic acid filler two hours earlier. Patient was found to be in acute hypoxic respiratory failure requiring 100% oxygen via high flow system. Chest X-ray and CT scan done on admission were remarkable for ground glass opacities and small pulmonary nodules. Blood cultures, respiratory cultures, and viral respiratory panel were negative. Autoimmune workup was negative. A diagnosis of acute drug induced pneumonitis was made and the patient was started on high dose intravenous steroids. Patient's clinical condition improved significantly and at hospital day 4, he was off oxygen and eventually discharged home. A follow-up chest X-ray was normal and at 3 months post-discharge follow-up patient had fully recovered without any long-term disability.

Discussion:

Hyaluronic acid (HA), a ubiquitous glycosaminoglycan composed of repeating disaccharide D-glucuronic acid and N-acetyl-D-glucosamine is used in many cosmetic procedures, including penile girth enhancement. There have been rare case reports of HA induced non-thrombotic pulmonary embolism and diffuse alveolar hemorrhage. Our case is the first in literature to report drug induced pneumonitis from HA penile enhancement injections which was treated successfully with intravenous steroids.

Macon – 18

Anesthesia Access in Rural Georgia and Proposed Solutions

Chloe Boynton and Caroline E. Anglim
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Abstract

Anesthesia services are essential for the provision of surgical, obstetric, and emergency services in rural regions. Inadequate access in these areas has become a growing problem, as these populations tend to have higher rates of morbidity compared to urban regions. This has prompted legislation to create policies addressing these concerns, such as increasing the use of Certified Registered Nurse Anesthetists (CRNAs) in rural hospitals, offering incentives to physicians and hospitals, and providing transportation services, among others. However, issues regarding the quantity and quality (as a result of bias) of data result in anesthesia access gaps remaining. This paper summarizes the challenges in provision of anesthesia care in rural regions, with a focus on rural Georgia. Additionally, we explore current proposed solutions and the evidence supporting them to highlight areas for improvement. Ultimately, we believe future research should focus on the impact policies have on patient outcomes, in order to better meet the needs of rural regions.

Macon – 19

"It's Called A What Cell?": A Review of F-Cells' History, Current Utility, and Future Use

Ashi Dama, BS; Andrew I Hearn, MD, MSCI

Abstract

Fetal hemoglobin (HbF) was first discovered in 1866 by E. Von Korber after sampling blood from the umbilical cord. This set the stage for discovering the functions and clinical utility of HbF. F-Cells are erythrocytes in the fetus that carry HbF which has a higher oxygen affinity than the Hemoglobin A (HbA) that's found in adults. This high affinity allows HbF to transport oxygen from maternal to fetal circulation. In Sickle Cell Disease (SCD), persistence of Fetal Hemoglobin in adults provides a protective effect against the polymerization of Hemoglobin S (HbS). However, not much is understood about why this is the case or why a certain percentage of HbF is needed in an erythrocyte to have this protective effect. Many therapies that increase HbF levels have been shown to prevent and decrease the severity of vaso-occlusive events in SCD, such as Hydroxyurea and CRISPR-Cas9 gene editing of BCL11A. As such, revealing more about HbF may lead to the discovery of better treatments, diagnostic methods, and ways to monitor disease progression and treatment efficacy. This paper serves as a review of Fetal Hemoglobin and its relation to SCD as well as to discuss further avenues of research and the clinical utility of these findings.

Macon – 20

Achievement of fusion following revision tibiotalocalcaneal arthrodesis

Ashish Shah MD, Garrett Jebeles, Emilio Feijoo, Marc Bernstein, Tyler Kelly MD, Damon Dunwody, Paras Ahuja, Keerthi Jaliparthy MD

Abstract

Background and Objective

Past research on tibiotalocalcaneal (TTC) arthrodesis has focused on outcomes following primary surgery and reasons for revisions. To our knowledge, no study has reported outcomes following revision TTC arthrodesis. Our study aims to expand the knowledge of revision TTC fusion by analyzing rates of fusion following revision surgery.

Methods

The electronic medical record was searched using the current procedural terminology (CPT) codes 27870 and 28725 for TTC and subtalar arthrodesis for three orthopedic surgeons at a single institution between 2011 and 2024. Inclusion criteria included patients over the age of 18 who underwent revision TTC fusion after failure of primary surgery. Patients were excluded for loss to follow-up, lack of post-operative radiographic and clinical outcomes, and a history consisting only of primary TTC fusion. The final patient cohort consisted of 39 patients. Pre- and post-operative radiographs were compared to assess fusion after revision surgery. Radiographic union was defined as greater than 50% of fusion on CT evaluation. Demographics and reasons for revision were collected through chart review. Descriptive statistics were utilized to assess patient demographics, reasons for revision and the frequency of fusion.

Results

51.3% of the patients were male and 48.7% were female. Prior to revision surgery, 62.1% of patients were classified as obese. 30.8% of the patients had a documented history of diabetes, 18.0% with a history of chronic pain, 10.0% with a history of osteoarthritis, and 5.1% with a history of rheumatoid arthritis. The most common reason for revision was nonunion at 84.6% with 10.3% of patients requiring revision for device complications. 53.9% of patients achieved fusion as defined in the methods.

Conclusion

Fusion rates for revision TTC arthrodesis are lower than those for the surgery. Patients requiring revision TTC should be counseled on this decreased expected fusion rate prior to consenting to surgery. Future studies should look to incorporate assessment of patient-reported factors including pain and quality of life to further assess success of this procedure.

Macon – 21

Do patient reported outcomes correlate with radiographic parameters following first metatarsophalangeal fusion: A retrospective analysis

Marc Bernstein, Paras Ahuja, Damon Dunwody, Tyler Kelly MD, Garrett Jebeles, Keerthi Jaliparthy MD, Ashish Shah MD

Abstract

Background and Objective

There are few studies that report the interval outcomes of patients undergoing first metatarsophalangeal fusion for hallux valgus and hallux rigidus using patient reported outcome measurement information system (PROMIS) scores. This study sought to analyze the post-operative radiographic changes in first metatarsophalangeal alignment with interval PROMIS scores over one year.

Methods

A retrospective review of patients who underwent first metatarsophalangeal arthrodesis between July 2020and July 2024 yielded 35 patients. Demographic information and clinical complications were collected. Patient-reported outcome scores collected included PROMIS Physical Function (PF), PROMIS Pain Interference (PI), Foot Function Index (FFI) Pain, and FFI Disability. Patients were grouped based on preoperative review of foot radiographs yielding 18 patients with hallux rigidus and 17 patients with hallux valgus. The clinical, radiographic, and patient-reported outcome data were compared between groups.

Results

There were no significant differences in patient demographics or surgical complications between groups. The changes in HVA and IMA were significantly higher in the hallux valgus group ($p< 0.001$ for both). At 3 months, the hallux rigidus group reported significantly higher PROMIS PI and FFI Pain scores ($p=0.025$, $p=0.0403$, respectively). At six months postoperatively, there was a significant correlation between PF change from baseline and IMA correction ($p = 0.0465$) for patients with hallux rigidus. Also at six months, a significant correlation was found between disability change from baseline and DFA correction for the hallux rigidus group ($p = 0.0305$). At all other time points, there was no significant correlation between change in radiographic parameters and patient-reported outcome metric.

Conclusion

In conclusion, there does not appear to be a significant difference between the improvement of radiographic parameters and patient-reported outcome scores following successful fusion of the first metatarsophalangeal joint in patients with hallux valgus and hallux rigidus.

Macon – 22

Abscess on the move: A tale of the traveling hip injection

Darshit Patel, DO, Pedro Flores, MD, Aisha Miller, MD

Abstract

Greater Trochanteric Pain Syndrome (GTPS) also known as greater trochanter bursitis is a complex musculoskeletal condition involving interactions between various tissues under mechanical stresses leading to greater trochanter of the proximal femur pain that can be debilitating in severe cases. Joint injections are a common treatment to provide modest pain relief in this condition. However, infections can be missed leading to challenges in management and outcomes. A 60-year-old male presented to the hospital with 3-day progressive right hip pain after corticosteroid hip injection for GTPS. Patient was being treated for trochanteric bursitis of the right hip and primary osteoarthritis of the right hip. History revealed that the patient received a steroid injection into the right trochanteric bursa 11 days before emergency department admission. Additional history revealed a steroid injection on the right hip performed the month prior. This case illustrates the potential development for an abscess such from trauma induced during steroid injection and the value of a complete history. While steroid injections are minimally invasive procedures utilized world-wide they are still prone to complications, and though abscess formation can form as a consequence of intramuscular steroid injections, it is an unpredictable complication to keep in mind. Recognition early on is crucial for administration of suitable therapy and prevention of further major sequelae like abscesses, bacteremia and generalized sepsis or worse, multi-organ failure. Ultrasound-guided hip injections effectively relieve pain and inflammation from conditions like arthritis or bursitis by precisely delivering medication into the hip joint. A case example showed a patient who initially experienced pain, which later developed into a spreading abscess, highlighting the importance of monitoring for complications like infection.

Macon – 23

How to Diagnose Complex PTSD in the Inpatient Setting for Sexual Trauma Victims

Julia Giles MS2, Sabrina Weeks DO; Carson Piper MS2; Eric Kraitman MS2

Background and Objective

Understanding Complex PTSD (C-PTSD) is essential because it acknowledges the deep and enduring effects of recurrent trauma, aspects that are frequently neglected in clinical contexts (1). Both C-PTSD and PTSD are under the general category of 'Disorders Specifically Associated with Stress' but C-PTSD can be seen in patients who have been exposed to sustained or multiple forms of traumatic events (3). Establishing a diagnosis of C-PTSD can lead to the development of a more personalized treatment plan, compared to a PTSD diagnosis (3).

Methods

Based on the patient's history, a diagnosis of Complex PTSD was suspected. Three questionnaires were given to accurately assess the patient and correctly diagnose: PCL-5, International Trauma Questionnaire (ITQ), and the Zanarini Rating Scale.

Results

According to the Zanarini Rating Scale, the patient met criteria for Borderline Personality Disorder. Criteria was met for PTSD based on the PCL-5, but not the ITQ. While she did meet criteria for Disorders in Self Organization (DSO), a group of symptoms used to diagnose C-PTSD, a full diagnosis could not be made because PTSD requirements were not met. The patient was discharged to a rehabilitation center with a diagnosis of PTSD secondary to human trafficking and sex slavery.

Conclusion

Understanding Complex PTSD is critical for recognizing the significant and long lasting effects of chronic trauma that is often overlooked in the inpatient setting. Unlike PTSD, which typically results from a singular traumatic event, C-PTSD patients may require a more personalized treatment plan focusing on emotional regulation, self-identity, and relational capacities (2). Patients with C-PTSD may struggle to form therapeutic connections, complicating treatment progression. Integrating DSM-5 and ICD-11 criteria would allow providers to develop more personalized treatment plans and enhance the accuracy of diagnosis in the inpatient setting.

Macon – 24

The use of AI to manage young pediatric patients with Diabetic Ketoacidosis: Cases of the Glucommander being illustrated as an efficient method in correcting Diabetic Ketoacidosis in children less than 2 years of age.

Faith Harris, Mercer University School of Medicine; Umesh Narsinghani, MD, Atrium Health, Navicent Medical Center

Abstract

Diabetic Ketoacidosis (DKA) is a major complication of Type 1 Diabetes Mellitus (T1DM). This diagnosis is relatively rare in infants, and the current standard treatment of DKA is the traditional two bag method. We aim to increase awareness of cases of DKA in two pediatric patients under two years of age, and how it was treated safely and efficiently with an alternative method: the Glucommander protocol. The Glucommander is an adaptable algorithm that can be used to correct a hyperglycemic crisis by evaluating the velocity of the glycemic drop and its proximity to the target blood glucose range to adjust dosages of insulin over time.

We present two separate cases of a 12-month-old male and an 18-month female who both exhibit clinical symptoms and laboratory findings consistent with. Both patients underwent two separate insulin treatments under the Glucommander protocol. Blood glucose was lowered into target range and absence of symptoms were achieved in 10 hours and 8 hours respectively.

There exists evidence that supports that computer-based management of a hyperglycemic crisis is associated with less adverse outcomes, a decreased duration of hospital stays, lower intensive care admissions, and less time spent outside of the target blood glucose range. The goal of this case is to illustrate that the Glucommander protocol is a safe and efficacious treatment for treating DKA in patient populations under two years of age.

Macon – 25

Patient Reported Outcomes Following Arthroscopic, Knotless, Transosseous Triangular Fibrocartilage Complex (TFCC) Repair

Ethan Harrison, Daniel Gentry, Todd Rubin, MD, Brent Ponce, MD

Abstract

The triangular fibrocartilage complex (TFCC) is a key stabilizing and shock-absorbing structure in the wrist. Injuries to the TFCC frequently result in ulnar-sided wrist pain, impaired grip strength, and reduced range of motion. Recently, there has been an increasing shift towards arthroscopic repair for TFCC injuries, which has demonstrated similar or improved outcomes compared to traditional open repair. A novel arthroscopic technique involving a knotless suture anchor has been introduced by surgeons to reduce tissue irritation, potentially improving post-operative pain management and recovery time. This study aimed to evaluate the outcomes of this new technique through a patient-reported survey. The survey assessed pain, range of motion, return to work, and overall satisfaction following surgery. Preliminary results do not yet show significant improvements in patient outcomes compared to traditional techniques. However, the small sample size may limit the strength of these findings. Further research with larger sample sizes is needed to fully evaluate the efficacy of this novel arthroscopic method and its potential benefits in TFCC repair.

Macon – 26

Perspectives of AI in Healthcare

Ethan Harrison and Donald Carter

Abstract

The use of AI in healthcare is already a reality for many patients and providers, and further integration of AI is actively being sought after by healthcare leaders. These leaders are focused on increasing the efficiency and reach of their services, but they are particularly focused on the accuracy of these AI tools. This survey will focus on observing and reviewing the perceptions of both the public and the medical community on integrating these AI tools and comparing these perceptions. People working and studying medicine may see the applications and advantages of using AI that the general public cannot, such as lower costs and better accessibility. In addition, the overall public may not be as comfortable trusting an AI system with their health and health information. A short survey was distributed to people with and without medical backgrounds, and the results showed more overlap than expected. The public, compared to those with a medical background, is more concerned with the lack of privacy that may come from AI in healthcare. Still, they value the wider breadth of information AI tools provide more than respondents with a medical background. The varying levels of approval between and across individuals with and without a medical background, as well as their unique priorities, show relationships that should be further researched by healthcare leaders before further incorporation of AI in healthcare. This will hopefully allow a smoother transition to an AI-heavy healthcare system.

Macon – 27

Blood Pressure Variability in Patient Receiving Bolus versus Continuous Infusion Antihypertensives

Erin D. Wieruszewski, PharmD, Caitlin S. Brown PharmD, Alicia E. Mattson, PharmD, Gia A. Jackson, Jacob Klinger, Kristin S. Cole, MS, Fernanda Bellolio MD, MS, Daniel Cabrera, MD, Alejandro Rabinstein, MD

Introduction/Hypothesis:

There's growing evidence that swings in blood pressure (BP) are linked to worse outcomes for people with ischemic or hemorrhagic strokes. This points to the need for antihypertensive treatments that can keep BP steady. Our study aims to find out if using IV bolus, continuous infusion, or a mix of both antihypertensive treatments can improve BP stability and prevent neurological decline.

Methods:

We included patients who came in with acute ischemic stroke (AIS), intracranial hemorrhage (ICH), or aneurysmal subarachnoid hemorrhage (aSAH) and needed IV antihypertensives to manage their BP. We split them into groups based on whether they got bolus IV meds, continuous infusion, or both. We tracked their systolic and diastolic blood pressure (SBP, DBP) for the first 24 hours and calculated BP variability (BPV). The main goal was to see if patients' neurological conditions got worse within 24 hours, based on a change in NIH Stroke Scale (NIHSS) or Glasgow Coma Scale (GCS).

Results:

Out of 625 patients, 292 (46.7%) got bolus only, 158 (25.3%) had continuous infusion, and 175 (28%) received a combo of both. Around 42.4% of patients had AIS, 39.8% had ICH, and 17.8% had aSAH. The groups were pretty similar when it came to their baseline stroke severity (median NIHSS: 10, GCS: 14). BPV was different between the treatment groups ($p<0.05$), with the bolus group showing the most variation. Neurological decline was evaluated in about 78.6% of patients. Decline based on GCS happened more in the combo group (37.6%) than in the other groups (25%, 26.8%, $p=0.012$). NIHSS worsened most in the combo group too (20.9% vs 15.6%, 13.5%, $p=0.001$). Mortality rates in the hospital and after 30 days were similar across all groups.

Conclusions:

Bolus IV antihypertensives lead to more BP variability compared to continuous infusion or combo treatments. However, this didn't seem to be tied to a worse neurological outcome. More work is needed to figure out how to best manage BP during neurologic emergencies and to see which patients might benefit from each approach.

Macon – 28

Fulminant Cryptococcal Meningitis in an Immunocompetent Patient: A Diagnostic Challenge

Gia Jackson, Larry Nichols, MD

Mercer University School of Medicine

Abstract

This case report outlines the perplexing clinical trajectory of a 48-year-old truck driver presenting with a headache, residing in a rural area of the Mideast United States. Initially diagnosed with a presumed sinus infection, the patient's condition deteriorated despite antibiotic treatment. Lumbar puncture at a small rural hospital revealed aseptic meningitis, prompting transfers to regional and tertiary care hospitals.

At the tertiary care facility, the patient's neurological decline continued, leading to intubation, mechanical ventilation, and vasopressor therapy. Imaging demonstrated cortical signal changes and cerebral infarction. Subsequent autopsy revealed severe cryptococcal meningitis, challenging the conventional perception of this infection as exclusive to immunocompromised individuals.

This case underscores the diagnostic complexity of cryptococcal meningitis in immunocompetent patients, emphasizing the importance of considering rare etiologies in headache presentations. The report highlights the pitfalls of presumptive telephonic diagnoses, urging a thorough physical examination to discern subtle signs of meningeal inflammation. Lessons drawn include the necessity of testing cerebrospinal fluid for cryptococcal antigen, even in unlikely cases, and maintaining a broad differential diagnosis for secondary headaches, especially in patients over 55.

The atypical presentation and rapid neurological deterioration in this case serve as a reminder to clinicians to remain vigilant for uncommon conditions, challenging traditional diagnostic paradigms in the evaluation of severe headaches.

Macon – 29

Discussing Religion and Spirituality in Clinical Practice: An Assessment of Workshop Effectiveness

Hannah M. Jackson[1], Paul D. Byrd[2-3], and Caroline E. Anglim, PhD[1]

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Abstract

In recent decades, clinicians and academics have displayed an increased interest in how religion and spirituality should be addressed in clinical practice. Due to a lack of training for healthcare professionals, however, the integration of religious/spiritual care into medical care has failed to become common practice. The Faith in Rural Health program aims to address this lack of training though the collaborative efforts of faith and health leaders. As a part of this initiative, I developed a workshop on how healthcare professionals can discuss religion and spirituality in clinical practice and facilitated a pilot study. The workshop's curriculum was created using a review of the literature that pertained to the relationship between spirituality, religion, and healthcare. The workshop's contents included a base curriculum, discussion questions, and case scenarios, all of which were combined into a PowerPoint presentation. The anticipated time commitment of the workshop was two hours. A pre- and post-survey was used to evaluate the workshop's effectiveness and acquire feedback on how the workshop could be improved for future us. Analysis of survey data revealed an overall increase in comfort performing various aspects of spiritual/religious care amongst those who participated in the workshop. The results from this study show how simple education efforts such as this 2-hour workshop can help healthcare professionals feel more comfortable addressing spiritual/religious need in clinical practice. The generalizability of this study is limited due to only three physicians participating in the workshop. Additionally, participation was voluntary; thus, participants may have had a higher initial comfort level than those who chose not to participate. Future efforts should be made to improve the workshop's effectiveness by including basic information on major religions and gathering feedback from more healthcare professionals.

Macon – 30

Trapped in Strength: The Struggles of a Male Abuse Victim

Eric Kraitman, BA; Carson Piper, BS; Julia Giles, BS

Abstract

The male gender role is characterized by strength, emotional restraint, and pain tolerance. As a result, male domestic abuse victims are less likely to seek help than women. [1]

This case involves a 42-year-old male with Bipolar II and alcohol use disorder presenting with depression and passive SI secondary to abuse by his ex-wife's husband, who provides the patient housing. The abuse included food limitations, forced labor, and physical assault leading to orbital and rib fractures. The patient denied manic episodes but reported depression, hopelessness, poor sleep, guilt, low energy, anhedonia, and SI, qualifying as a major depressive episode. This case will examine the difficulties men encounter in seeking help for domestic abuse.

The patient was restarted on lurasidone and bupropion with ketorolac for rib pain. Analgesia improved group therapy participation, sleep, demeanor, and SI for three days until anxiety and SI increased due to discharge planning. SI was limited by plans of sobriety and regaining child custody. His medications at discharge included hydroxyzine for generalized anxiety and trazodone for sleep.

Upon discharge, he denied SI and detailed a safety plan with an internal coping and external support system. He was discharged with a referral to a homeless shelter and community resources due to housing shortage for male abuse victims.

Bipolar II and alcohol use disorder are associated with higher domestic abuse victimization risk. [2] One in seven men experience severe physical violence at the hands of an intimate partner. [3] Men may have difficulty identifying their experience as abuse and struggle to recognize their risks. [4], [5] Men avoid seeking help because of stereotypes; those that confide in peers and support services are met with ridicule, minimization, and doubt. [6], [7]

To prevent similar situations, providers must identify risk factors and provide patients resources for abuse avoidance.

Macon – 31

Three Cases of Diverticulitis in Adolescent Population

Pavel Gonzalez MD, Cory Nonamacher MD, Joshua Glenn MD, Gabrielle Newsome MS3

Abstract

Background and Objective: There has been a rise in the number of cases of diverticulitis requiring operative management at Beverly Olsen Knight Children's hospital in Macon, GA. The pathogenesis of diverticulosis in adults includes chronic constipation and inflammation of the colon, it is not a commonly reported disease among children. In addition, because this is typically considered an adult disease, there may be a delay in diagnosis leading to complications such as perforation and abscess.

Methods: A thorough chart review was conducted on the three patients so that a comparison could be made between presentation, lab values, imaging, management, and outcomes. The patients included a 17-year-old male, 16-year-old female, and a 14-year-old male, all of whom have undergone surgery for diverticulitis in 2024.

Results: Common among the patients was a history of morbid obesity, multiple ED admissions, and complications of diverticulitis such as perforation and abscess. Only one of the three patients carries a diagnosis of diabetes, and they are of different genders, racial and ethnic backgrounds. The patients also have differing insurance statuses and access to healthcare. One patient underwent a laparoscopic sigmoidectomy with colorectal anastomosis. The second received a robotic converted to open sigmoidectomy with colorectal anastomosis. The third patient was given a diverting colostomy to allow for inflammation to subside and increase the likelihood of a successful anastomosis. He has not yet received further surgical intervention.

Conclusion: Based on the three patients presented, the pathogenesis of diverticulitis in the adolescent population seems to be similar as that of the adult population. A history of obesity or chronic GI issues seems to make diverticulitis a reasonable diagnosis in the patient presenting with left lower quadrant abdominal pain without evidence of obstruction, as in adults. Pediatric diverticulitis refractory to treatment can be surgically treated with sigmoidectomy and colorectal anastomosis.

Macon – 32

The Determination of Sources for Sepsis

Jay Patel and Dr. Khadijat Kasumu M.D.

Abstract

Sepsis is a critical condition that can result in life-threatening complications. Identifying the primary source of sepsis is crucial for preventing further deterioration in patients. However, pinpointing the source can be challenging in certain cases. This difficulty can delay appropriate treatment, leading to complications which may impact mortality of patients. A 61 y/o male presented to the emergency room with generalized weakness for two days. He has a history of heart failure with reduced ejection fraction (EF 40%-45%), Complete Heart Block status post pacemaker placement with recent readjustment of pacemaker leads 3 months prior to presentation. In the ED, the patient had a fever of 102.5º F. This prompted a sepsis workup and treatment, including collection of cultures and starting broad spectrum antibiotics with IV Vancomycin and Cefepime. Initial blood culture reported gram positive cocci in clusters which speciated to methicillin resistant *Staphylococcus aureus* (**MRSA)**. He has a chronic, recurrent draining abscess on his buttocks and bilateral diabetic feet ulcers, which he regularly follows with a dermatologist and podiatrist. Tissue culture taken during pacemaker removal and sacral and foot ulcers have showed no growth to till this day. Despite several potential sources, no cultures were grown. Gastrointestinal translocation emerged as a potential source, a hypothesis that can only be confirmed by exclusion. There have been several potential hypotheses for the GI translocation for sepsis, but there needs to be more research to find a direct mechanism. If a link can be established, it can allow for proper and rapid treatment which may reduce further complications.

Macon – 33

What exactly are the “freckling” conditions? A review.

Ian Sellars, BS, Yiqun Shellman, PhD

Abstract

The term “freckles” is often used as an umbrella term to describe both ephelides and lentigines. These skin lesions are frequently used interchangeably in literature, contributing to confusion, as ephelides is the medical term for what is commonly referred to as freckles. This review aims to summarize the current understanding of ephelides and lentigines with the aim of establishing a consensus on terminology.

Ephelis (singular) or ephelides (plural) originates from Ancient Greek, “epi” meaning upon, and “helios,” referring to the sun. Ephelides are small, 1- to 2-mm sharply defined macular lesions of uniform color, commonly ranging from red to tan or light-brown. They typically first manifest during early childhood and often fade by adulthood. Ephelides often darken with UV exposure during the summer months and lighten in the winter.

Lentigo (singular) or lentigines (plural), named after their resemblance to small lentils, are similarly sharply defined macular lesions, but range in size anywhere from 2- to 20-mm. They present as light-brown to dark-brown or black pigmented lesions. Unlike ephelides, lentigines do not change in pigmentation with UV exposure.

Previous studies have well documented the challenges in identifying the histopathological features in ephelides. This leaves their differentiation from lentigines primarily to clinical diagnosis, which is essential for effective clinical management. Literature and researchers need to avoid use of the nonspecific term “freckles” and accurately differentiate between these two conditions by applying the more appropriate medical terminology.

Macon – 34

Penetrating Aortic Ulcer of the Distal Aortic Arch

Will Van Brackle, Aisha Miller MD

Abstract

Penetrating aortic ulcer is a rare but potentially life-threatening complication of advanced atherosclerosis. It is the least common cause of acute aortic syndrome, but there is a high risk of progression to intermural hematoma, aortic dissection, or rupture, especially in symptomatic patients. This case report describes a 66-year-old female who presented to the hospital with a 4-day history of chest pain and a medical history significant only for hypertension. Computed tomography scan revealed a penetrating aortic ulcer of the distal aortic arch that was successfully treated using endovascular thoracic aortic aneurysm repair. No post-operative complications were encountered and the patient was discharged home the following morning on aspirin and atorvastatin in addition to her hypertensive medications.

MACON Epidemiological

Macon – 35

Community-Oriented Primary Care in Rural and Indigenous Geographies: A Review of the Literature

Elia Nicole Nelson, Zaid Al-Husein, and Maggie Zeigler (**equal contributors**)

Abstract

Despite attempts to improve the health of rural and underserved Americans, the US healthcare system continues to see gaps in care when attempting to reach these communities. This literature review explores the previous use of the community-oriented primary care (COPC) model to determine its use in rural Georgia and tribal Oklahoma. This review underscores the successes and failures seen by programs that utilized COPC while applying its principles to the American healthcare system and determining the directions American healthcare could move should COPC be applied. This literature review further explores common barriers faced when attempting to implement COPC, such as lack of funding, inadequate community support, low literacy rates, scarce community resources, and an absence of COPC in medical education.

Current literature describes the lack of COPC's use in its entirety, stating that many providers are using only parts of the whole model, if it is being used at all. This partial implementation can lead to underrepresentation and potentially skew the understanding of COPC practices in contemporary healthcare settings. Additionally, the literature on the implementation of COPC in Indigenous populations is notably sparse. Several articles detailing COPC projects founded both domestically and internationally were reviewed, and the ultimate conclusion was made that COPC can be effective when all parties involved fully engage in the process and feed the project with community support. While action has been taken to improve American healthcare with the passing of the Affordable Care Act, there remains a need for commitment to community engagement at the systemic, organization, and patient levels. This review highlights what is missing, where COPC fits in the future of American healthcare, and makes a call-to-action for community stakeholders to review the benefit COPC may have in the aforementioned communities and to predict the influence it may have on such populations.

Macon – 36

Effect modification of race-ethnicity on the association of allostatic load and educational attainment with risk of cancer mortality among men in the United States.

Cynthia Li, BS, MD, Sydney P. Howard, DrPH, MS; Charles R. Rogers, PhD, MPH, MS, MCHES; Sydney Andrzejak, MS; Keon L. Gilbert, DrPH; Keith J. Watts, PhD, MSW; Malcolm S. Bevel, PhD, MSPH; Myles D. Moody, PhD, MA; Marvin E. Langston, PhD; Judah V. Doty, MS; Adetunji T. Toriola, MD, PhD, MPH; Darwin Conwell, MD, MSc, FACG; Justin X. Moore, PhD, MPH

Abstract

Importance: Health disparities among racial and ethnic minorities, particularly in cancer mortality rates, remain a significant public health concern. Black men, specifically, face the pervasive effects of discrimination in their daily lives, which also contribute to the complex relationship between allostatic load (a marker of chronic stress), educational opportunities, and elevated risks of cancer mortality.
Objective: This study aimed to elucidate the relationship between educational attainment, allostatic load, and cancer mortality risk among men.
Design: Retrospective analysis of data from the National Health and Nutrition Examination Survey from 1988 to 2010 with follow-up data through December 31, 2019.
Setting: A nationally representative sample of ~5,000 people per year in counties across the country.
Participants: Black men (N = 20,529)
Intervention (or Exposure): Allostatic load data were stratified by education and adjusted for age.
Main Outcome(s) and Measure(s): Educational attainment was categorized as (1) less than high school education, and (2) high school graduate and above. Allostatic load score was calculated as the sum of total abnormal biomarkers and health measures (nine total). Participants were considered to have high allostatic load if their score was three or more. Weighted Cox proportional hazards models were fitted to estimate adjusted hazard ratios of cancer death between educational attainment/allostatic load (adjusted for age, income, and smoking status).

Macon – 37

Perinatal Mood and Anxiety Disorders: Risk Factors and Potential Management Strategies

Sydnee Burke

Abstract

Perinatal Mood and Anxiety Disorders (PMADs) encompass a variety of mental health conditions including depression, anxiety, post traumatic stress disorder, and others that occur during pregnancy and up to one year postpartum. PMADs affect approximately 1 in 5 mothers in the United States, and they are currently one of the leading causes of maternal mortality in the state of Georgia. The risk factors for PMADs are vast, spanning biological, sociological, and psychological domains. Despite their prevalence and their significant impact on mothers, infants, and families, screening and treatment of PMADs remains limited and inconsistent. This problem analysis, conducted via comprehensive literature review, aims to identify barriers preventing effective screening and treatment of PMADs and proposes potential strategies to improve outcomes for women in Georgia. Findings indicate that the most substantial obstacles to PMAD management are insufficient provider training and lack of PMAD specialists and mental health providers. Proposed solutions include: implementing provider-specific curricula that address racial and cultural risk factors for PMADs in medical school and other clinical programs, referring mothers who screen positive to telehealth counseling services, promoting ongoing PMAD training sessions for current providers, broadening the maternal health care team to include doulas and midwives, expanding home visiting programs, fostering participation in online support groups, and offering individualized treatment plans with the minimal effective doses of SSRIs. PMADs are a critical issue contributing to maternal mortality across the state of Georgia and the nation. By advocating for these additions and changes to current practices, it may be possible to reduce the incidence of PMADs and improve maternal health outcomes for women in Georgia.

Macon – 38

Urinary concentrations of parabens among US adults with and without cancer diagnosis

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Abstract

Background & Objectives: Parabens are endocrine disrupting compounds (EDCs) commonly used as antimicrobials in personal care products (PCPs), food, pharmaceuticals, and household products. There has been an increasing concern about environmental exposure to parabens and cancer risk. This study aims to assess whether paraben concentrations differ relating to cancer diagnosis in the general adult population. **Methods**: We examined urinary concentrations of parabens, including butylparaben (BP), ethylparaben (EP), methylparaben (MP), and propylparaben (PP), in a total of 8631 adult participants aged 20-85 years from the 2005-2016 NHANES cycles. To control urine dilutions in spot urine samples, creatinine-adjusted urinary concentrations of parabens were determined for each individual. Cancer diagnosis including all types of cancers was from the medical condition questionnaire data. **Results**: Of the 8631 participants, 816 (9.45%, weighted prevalence) reported a cancer diagnosis. MP was the most abundant paraben in urine with a weighted geometric mean of 52.65 μg/g creatinine, followed by PP (6.92 μg/g creatinine), EP (2.60 μg/g creatinine), and BP (0.30 μg/g creatinine). Individuals with cancers showed a statistically significant increase in the geometric mean of urinary MP concentrations (67.51 μg/g creatinine) compared to non-cancer individuals (51.22 μg/g creatinine) ($p = 0.0054$). None of the other parabens showed statistically significant increase in urine concentrations among cancer individuals. Interestingly, females were found to have an almost five-fold increase in the geometric mean of urinary MP concentrations (111.37 μg/g creatinine) compared to males (24.00 μg/g creatinine) ($p < 0.0001$). **Conclusion**: This study demonstrates a significantly increased urinary concentration of MP among cancer individuals. Further studies are warranted to examine the association between paraben exposures and cancer risk, especially among women, and to evaluate PCP usage in relation to paraben exposure to provide more insights into the potential role of parabens in cancer etiology.

Macon – 39

Conversion from Minimally Invasive surgical approaches to open surgery among endometrial cancer patients in the SGO Clinical Outcomes Registry

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Endometrial cancer (EC) ranks as the predominant gynecological malignancy in the US. While minimally invasive surgical (MIS) techniques have revolutionized EC management, conversion to laparotomy remains a concern, with reported rates varying widely. Factors influencing this conversion, including patient characteristics and tumor attributes, have not been fully understood. Addressing this gap, our study employs a national registry to analyze patient, tumor, and surgeon-related factors contributing to the transition from MIS to laparotomy in EC cases.

Results: 0ur results showed, 3.4% (135/4028) experienced planned MIS-to-open conversion. Demographic disparities were absent between conversion and MIS groups. Conversion was more prevalent in obese (29%) and morbidly obese (37%) patients (P=0.04), linked to prior abdominal surgery (63% vs 52%; P=0.001). Endometrioid EC predominated (59%) in the converted group, with higher non-endometrioid rates (serous carcinoma 16%, clear cell carcinoma 4%, carcinosarcoma 5%, mixed histology 12%; all P<0.01). Advanced FIGO stages were more common in conversions (stage II: 5%, stage III: 25%, stage IV: 9%; all P<0.001). Type II (24%) and type III (5%) hysterectomies were more frequent in conversions (P<0.001). Logistic regression indicated BMI, prior surgery, FIGO stage, histology, and operation type affected conversion (p<0.001), explaining 12.3% of variance. Indications for conversion included uterine size, adhesions, and disease extent.

Conclusion: the adoption of minimally invasive surgery (MIS) has become increasingly popular for managing endometrial cancer (EC), attributed to enhanced perioperative outcomes. However, prudent patient selection and surgical planning are imperative to mitigate the risk of unplanned transition to open surgery. Predictive factors for such conversion include uterine size, prior abdominal surgeries, surgical complexity, disease extent, and histologic types. Further prospective research is warranted to validate these findings and identify individuals at conversion risk. Ultimately, a personalized surgical approach, tailored to individual patient attributes, remains pivotal for optimizing outcomes in EC management.

Macon – 40

Closure of Rural Hospitals and Obstetrical Units Who Serve Minority Populations

Abbie Earnest

Abstract

Since 2008, Georgia has seen the closure of nine rural hospitals and over 41 rural obstetrical units in the past 30 years. These closures have significantly impacted local communities, maternal and infant health, and have exacerbated racial disparities. This problem analysis aims to identify the root causes behind the closures of rural hospitals and obstetrical units serving minority populations in Georgia and to propose effective solutions. A systematic literature review and comprehensive data analysis were conducted to explore these issues. This problem and solution analysis was conducted using a systematic literature review and comprehensive analysis. Data was sourced from healthcare reports, policy documents, and interviews with rural healthcare providers. The literature review focused on peer-reviewed research that documented successful interventions for similar challenges faced by rural communities across the United States. The problem analysis identified key factors contributing to the closures: financial pressures prioritizing returns over health equity, inadequate policies for rural and minority populations, and difficulties in recruiting and retaining healthcare professionals. The findings revealed that rural hospitals and obstetrical units serving high proportions of Black and Hispanic residents are particularly vulnerable to closure, highlighting how sociodemographic factors influence healthcare access. To address these issues, the study recommends several strategies: conducting targeted research on rural health disparities and minority populations, advocating for policy reforms, enhancing insurance options, and establishing partnerships with educational institutions to support the training and retention of rural healthcare professionals. Implementing these recommendations can help mitigate the negative impact of hospital closures and improve healthcare access for rural and minority communities.

Macon – 41

Mobile Centering Pregnancy: A Scaling Solution to Providing Prenatal Care in Maternity Care Deserts

Carson Edwards

No Abstract Submitted

Macon – 42

Community Engagement in Overcoming Barriers to Women's Healthcare

Tiera Evans

Abstract

A delay in women's access to primary healthcare services in the United States can have serious implications. This delay can result in postponed screenings and preventive care, increasing the risk of late detection of cancer, infertility, or other gynecological illnesses. Consequently, women may face a higher likelihood of adverse health outcomes, including more advanced stages of disease at diagnosis, limited treatment options, and higher mortality rates. Furthermore, delayed access to healthcare can compound existing health disparities and place a greater burden on the healthcare system. It is essential to address these challenges to improve women's health outcomes and minimize the broader societal impact of delayed care.

Macon – 43

Disparities in the Delivery of Maternal Care in Georgia

Chloe Johnson, Zelma Y. Delgado, and Jennifer L. Barkin

Abstract

Maternal mortality throughout the United States remains a critical issue with maternal-related deaths increasing over time. Significant rural and racial disparities persist in maternal mortality. Women from minority groups and women from rural areas often experience barriers in access to care, etc. While these issues remain important across the United States, these disparities are more pronounced in Georgia due to the high maternal mortality and morbidity rates. The goal of this study was to review recent literature on rural and racial disparities in maternal care within Georgia. A systematic literature review was conducted, screening 326 articles from PubMed. After applying inclusion criteria and excluding non-relevant studies, 19 articles were selected for detailed analysis. Various themes such as external traumas, racial differences, rurality and insurance coverage were evident as risk factors following analysis of the studies. Key findings include low preconception folic acid supplement use, with Hispanic women particularly affected, and racial disparities in epidural analgesia administration. External factors such as social determinants, evictions, and stressful life events were found to correlate with poor maternal health outcomes. Mothers from minority groups and mothers from rural areas frequently experienced worse outcomes relative to non-Hispanic White mothers. Hispanic women face higher maternal mortality rates and increased instances of preterm births, low birthweight, and postpartum depression in comparison to that of non-Hispanic White mothers. They also report higher rates of mistreatment and discrimination. These disparities highlight the need for targeted interventions to improve maternal health outcomes in Georgia.

Macon – 44

Socioeconomic Status and Its Effect on Incidence of Child Maltreatment

MaKayla Paulk MD Student, Dr. David Hollar PhD

Abstract

Nationally, more than 3 million children in the world have received an investigation response due to suspected maltreatment.[2] Child maltreatment, or "the abuse and neglect that occurs to children under 18 years of age"[1] is an unfortunate event that happens way too often. The purpose of this study was to determine the statistical significance of socioeconomic factors and their potential effect on increasing the likelihood of a child occurring maltreatment. The study was conducted using the 2021 National Child Abuse and Neglect Data System (NCANDS) data for the state of Georgia and SPSS software to determine the Chi Square value and p value of each dependent variable included in the "risk factors" section of the NCANDS data. After condensing the data to make sure no duplicate cases were included, statistical analysis of the data was completed, and the significance of each variable was determined. Included in the NCANDS data were three variables of particularly high interest in this research: inadequate housing, financial problem and public assistance. These were the most relevant variables pertaining to socioeconomic status. It was determined that these three variables were all statistically significant with a p-value of <0.001 showing that the incidence of child maltreatment had <0.1% chance of occurring by chance and therefore tells us that being a part of lower socioeconomic statuses increases a child's chances of incurring some form of maltreatment. This study could potentially be used to help physicians understand that children coming from lower socioeconomic statuses are more likely to suffer from maltreatment and can guide the physicians to be more aware of signs of maltreatment in these children. This could be the start of a more in-depth study to help public health officials determine ways to decrease the incidence of child maltreatment in individuals from lower socioeconomic statuses.

Macon – 45

Rural and Urban Differences in Child Maltreatment Reporting During the COVID-19 Pandemic

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Abstract

Background & Objectives: During the COVID-19 pandemic, stay at home orders caused a change in family dynamics with children out of school and at home with their parents. Many parents had increased stress and suffered from parental burnout while trying to maintain a sense of normalcy under new restrictions. It would be of great interest to see how these new dynamics would impact child maltreatment rates across the state of Georgia and how these rates would differ in rural and urban regions. **Methods**: A literature review was conducted looking through Science Direct, EBSCO, and Google Scholar. Data on child maltreatment rates were obtained from Kids Count Data Center. Data on socioeconomic variables were obtained from the county health rankings website for central Georgia counties. In this study, we specifically compared a rural county, Macon County, with a nearby urban county, Houston county, in central Georgia to assess the differences in the impact of COVID-19 on child maltreatment between rural and urban counties and potential risk factors. **Results:** The substantiated incidence of child abuse was higher in Macon county than in Houston county over the years of 2018-2022. A decrease in reporting child abuse was seen at the beginning of the pandemic in both Macon and Houston counties. A much higher substantiated incidence of child neglect was found in Macon county as compared to Houston county and the state over the years of 2018-2022. An even higher rate of child neglect during the pandemic (2021 and 2022) was observed in Macon county. **Conclusion**: A pronounced impact of COVID-19 pandemic on child maltreatment was found in the rural Macon county. The higher substantiated incidence of child abuse and neglect in Macon county than in Houston county could be largely due to the differences in socioeconomic factors.

Macon – 46

Behavioral Risk Factors for Cardiovascular Disease in the 2017-2018 NHANES Cohort

Laramie Prince

Abstract

Background There are many studies that demonstrate the relationship between socioeconomic status (SES) and risk of cardiovascular disease (CVD). Prior studies show that people with a low SES have higher risk of CVD and are more likely to experience poorer outcomes compared to people with a higher SES. Disadvantaged people have more risk factors for heart disease such as smoking, consumption of alcohol, physical inactivity, unhealthy diet, depression, diabetes, obesity, and hypertension.

Methods This study aims to explore the correlation between cardiovascular health and socioeconomic factors such as income, education, and employment status. In this study, a multivariable risk algorithm was used to assess risk of cardiovascular disease events in participants using data from a 2017-2018 NHANES study. The Cox proportional-hazards regression was used to evaluate the risk of a person developing a CVD event. Sex-specific multivariable risk functions were derived that incorporated age, total and high-density lipoprotein cholesterol, systolic blood pressure, smoking, and diabetes status. An individual's CVD risk score was then compared to how many hours an individual worked last week, if they smoked 100 cigarettes in their lifetime, health insurance coverage, level of education, annual household income, individual income from wages, race, food security, marital status, and gender.

Results The strongest correlation with CVD risk is smoked at least 100 cigarettes in their lifetime, not being married, and being male. Smoking, being a male, and not being married shows a positive correlation with CVD risk. There was a weak negative correlation between education and CVD risk. There was no correlation between CVD risk and income and employment.

Conclusion Addressing the correlation between SES and risk of CVD can help to lower risk cardiovascular disease in groups with a low SES reducing morbidity and mortality.

Macon – 47

Effects of Sleep Disturbances on Allostatic Load and Cardiovascular Risk Factors.

Haley Thompson and Dr. David Hollar

Abstract

Background and Objective: Via allostasis, various physiological systems have worked together to protect the body amid various stressors. However, this continuous adaptation to stress came at a price—allostatic load. Over time, the wear and tear of allostatic load (AL) can ultimately predispose an organism to disease. The role of allostatic load in cardiovascular disease has been well-established, but studies have been inconclusive as to the relationship between allostatic load and sleep quality. This study aimed to explore the interplay between measures of sleep disturbances, allostatic load, and cardiovascular risk.
Methods: Using the National Health and Nutrition Examination Survey (NHANES) 2017-2020 Pre-Pandemic data and IBM SPSS Statistics, various analyses were conducted to assess associations between sleep disturbances and AL including differences across sociodemographic and lifestyle factors. This was done in a manner similar to the Chen et al. study. Additionally, pulse pressure was evaluated across age groups for associations with increased AL.
Results: Sleep apnea symptoms, severe insomnia symptoms, long and short sleep duration, functional impairments related to daytime sleepiness, and telling the doctor about trouble sleeping were associated with significantly increased AL (p value <0.001). Correlations were found between increased AL and certain sociodemographic and lifestyle factors as well. Finally, increased pulse pressure was found to be associated with higher AL and older age.
Conclusion: Data supported the idea that sleep quality and duration could be linked to physiological regulation and cardiovascular health. It also reinforced the idea that pulse pressure could be an indicator of cardiovascular risk particularly for older adults. However, further research must be conducted to determine causal associations between AL and sleep characteristics.

MACON Medical Education

Macon – 48

Influence of MCAT, GRE, and Undergraduate School on MSPCS Program Success

Sahaj K. Bhimani MS, Kenneth Onyedibe* MBBS, PhD, and James Drummond PhD

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Background and Objective: The Mercer University School of Medicine's Master of Science in Preclinical Sciences (MSPCS) program was developed in 2012 with the hopes to further prepare students pursuing professional science degrees or other careers in medicine after their undergraduate career. Since 2017, there have been 327 attendees with 258 graduates. The goal of the data analysis that was performed on all past PCS students was to understand factors that are leading to student's success. Factors such as postgraduate MD acceptances, program success based on which standardized test was taken prior to acceptance, and comparing students from 5 different undergraduate schools were explored in this medical education research project.

Methods: Data collection began in 2017 by gathering the information provided from each student's application. The data was entered into an excel file. This data included where each student is from, what college they attended, undergraduate GPA, degree earned, and pre-MSPCS standardized testing scores (MCAT, GRE, DAT). This data was examined to note whether the student was from a rural area or non-rural area (R vs NR). This data was then examined at the completion of each academic year entering each students' outcomes including graduation status, each course grade, overall program average grade, and medical school acceptance status. The various different analyses performed were done through Microsoft Excel.

Results: Through the data analysis it is revealed that the MSPCS students that were accepted into the MUSM MD program outperformed other students in undergraduate GPA, pre-MSPCS MCAT, pre-MSPCS GRE, and overall program performance. When assessing general performance data, the students that took the MCAT prior to the PCS program outperformed those students who took the GRE and DAT by multiple grade points within the program and had a 20% greater graduation rate. In the school comparison groups, the students from schools A, B, and C fared better in their standardized tests and program performance in comparison to those from school D and E. Additionally, within each school those who took the MCAT performed better within the program compared to those who took the GRE.

Conclusion: Through this data analysis, we generally see that those who take the MCAT prior to the MSPCS program perform better within the program in comparison to those who take the GRE. This may be since the MCAT is a very rigorous test that involves studying many similar subjects that are taught in the MSPCS program. With the analyses done, I think a review of the current acceptance criterion could be changed to allow for higher success rates.

Macon – 49

Executing an OSCE Curriculum for fellows and residents in an Academic Anesthesiology Program

Chloe Boynton[1], Michelle L. Sumler[2], and Susan A. Smith[2]

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Abstract:

Objective Structured Clinical Examinations (OSCEs) are designed to evaluate clinical skill performance of students in preparation for real world practice. OSCEs are commonly used in healthcare professions and are associated with high levels of anxiety over performance and preparation[1,2]. Mock OSCEs have been shown to be beneficial, as there are not many resources available for students to practice. However, barriers such as financial or administrative burdens exist[3]. This study addresses these gaps by implementing and evaluating an OSCE curriculum for anesthesia residents and fellows. Case scenarios were created based on the American Board of Anesthesiology's (ABA) guidelines and embedded in review presentations. Pre and post OSCE and mock OSCE reviews were conducted and feedback from students was collected. We expect the curriculum to improve students' confidence, preparedness, and OSCE scores.

Macon – 50

Pathology and Clinical Science: Case-Based Learning with Multiple-Choice Questions and Quantifiable Outcomes

Kevin Davis, B.S. and Larry Nichols, M.D.

Abstract

Background

MedCockpit is a digital online medical education platform, still in development, geared toward teaching pathology to residents, which we at Mercer are helping expand to teaching medical students. Our goal is to develop content for the software that is appropriate for use by preclinical medical students. To that end, cases were adapted by Dr. Nichols and his previous Mercer medical student collaborators from autopsies performed by Dr. Nichols, with case histories that each include a virtual microscopic slide.

Methods

Our goal was to generate and embed USMLE-style multiple choice questions that would be presented to the student learner as the case is presented in a progressive-disclosure fashion. The learner is required to identify the best answer choice out of five options before receiving the next piece of the case history. Each answer option has a rationale, but the rationales for each incorrect answer choice must explain why that answer is incorrect without revealing the correct answer. A five-question pre-test is administered at the beginning of the case composed of difficult questions that the student should have difficulty answering correctly prior to going through the case-based learning exercise. The same questions are administered as a post-test following completion of the case; at this point, students should have gathered enough information from working through the case questions to identify the correct answers. Comparison of pre-test and post-test scores will provide data points that can be used to assess the validity of this model for pathology education.

Macon – 51

Motivating teens to consider careers in healthcare through innovative rural summer medical camps

Carson Edwards, Seth Johnson, Ali Gheidi

No Abstract Submitted

Macon – 52

Response Times of Drone Delivery of Naloxone Compared to Traditional Methods in Rural Areas: A Meta Analysis

Lendley Gibbs; Mayson Watford; Taliyah Henderson, MSIT; David Hollar, PhD; Anne Montgomery, PhD

Background and Objective

In rural areas, opioid overdoses are a significant public health issue, often exacerbated by delayed emergency response times. Naloxone, a medication used to reverse opioid overdoses, must be administered promptly to be effective. This meta-analysis aims to evaluate the response times of drone-delivered naloxone compared to traditional emergency medical services (EMS) in rural areas, focusing on improving timely access to life-saving medication.

Methods

Meta-statistics were applied to synthesize data from selected studies. Odds ratios were combined to assess overall effect sizes, and a forest plot was constructed to visually represent individual and combined odds ratios. This allowed for a clear comparison of the effectiveness of dronedelivered naloxone versus traditional EMS in reducing response times in rural areas.

Results

The analysis revealed that drone-delivered naloxone significantly reduced response times compared to traditional EMS. Although some studies did not report exact times, performance metrics consistently showed that drones were faster and more efficient. The forest plot underscored the superior effectiveness of drone technology in overcoming infrastructure challenges that often delay EMS in rural settings.

Conclusion

Drone-delivered naloxone offers a faster, more efficient alternative to traditional EMS in rural areas, where infrastructure limitations can hinder timely emergency responses. These findings suggest that integrating drones into emergency medical services could significantly improve patient outcomes and reduce opioid-related fatalities. Future research and policy efforts should focus on supporting the adoption of drone technology to enhance healthcare delivery in underserved regions

Macon – 53

Virtual Education in Emergency Preparedness: Evaluating the Usefulness of Online Simulation for Cardiac Arrest in the Athlete

Raegan Kelley, MA; Nicholas L. Strasser, M.D.

Abstract

Background and objective: Sudden cardiac arrest (SCA) in an athlete is a rare but devastating event. Pre-participation screening is commonly used to detect potentially dangerous cardiac conditions, but its effectiveness is limited as many athletes remain asymptomatic until the point of cardiac arrest. Medical providers and coaches must be sufficiently trained in recognizing cardiac collapse and promptly administering cardiopulmonary resuscitation (CPR) and defibrillation. Simulation-based learning effectively strengthens clinical skills and maximizes application of knowledge to real-life scenarios. This pilot study aimed to evaluate the feasibility of a virtual micro-learning simulation designed to train individuals in recognizing cardiac collapse and implementing appropriate treatment.

Methods: Module learners consisted of all medical staff and coaches who cover Vanderbilt University and high school athletics. Data collected consisted of demographics, pre- and post-test scores, micro-sim scores, and satisfaction surveys.

Results: Preliminary results from 26 out of 80 participants (33% response rate) revealed that 81% (21/26) believed the simulation helped to identify gaps in their CPR knowledge, 77% (20/26) felt better prepared to perform CPR on an athlete, 69% (18/26) would use the micro-sim for future skill refreshment, and 81% (21/26) would appreciate more of this learning method in the curriculum. Limitations include a small sample size, single-institution focus, lack of a control group, and a potential learning curve for the software.

Conclusion: Next steps will be largely influenced by additional feedback and survey responses. Efficacy will be determined by improved pre- to post-test scores and achievement of a passing score (70%) on action and quiz prompts. Future objectives include developing modules for other critical areas, such as concussion and fracture management, and expanding the micro-simulation to additional school programs. This innovative online simulation is designed to enhance critical skills in emergency preparedness in sports medicine, with the long-term goal of reducing sudden cardiac deaths among athletes.

Macon—54

Design, Development, and Validation of a Low-cost 3D Printed Cricothyrotomy Simulator

Madison Kelly, Andres Callahan, Anna Fe Miller, Drake Altman, Tristan Brown, Joshua Richards, Meshwa Patel, Joanna Thomas, Robert Sarlay, Yahya Acar

Abstract

Aim: Simulation-based training is rising in prevalence and has proven to be an efficacious way to educate physicians and give them hands-on practice. The cost of simulation makes it economically unfeasible for broad use, leaving an opportunity for a lower-cost, highly effective new simulator to be developed and tested for future educational use. The goal of this project is to design and fabricate a cricothyrotomy (CTT) simulator and conduct a validation study for its use in physician education and training

Methods: MUSM and MUSE BME faculties and students determined the necessary anatomic components per the components supplied with commercially available simulators. BME students then converted scans of their head and shoulders into files compatible with 3D printing. After their busts were cropped and modified to accommodate insertion of a repaceable larynx/trachea in AutoCAD Fusion 360, they were 3D printed in PLA with an FDM printer. The trachea/larynx was printed from a publicly shared files (Thingiverse.com) in Formlabs Elastic 50A resin on an SLA printer and the replaceable skin flap was cast from BBDino Super Soft Silicone 00-30. The validation survey was adapted specifically to this study from a validation survey previously published by The University of Michigan Medical School in 2014. Participants will take a pre-survey, complete a CTT procedure on the simulator, and complete a post-survey to be evaluated for areas of success and areas for improvement.

Results: Parts for a simulator prototype were fabricated via 3D printing and casting; we have submitted the IRB, finalized the survey questions and are ready for collecting data pending IRB approval. Following approval, the simulator will be introduced to the survey participants and their responses will be collected

Conclusion: This project will provide data for the validation of a cost-effective CTT simulator. One the design is published; simulators may be reproduced at significantly lower costs allowing all incoming medical students and residents of all specialties to train in the procedure.

Macon – 55

Health perceptions and motivation in rural communities: Application of a theory-structured blinded focus group (TBFG) process for targeted message development and program design

Davis Kidd, Peter Gryffin, Tahiya Anwar

Abstract

Background: Rural health is a significant issue when comparing the health of urban and rural communities. Rural areas have fewer programs for smoking prevention, drug rehab, healthcare infrastructure and nutritional education, and higher rates of childhood obesity. Hospital closures have further put rural populations at risk.

Methods: To assess health perceptions and needs 2 theory-structured blinded focus groups, as well as farmer's market interviews, were conducted in Hancock County, Georgia. Participants included 5 users of the health department services, 18 participants from the senior center, and 10 farmer's market interviews. Using a form of nominal group process, means and standard deviation were evaluated to identify potential target areas using a 0-9 scale.

Results: Focusing on health perceptions among the senior center group, chronic pain (M=7.0; SD=2.54) stood out as a particular health threat. Although variance was high, 50% reported scores of 8 or 9, with 3 participants rating depression and risk of suicide as a 9. The largest perceived health threat was high blood pressure (M=7.71; SD=1.86). The highest mean related to benefits of a healthy lifestyle was reducing diabetes risk (M=7.88; SD=2.36). The greatest perceived barrier was too much pain, preventing adoption of healthy actions (M=6.69; SD=2.91). Faith and spirituality were noted in the discussion phase as playing a large role in their life, as well as the potential opportunity for church involvement in developing community health programs.

Conclusion: Initial recommendations include incorporating opportunities for seniors for an evidence-based walking and tai chi for balance program, which have shown benefits for pain, arthritis, blood pressure, mental wellness, and fall prevention, among other benefits. Perceived threats, benefits, barriers and motivators differed depending on the population. Rural health programs and providers can also consider faith and religion to better address biopsychosocial aspects. Future work will address additional findings.

Macon – 56

Growing Popularity of Research Year Fellowships in Orthopaedic Surgery

Prit Patel, MS, Daniel Gentry, MS, Brent Ponce, MD

Background and Objective

Orthopaedic Surgery is a highly competitive specialty with 1,488 applicants competing for 916 positions in the 2024 match. The of USMLE STEP 1 to pass/fail in 2022 has led to focus more on research as shown by the increase in average number of publications from 16.5 in 2022 to 23.8 in 2024. In 2024, 267 applicants went unmatched. For unmatched applicants, it is recommended to pursue a research year fellowship or a preliminary surgical internship to strengthen their applications. Research year fellowships, last 1-2 years, and can be completed during medical school or after graduation. These positions build research experience, connections with faculty and residents, and participation in resident educational activities, all of which potentially increase the chances matching. Our objective was to analyze the trends in research fellowships relative to number of unmatched applicants.

Methods

Data on research year fellowships from 2014-2024 was collected from Orthogate examining program characteristics such as location, subspecialty focus, duration, salary and associated residency programs. Further data on applicant trends was sourced from NRMP Residency Charting Outcomes.

Results

A total of 523 research year fellowships were identified in Orthogate, with an average of 2 fellows per program. Of these, 216 (41%) mentioned improved match competitiveness, 474 (90%) offered publication opportunities, and 315 (60%) allowed fellows to work with residents. The number of fellowships increased gradually, with a significant rise after 2020. Analysis of research fellowship data and the number of unmatched applicants exclusively applying to orthopaedic surgery revealed a noticeable increase in unmatched applicants in 2022, despite yearly fluctuations without a clear trend.

Conclusion

With orthopaedic surgery becoming increasingly competitive, the demand for research year fellowships is likely to rise. Given the circumstances, these fellowships may soon become an unofficial perquisite for matching into orthopaedic surgery.

Macon – 57

Evaluating the Impact of Georgia's SB 419: Analyzing Anesthesia Opt-Out Policies Through the Advocacy Coalition Framework

Anna Pekala, Caroline Anglim, PhD

Background and Objective:

Senate Bill 419 (SB419), introduced by the Georgia Legislature in 2023, allows CRNAs to administer anesthesia based on an order from physicians without requiring direct supervision. This policy aims to increase address anesthesia provider shortages in rural areas. This research evaluates the efficacy of SB419 using the Advocacy Coalition Framework (ACF).

Methods

The methodology involves conducting a literature review of opt-out policy evaluations in other states, localities, and hospital systems. We use this information to assess various criteria within the ACF such as policy subsystems, core beliefs, external subsystem events, and institutional rules. The insights gathered through this policy analysis framework are utilized to assess the efficacy of SB419.

Results

The application of the ACF revealed that the interactions between actors were less complex than expected. Hospitals played a larger role in the success of opt-out policies than anticipated. The effectiveness of opt-out policies is mixed, with some studies suggesting increased access in rural areas, while others showed no impact on provider numbers or costs. Meta-analyses found no definitive evidence of superior patient outcomes between providers, with results often reflecting bias based on the authors' professional affiliations. The research questions the economics of opt-out bills, hospitals' reluctance to change supervision requirements--even when permitted, and the assumption that CRNAs are more likely to work in rural areas. Increasing provider influx to rural areas, rather than focusing solely on CRNA autonomy, may be a more effective approach to addressing shortages.

Conclusion

The research suggests that while opt-out policies like those in Georgia's SB419 may offer some of its intended benefits, their impact on provider distribution, healthcare costs, and patient outcomes is multifactorial and not uniformly positive. Further quantitative research is needed to assess the long-term effects of this policy on anesthesia care and provider shortages in rural Georgia.

SAVANNAH Biomedical

Savannah – 1

Quantitative Flow Cytometry-based Detection of Mesenchymal Stem/Stromal cell Immunomodulation on Monocytes.

Lawson W. Blake, Sara Temple, Raghavan Chinnadurai

Background and Objective

Mesenchymal Stem/Stromal Cells (MSCs) are immunomodulatory cells within bone marrow that support hematopoiesis. Their interaction with immune cells is of emerging interest as a cellular therapy for inflammatory disorders, such as Hematopoietic Stem Cell (HSC) transplant complications. Monocytes are important innate immune cells that mediate inflammation. Although previous studies have shown some effect of MSCs on monocytes, quantitative methodology to identify this effect has yet to be well defined. Our study defines a flow cytometry-based methodology to quantify the effect of MSCs on monocyte differentiation. We also determine the impact of the stem cell mobilization drug AMD3100 on this process.

Methods

MSCs were derived from the bone marrow of seven donors. Monocytes were isolated from Peripheral Blood Mononuclear Cells (PBMCs) of another seven donors using magnetic enrichment procedures. MSCs and enriched monocytes were co-cultured at varying ratios. 100 millimolar of AMD3100 was also included in certain conditions. The co-cultures were analyzed 48 hours later for monocyte differentiation into immunosuppressive M2-macrophages (CD14+, CD206+) using flow cytometry. The percentage of CD14+ and CD206+ cells was determined utilizing FloJo Software, quantifying the degree of monocyte differentiation within each culture.

Results

We observed that monocytes on their own, do not substantially express CD206. However, we identified that MSCs massively upregulate CD206 expression on monocytes, which suggests differentiation into M2-macrophages. We confirmed these results with repeated experiments from all independent donors. The degree of CD206 upregulation varies from donor to donor. We also identified the addition of AMD3100 had no major effect on MSC mediated differentiation of monocytes.

Conclusions

We developed a flow cytometry-based methodology to quantify MSC's effect on monocytes by determining the percentage of CD206+ populations. Although AMD3100 does not impact this immunomodulatory effect, our methodology can be utilized to screen the effects of other transplant drugs.

Savannah – 2

Effect of MDM2 Mutations on p53 Expression in H1299 Cancer Cells

Eischeid, Emilye; Lee, Paul; Palefsky, Emma; Yang, Wei-Hsiung; Lee, Jong-Hyuk

Abstract

Peto's paradox highlights the intriguing observation that larger animals, like elephants, with more cells in number, do not have a proportionately higher risk of developing cancer compared to smaller animals. This paradox is essential for understanding cancer resistance mechanisms, as resolving it could provide insights into novel cancer prevention and treatment strategies. A potential explanation for Peto's paradox lies in the discovery of elephants having 20 copies of p53 isoforms, a tumor suppressor gene critical in regulating cell cycle arrest, apoptosis, senescence, and DNA repair. The presence of multiple p53 isoforms may amplify the ability of elephants to effectively prevent cancer development, thus contributing to their low cancer incidence despite having many cells. In our study, we focused on the role of elephantine MDM2, a master regulator of p53. MDM2 is transcriptional target of p53, and also a E3 ubiquitin ligase of p53, regulating its protein level. We cloned human MDM2 harboring key elephantine sequences. These elephantine MDM2 constructs were introduced with wild type p53 into H1299 cancer cells, which do not express endogenous p53. DNA damage was induced post transfection, to activate p53, and then the cells were harvested. MDM2-p53 levels were evaluated with Western blot, while p53 activity was assessed by investigating p53 downstream target gene expressions by realtime PCR. We found elephantine MDM2 mutant T63A, containing a point mutation on its N-terminus p53 interaction domain, displays impaired ability to degrade p53, resulting in higher p53 activity. Researching Peto's Paradox not only advances our understanding of cancer biology but also opens new avenues for cancer prevention, diagnosis, and treatment. The future findings from this project are expected to advance the understanding of the crucial role of MDM2 in cancer suppression and highlight how evolutionary adaptations can lead to improved mechanisms for maintaining genomic stability through p53 regulation.

Savannah – 3

Fragile X Syndrome: Characterization of Synaptic Inputs in the Inferior Colliculus

Dr. Sarah Rotschafer, Muriel Essimbi

Abstract

Fragile X Syndrome (FXS), the most common monogenetic cause of autism spectrum disorders (ASD), is the result of mutations in the Fragile X Messenger Ribonucleoprotein 1 gene (*Fmr1*). *Fmr1* codes fragile X messenger ribonucleoprotein (FMRP) which binds messenger mRNA at synapses, thereby preventing them from being erroneously translated into proteins. Therefore, loss of FMRP affects the expression of associated proteins, consequently generating several abnormal phenotypes. One of the crucial systems impacted in FXS is the auditory pathway, and the inferior colliculus (IC) in particular. Located in the midbrain, the inferior colliculus comprises 3 subdivisions: the dorsal, external, and central inferior colliculi. At the core of the FXS auditory processing phenotype, is an imbalance between the excitatory and inhibitory inputs. The IC is known to receive projections from the auditory brainstem, which, in FXS, has been found to have an over-abundance of synapses and an increase in the number of inhibitory synapses present. The IC also sends projections to the auditory cortex. In FXS, the auditory cortex is known to have heightened responses to stimuli. To better understand the inhibitory/excitatory balance in the IC, the different synaptic inputs received by each IC subdivision were analyzed. We compared brains from 21-day old wild-type and *Fmr1* knock-out mice. Immunolabeling and confocal imaging were used to quantify the synaptic inputs observed, followed by statistical analysis to compare the results obtained. Furthermore, the propagation of auditory processing-associated action potentials was considered. As action potentials relay electrical impulses along axons, myelination and axonal diameter can be decisive in their efficiency and proper functioning. Transmission-electron microscopy enabled the assessment of the myelination levels and axonal diameters between wild-type and knockout mice. Inferences about variable axonal conductance and correlated auditory processing were made.

Savannah – 4

SARS-CoV-2 Spike Protein Accelerates Alzheimer's Disease-Related Dementia Through Increased Cerebrovascular Inflammation in hACE2 Mice.

Parker Hilliard, MS2; Kaitlyn Vu, MS2; Veronica Hermanns, BS; Mohammed Abdelsaid RPh, Ph.D.

Introduction: SARS-COV-2 causes neurological and cognitive impairments and aggravates Alzheimer's Disease-Related Dementia (ADRD). Yet, the molecular mechanism is not fully understood. Our group has shown that SARS-CoV-2 spike protein causes brain renin-angiotensin system (RAS) imbalance, leading to increased cerebrovascular inflammation. We hypothesize that the SARS-CoV-2 spike protein will amplify hypoxia-induced cerebrovascular inflammation, which impairs blood-brain-barrier (BBB) functions and leads to accelerated ADRD.

Methods: Cerebral hypoxia was induced in humanized ACE2 mice, COVID-19 mouse model, using unilateral common carotid artery ligation surgery (UCCL) and confirmed by measuring cerebral blood flow using laser speckle imaging. ACE-2 mice either received the vehicle, SARS-CoV-2 spike protein (SP, via jugular vein) or SP with Losartan (AT_1R blocker) in drinking water. The Novel Object Recognition test assessed learning and cognitive functions at baseline, seven days, and 14 days after surgery. Inflammatory markers (TNF-α, Il-6, VEGF, and MMP-9) were measured using RT-PCR and Western Blot.

Results: Blood flow analysis confirmed cerebrovascular hypoxia in all groups. Only, losartan treatment improved CBF ($P<0.05$). Spike protein significantly increased inflammatory markers after UCCL. Spike protein aggravated ADRD and deteriorated learning and memory functions after UCCL ($P<0.05$). These effects were improved by Losartan ($P<0.05$).

In conclusion, the SARS-CoV-2 spike protein accelerates Alzheimer's Disease-Related Dementia through increased cerebrovascular inflammation in hACE2 mice. AT_1R blocker Losartan attenuated Spike protein-induced ADRD and represents a potential therapeutic strategy to treat COVID-19-induced long-term ADRD.

Savannah – 5

Investigating the Immunomodulatory Role of Plerixafor (AMD3100) on Mesenchymal Stem Cell Interaction with T cells

Keenan Hogan, Sara Temple, Raghavan Chinnadurai

Background and Objective

Plerixafor (AMD3100) is an FDA-approved drug that causes hematopoeitic stem cell (HSC) mobilization from the bone marrow into peripheral blood to facilitate HSC transplantation in patients with hematological malignancies. Of clinical interest is the identification of AMD3100's effect in modulating the immune microenvironment of bone marrow. Mesenchymal Stem/Stromal Cells (MSCs) are non-hematopoietic multipotent immunomodulatory stem cells primarily found in the bone marrow. MSCs are known to inhibit T cell-mediated inflammation. We investigated the effect of AMD3100 on modulating the immunosuppressive properties of bone marrow-derived MSCs on T cell responses.

Methods

MSCs were derived from bone marrow and Peripheral Blood Mononuclear Cells (PBMCs) from leukapheresis bags of 5 independent donors. PBMCs were stimulated with anti-CD3 and anti-CD28 to induce T cell proliferation in the presence and absence of MSCs and AMD3100. Co-cultures were incubated for 4 days and then stained for CD3 (T cell marker) and Ki-67 (T cell proliferation marker). Stained cells were acquired utilizing flow cytometry from which the percentages of CD3+Ki-67+ T cells were determined. The results were analyzed with the FloJo software.

Results

We confirmed that unstimulated T cells did not display significant proliferation while stimulation produced massive T cell proliferation noted by the upregulation of CD3+Ki-67+ T cell populations. In addition, we found that MSCs exhibit a dose-dependent immunosuppressive and inhibitory effect on T cell proliferation despite donor-dependent variations. We observed no effect of AMD3100 on MSC-mediated suppression of T cell proliferation at all concentrations. These results were confirmed with 5 independent donors.

Conclusion

Although AMD3100 does mobilize HSCs from the bone marrow to the peripheral blood, the drug may not have any effect on the immune microenvironment of bone marrow. Hence patients who are experiencing leukemic relapse post-HSC transplantation may not be due to the effect of this drug.

Savannah – 6

An Investigation into Unique Effects of Slower-Paced Walking on Respiration and Blood Oxygen Saturation

Jesurebor I. Ivbaze, P. Anthony Gryffin

Background and Objective:

Exercise improves cardiac function, lowers the risk of diabetes, cancer, and hypertension, and provides many other benefits. While much is understood about the mechanisms of high-intensity exercise, low-intensity exercise has also been shown to produce positive benefits that are not completely understood. To investigate if slower-paces of walking might result in similar physiological changes such as tai chi, participants walked on a treadmill for 20 minutes at 1.5 miles per hour while heart rate and blood oxygen saturation (SpO2) were measured.

Methods:

Sixteen people, aged 17-77 walked on a treadmill for 20 minutes at 1.5 miles per hour while heart rate (HR) and blood oxygen saturation (SpO2) were measured using a Nonin 3150 WristOx oximeter. HR and SpO2 were measured for 1 minute before, 10 minutes while walking, and for 5 minutes after walking.

Results:

Participant 8 showed a marked drop in post-SpO2 level from 97% to 86% before returning to normal levels. Participant 13 showed a distinct 2% drop in post-SpO2. In other participants, changes in post-SpO2 levels were not as clear nor consistent. The significant drop in participant 8 could be attributed to the chronic medical conditions present which would be consistent with tai chi measurements. Participant 13 may reflect post SpO2 drops more consistent with those observed in healthy people.

Conclusion:

Without extensive measurements with several different demographics, including those with various chronic conditions, it cannot be concluded based on the observed distinct SpO2 changes seen in 2 participants, that these results are either a result of the chronic medical conditions present in participant 8 or a normal phenomenon that some people exhibit. Therefore, more research is needed to verify any significant differences and potential implications for a difference in oxygen metabolism and utilization between faster-paced exercises and slower-paced exercises.

Savannah – 7

Estradiol synthesis in presence of Pyrvinium Pamoate stably expressing AIPB in Triple-negative breast cancer cells ($Er^-/Pr^-/Her^{2-}$)

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Breast cancer is a leading cause of death among women in the United States. They are classified with the presence of Estrogen Receptors (Er^+), Progesterone Receptors (Pr^+), and Human Epidermal Growth Factor Receptors (Her^{2+}), where triple-negative breast cancer (TNBC) minimally expressing all three (<1%). Resistance to chemotherapeutic modalities is high in TNBC. We discovered a 22-kDa protein expressing in unaffected and affected breast tissue, Aromatase Interacting Partner in Breast (AIPB). AIPB interacts with Aromatase, directly decreasing Estradiol. AIPB is highly expressed in TNBC (MDA-MB-231). I hypothesized that induction of TNBC cells ($Er^-/ Pr^-/ Her^{2-}$, MDA-MB-231) with Pyrvinium Pamoate (PvR), after conditional overexpression of AIPB, will result in decreased Estradiol. Conditionally expressing AIPB in TNBC cells (MDA-MB-231) were co-incubated with Doxycycline and PvR ranging from 1.0ng to 50.0μg for 48 hours. I preformed radioimmunoassay (RIA) to determine Estradiol synthesis. I observed a direct and inverse relationships between PvR + Doxycycline induced cells, with increased Estradiol expression with both increased and decreased concentrations of PvR + Doxycycline. Western Blotting with Calnexin antibody shows uniform expression with all the concentrations of PvR applied with and without Doxycycline. Calnexin protein is an ER and MAM marker. In conclusion, we expect to bear a correlation between the Estradiol and protein expression. I am now continuing this project to further confirm current results.

Savannah – 8

KLHL41: a novel regulator of ER homeostasis in skeletal muscle

Tamara Moretti, Astha Tuladhar, Yotesawee Srisomboon, Scott M. O'Grad[2], Jeff Essner and Jinoh Kim

Background and Objective: CUL3-RING E3 ubiquitin ligases (CRL3s) play crucial roles in various cellular processes. The N-terminal region of CUL3 forms complexes with Bric a brac, Tramtrack, and Broad-Complex (BTB)-domain proteins, which recognize target substrates for ubiquitylation. In the human genome, 183 genes encode BTB domain-containing proteins, with 114 having the structural basis for binding to CUL3, and 38 known to form complexes with CUL3. This enables CRL3s to participate in diverse cellular processes. Each BTB domain protein can recognize multiple substrates, indicating that the full scope of CRL3 functions in cellular processes is yet to be discovered. The goal of this study is to identify CRL3s involved in regulating endoplasmic reticulum (ER) homeostasis. A clue supporting the role of CRL3s in the ER came from a proteomic study of skeletal muscle-specific *Cul3 knockout* mice, which revealed increased levels of SERCA1, RYR1, and other Ca^{2+}-binding proteins in diaphragm muscles. These proteins are residents of the sarcoplasmic reticulum (SR), a smooth subcompartment of the ER that plays a critical role in Ca^{2+} storage and release in skeletal muscle cells.

Methods: We employed C2C12 myoblasts and zebrafish to address the goal.

Results: We identified KLHL41, a BTB-domain protein associated with nemaline myopathy, as a regulator of SERCA1 and RYR1. It likely achieves this by interfering with ER-associated degradation (ERAD).

Conclusion: Disruption of ERAD has been associated with compromised skeletal muscle function. Our data suggest that the KLHL41-ERAD connection contributes to the muscle dysfunction in nemaline myopathy.

Savannah – 9

Effects of FOXR2 on Human p53 Transactivation

Anmol Patel, Dr. Wei-Hsiung Yang

Abstract:

Background: p53 functions as a key tumor suppressor and is the most mutated gene in all cancer types. It activates multiple genes that induce cell cycle arrest, repair mechanisms, or apoptosis. When p53 is absent and/or mutated, it leads to genomic instability, the accumulation of mutations, and increased tumorigenesis. MDM2 and MDM4 are known negative regulators of p53 using different pathways. Forkhead Box Gene R2 (FOXR2) is a transcription factor that is involved in development, organogenesis, metabolic and immune regulation, and cellular homeostasis. While most studies currently classify FOXR2 as an oncogene, the relationship between p53 and FOXR2 is largely unknown.

Methods: In this research project, we aimed to dissect the relationship between p53 and FOXR2 using the following approaches: We used H1299 lung cancer cells that do no express endogenous p53 and MCF7 breast cancer cells that do express endogenous p53 for the current study. We conducted Luciferase Assay (using p53(14X)LUC system) to determine whether FOXR2 alters p53 transactivation with or without MDM2 and MDM4. We conducted Ni-bead pulldown and Western Blot analysis after transfection of FOXR2 for future interaction study of p53-FOXR2.

Results: First, we found that FOXR2 enhances p53 transactivation in p53(14X) luciferase assay in H1299 cells. Secondly, while MDM2 decreases p53 transactivation, FOXR2 dosedependently abolishes MDM2-mediated p53 repression. Moreover, while MDM4 decreases p53 transactivation, the ability of FOXR2 to abolish MDM4-mediated p53 repression is minimal. Finally, Ni-pulldown and Western Blot analysis indicate that we can concentrate FOXR2 after FOXR2 transfection in both H1299 and MCF7 cells for future p53-FOXR2 interaction study.

Conclusion: Our results indicate that FOXR2 has the potential to serve as a therapeutic target in cancer treatment by amplifying p53's transactivation effects possibly via blocking MDM2-mediated p53 repression. It is crucial to continue this research to ensure accuracy and draw appropriate conclusions about whether FOXR2 indeed functions as a novel p53 transactivator and can compete with MDM2 and MDM4 in regulating p53 function.

Savannah – 10

Growth hormone releasing hormone (GHRH) agonist analog and its protective effects on retinas of mice with traumatic brain injury

Mostafa Mahrous[1A], Tilak Patel[2], Sheila Ngumbi[1A], Nicholas Moore[1B], Krishnan Dhandapani[1B], Manuela Bartoli[1A],

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Background and Objective: Traumatic brain injury can cause significant vision impairment due to retinal dysfunction. Studies have shown that growth hormone releasing hormone (GHRH) agonist analogs have a neuroprotective effect on retinal cells in cases of diabetic retinopathy and optic nerve crush. Our goal was to test if GHRH agonist analog MR-409 has the same neuroprotective effects on mice subjected to TBI.

Methods: Male C57Bl/6J mice were subjected to a controlled TBI via craniotomy on the right parietal bone, followed by impact at a velocity of 3 m/s using a convex tip. Control mice underwent the same surgical procedures without the impact (sham). A subgroup of the TBI mice received daily subcutaneous injections of MR-409 (TBI+MR-409). Seven days post-injury, we assessed intraocular pressure (IOP), retinal morphology using H&E staining and OCT, reactive gliosis via GFAP immunohistochemistry (IHC), retinal ganglion cell density with RPBMS IHC, and oxidative stress through 4-HNE IHC and dot-blot.

Results: TBI led to a significant rise in IOP compared to sham and control groups, which MR-409 treatment did not mitigate. Retinal morphology in TBI mice showed moderate changes compared to sham, TBI+MR-409, and untreated controls. Additionally, we saw increased reactive gliosis (GFAP) and oxidative stress (4-HNE) in TBI retinas, which MR-409 significantly reduced.

Conclusions: These findings align with prior research showing elevated reactive gliosis and oxidative stress following TBI. Importantly, our findings suggest that GHRH agonists like MR-409 may offer protective effects against retinal inflammation and oxidative stress post-TBI, despite the persistent elevation in IOP. Future research will focus on evaluating the morphological and functional effects of GHRH agonistic analogs in a dose- and time-dependent manner to further confirm their neuroprotective properties.

Savannah – 11

Novel evidence of poly (ADP-ribose) polymerase inhibitors (PARPis) induced cardiovascular fibrosis in mice

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Ovarian cancer is the 6th leading cause of cancer-related deaths among women in 2024. Platinum-based compounds are effective against solid-tumor cancers but cause severe cardiovascular adverse effects that hinder their therapeutic use. Recently, poly (ADP-ribose) polymerase inhibitors (PARPis) have been used as maintenance and in combination therapy for solid-tumor cancers such as ovarian cancer. Yet, the cardiotoxicity of PARPis is unclear and requires further investigation. This study aims to assess the cardiotoxicity of two clinically used PARPis, Olaparib and Rucaparib. We investigated the effect of PAPRis on cardiac fibrosis in mice.

Methods: C57-BL mice were treated with varying doses or treatment duration of PARPis. Mice were treated with Olaparib (50 or 200 mg/kg/day for two weeks) and compared to Cisplatin (1 or 10 mg/kg/week for three weeks). For treatment duration, mice were treated with Rucaparib at 150 mg/kg/day for 25 or 50 days. Hearts were assessed for fibrosis using Masson's Trichome stain. Collagen deposition was quantified using ImageJ software.

Results: Dose-response analysis showed that Olaparib-induced cardiovascular fibrosis was comparable to cisplatin and significant to controls. In addition, results showed that Rucaparib significantly increased cardiac fibrosis compared to the controls. Quantification of collagen deposition supported a positive correlation between the longer treatment duration of Rucaparib and increased fibrosis.

Conclusion: Our results provided novel evidence that the PARPis, Olaparib and Rucaparib, exacerbate cardiovascular toxicity by inducing cardiac fibrosis in mice. Further studies are required to investigate the effects of PARPis on human cardiac muscles and follow up on cardiac function.

Savannah – 12

Assessing Adolescents Awareness of Nutrition and Benefits of Healthy Eating Habits in Rural Georgia

Rena McKenzie and Anna Wiggins equal contribution

Abstract

Childhood obesity rates are higher in rural areas than urban areas in the United States secondary to decreased food literacy, low-income, and a lack of availability to healthy ingredients. Past interventions have been implemented to increase children's knowledge on healthy eating. A five day educational intervention that combined lectures and a hands-on cooking activity was implemented at a camp for middle school students in a rural community in Georgia. Results of the study revealed that this type of intervention will increase students' interest in and knowledge about nutrition and healthy eating, including the difference between carbohydrates, fats and protein. It also showed that students are more likely to share this learned information with family and friends, and students are encouraged to incorporate nutrient dense foods into their diet after the intervention. Moreover, students demonstrated a significant increase in understanding of how the foods they consume can have long term positive or negative effects on their health. Implementing similar interventions will increase food literacy in rural communities, equip students to apply their learned knowledge into making healthy meals, and make healthy food selections in the grocery store. These students are now more equipped to live healthy lives and share that information by choosing to eat less processed foods and more nutrient rich ones.

SAVANNAH Clinical

Savannah – 13

Keeping an Eye on Retinopathy: A Quality Improvement Project

Victoria Blaisdell, Grace Fawcett, Riley King

Abstract

Diabetic Retinopathy (DR) is considered the leading cause of visual impairment among working adults in the US. Despite this, as many as 50% of patients diagnosed with DM have been unable to receive ophthalmic screening within recommended guidelines, leaving them with limited treatment benefits. Our aim was to quantify overdue patients for DR evaluation who were screened in clinic at the time of encounter and/or were assigned referrals and initiate protocols improving preventative care provided to meet current guidelines.

Our study included 619 encounters with the diagnosis code for Type I Diabetes or Type II Diabetes seen at a Memorial Health University Medical Center between March 1, 2024-May 31, 2024. Encounters were evaluated to see if patients were up-to-date or overdue for DR screening at appointment date, as well as active referral placement or past referral placement, and any discussion of ophthalmic care. Patient demographics were also compared.

69.95% of patients were overdue for DR screening. Of those overdue, 0.46% were screened at time of visit, and 12.93% of patients received a new referral. Of overdue patients who did not receive a referral/screen at appointment date, 29.10% had an existing referral, and 7.85% had no existing referral and no new referral placement but had evidence of ophthalmic care discussion. 43.19% of overdue patients did not receive a referral/screen at appointment date, lacked existing referrals, and had no evidence of ophthalmic care discussion.

The percentage of overdue patients who received no guidance on their screening was significantly higher than desired. In contrast, the percentage of overdue patients who were screened in clinic was minimal. Our goal is to implement a quality improvement project through resident education programs on importance of annual DR screening and ophthalmologic primary care guidance for patients previously diagnosed with Type I and Type II diabetes.

Savannah – 14

Yeast infection due to *Candida glabrata* is of rising concern for patients who have undergone a vaginoplasty.

Param Patel, MS2 with equal contribution to Logan Brown, MS2, Ronald E. Garner, PhD, Anthony J. Kondracki, MD, MPH, PhD

Abstract

Vaginoplasty, a well recorded gender-affirming surgery for transgender women, constructs a neovagina from penile or scrotal skin. Though the procedure may improve the patient's quality of life, the microenvironment created in the neovagina is susceptible to post-surgical complications including potential infections, like *Candida* spp. *Candida albicans* has been of primary focus historically; however, *Candida glabrata* has emerged recently as an inducer of infection, given its pathogenicity and rising incidence in post-vaginoplasty patients. This article compiles findings from multiple studies on the microenvironment of neovaginas, pathogenicity of C. *glabrata*, and the standard of care for gender-affirming surgeries, and includes a questionnaire gathering comprehensive demographic and medical information from patients in the Savannah area, focusing on those who have undergone or are undergoing gender-affirming care. Key findings reveal that the neovaginal microbiome differs markedly from that of cisgender women. The lack of bacteria like *Lactobacilli* which provide protection from pathogenic colonization and create the opportunity for organisms such as *C. glabrata* to flourish. Factors such as greater innate antifungal resistance and better host evasion mechanisms when compared to *C. albicans* heighten the risk of infection by *C. glabrata.* Gender affirmation surgeries are steadily increasing annually and are covered by more and more health insurance companies. The use of hormone replacement therapy has also been utilized to support the transition process. However, exogenous estrogen has proven to increase the pathogenicity of *Candida spp.* This stresses the need for specialized research and medical care for these populations given the little that is currently known for transgender women. This would help ensure positive long-term health outcomes and care for women post-vaginoplasty.

Savannah – 15

Pathophysiology of Angiotensin II-Mediated Cardiac Failure: A Perspective From Macrophages

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Abstract

Cardiac failure is a clinical diagnosis that is the result of prolonged abnormal cardiac processes such as hypertrophy and fibrosis that may lead to ventricular dysfunction and reduced cardiac output. After injury, inflammation of the myocardium and coronary vasculature activates compensatory mechanisms crucial for maintaining function. These intended protective mechanisms can become maladaptive and perpetuate injury, leading to heart failure with preserved ejection fraction (HFpEF, EF > 50%) or heart failure with reduced ejection fraction (HFrEF, EF < 40%). HFpEF is commonly characterized by diastolic dysfunction, which is the result of abnormal ventricular filling and concentric hypertrophy due to increased blood pressure. HFrEF is commonly characterized by systolic dysfunction, which is the result of abnormal ventricular pumping and eccentric hypertrophy due to increased blood volume. Angiotensin II (Ang II) contributes to cardiac failure by activating pathways for remodeling and mediating inflammation by increasing monocyte infiltration. The macrophage anti-inflammatory response is clearing of dead cardiomyocytes and extracellular matrix with proliferation and angiogenesis for adaptive repair; however, in cardiac failure, macrophages from circulation dominate and can perpetuate inflammation without proper resolution. A chronic pro-inflammatory state within the cardiovascular system is the hallmark for adverse remodeling and eventual failure. The role of macrophages in Ang II-mediated cardiac failure is the primary focus of this review. References were chosen after searching for primary articles published between 2015 and 2024 using the key words Ang II, macrophage, and cardiac failure within the PubMed database. After cardiac injury and subsequent Ang II-mediated overload, macrophages cause cellular changes that induce remodeling and dysfunction within a failing cardiovascular system. More research on mechanisms and therapeutic targets for the treatment of cardiac failure is necessary, and our findings conclude that macrophages deserve more attention in future cardioprotective efforts.

Savannah – 16

Compassion on the horizon: Uncovering barriers and facilitators to physicians' ability to provide compassionate care while developing a foundation for successful training interventions

Carcy Clements, Kimberley Klaus, Anna Smith

Background: Compassionate care is an essential component of clinical practice and is linked to enhanced clinical outcomes, strengthened physician-patient relationships, and a greater sense of satisfaction with healthcare. Which factors affect physicians' ability to provide compassionate care is an underdeveloped research field within the healthcare community, as is a comprehensive review of existing "compassion in medicine" training programs.

***Methods*:** A mini-literature review was conducted using scientific databases and relevant keyword statements, data was narrowed to include a few commonly experienced barriers and facilitators to compassionate care while also shining a light on some visionary ideas in the literature. Utilizing the Sinclair Compassion Questionnaire- Healthcare Professional Competence Self-Assessment and interview questions determined by the research team, a thematic analysis revealed themes regarding barriers, facilitators, and training programs of compassionate care.

***Results*:** In addition to the literature review, clinical faculty at Mercer University School of Medicine and physicians from Columbus, GA, communicated their viewpoints of compassionate care in medicine through surveys and interviews. When assessing physicians' competence in compassion, one widely mentioned barrier included physicians' ability to see medicine through the patient's perspective. Additionally, the importance of acquiring personal values of empathy through compassionate role modeling was emphasized by interviewed and surveyed physicians.

Conclusion: The discussion on barriers and facilitators to compassionate care among physicians in the literature review, along with the valuable personal insights offered in interviews, can help to refine ideas from existing training programs in compassionate care and serve as stepping stones into future research. The surveys and interviews also provide information that can form a foundation for a program aimed at instilling compassionate values early in medical education and promoting sustainable compassionate practices among physicians throughout their careers.

Savannah – 17

Lessons Learned:Choosing the Most Effective Buprenorphine Induction Strategy

Equal Contribution to authors Ansley Connelly BA and Lillian Fagan BS. Mary Ashley Mercer, MD. Nisha Beard, DO. Paige Marnell, MD.

Abstract

Opioid Use Disorder (OUD) affects 2.7 million people in the United States and leads to approximately ninety thousand deaths annually.1 The death toll has been on a steady rise due to an increase in the potency of opioids through the introduction of fentanyl. In an effort to better treat patients, physicians are having to adopt new and innovative strategies to help with withdrawal and relapse. A common treatment method has been the use of Buprenorphine, a partial opioid agonist used to help reduce cravings by its high affinity for the opioid receptor.2 However, with the rapidly changing drug scene, physicians are having to modify their induction strategies of Buprenorphine to best support patients in various stages of recovery. The development of MicroInduction and Rapid Induction was used to reduce the time patients were abstinent from substances, if at all, before starting treatment. While the development and use of these strategies are being used nationally, little communication is occurring regarding proper protocols. Through a retrospective analysis of past medical records from a community service board in Savannah GA., the different induction strategies were compared to offer guidelines for physicians attempting to treat opioid withdrawal. While the Rapid Induction strategy demonstrated a promising approach to opioid use disorder, the research highlighted the importance of providers addressing each patient as an individual in order to develop the most appropriate strategy of care. Addiction can be a difficult disease to treat because there is no one-size-fits-all approach to treatment, however, we hope this paper offers valuable insights and guidance to addressing the opioid epidemic.

Savannah – 18

Investigating and Addressing Deficiencies in our Current Urinalysis Reflex Program

Cameron Holsomback M4, Meghan Hobbs M4, Alexander Duggan MD Family Medicine

Objectives: Identify and address barriers within nursing staff, lab staff, or Epic protocols to streamline a process to appropriately reflex a positive urinalysis to culture. Decrease hospital length of stay by ensuring appropriate narrowing to microbe-sensitive antibiotics in a timely manner to align with antibiotic stewardship.

Background: Literature demonstrates that an effective reflex urine culture program decreases unnecessary urine cultures, reduces associated hospital costs, and prevents unnecessary antibiotic initiation or continuation[1]. There are studied interventions to address these consequences such as: validated thresholds on urinalysis results, urine collection containers that preserve initial urine samples prior to antibiotics, and pharmacy review of culture results to discontinue antibiotics appropriately.[1-3]

Methods: Reviewed urinalysis reflex to urine culture inpatient data from 1/4/24 to 2/26/24 to identify different inferences such as: the amount of urine samples meeting current criteria for reflex but failing to reflex in the system, encounters that had a separate urine culture ordered within 48 hours separately from the original reflex order, and the amount of urine samples that would satisfy previously studied criteria for reflex.

Results:

452 samples met current lab criteria (≥10 WBC) but did not reflex to a urine culture. There were 0 samples in the data provided that reflexed to a urine culture as intended in the reflex order

953 instances of a separate urine culture being ordered within 48 hours of the urinalysis reflex being ordered. 425 of these were ordered within 1 hour of the order of urinalysis with reflex, many ordered prior to the results of the urinalysis.

Conclusion: We recommend the criteria for reflex be changed to include three arms:

1. Nitrite positive + ≥5 WBC (98% PPV)
2. ≥5 WBCs + moderate or large esterase presence (94.35% PPV)
3. ≥10 WBC only (current lab criteria)

Savannah – 19

Rates of Ordering Ammonia Levels in the Diagnosis and Management of Hepatic Encephalopathy

Riley King[1], Victoria Blaisdell[2], Grace Fawcett[3], Eric K. Shaw[4], William Hannah[5]

Abstract

Introduction/Background: The management of Hepatic Encephalopathy (HE) often elicits controversy even though the American Association for the Study of Liver Disease (AASLD) states that the diagnosis and management of this disease should be based on clinical presentation. Ammonia plays a principal role within the pathophysiology of HE; however, serial ordering of ammonia levels during the management of patients with HE holds no clinical or prognostic utility per the AASLD. There is an unnecessary trend of ordering ammonia levels for these patients which could lead to misdiagnosis, mistreatment, and an unnecessary increase in hospital length of stay/costs.

Methods: We conducted a retrospective cohort study of 235 patients selected with the diagnosis of HE from Memorial Hospital HCA in Savannah, Georgia. Our preliminary data set included 314 patients but was reduced to 235 patients due to certain exclusion criteria. Our main outcome variable was number of ammonia labs ordered per HE hospital visit. Another outcome variable was hospital length of stay (LOS) with the independent variable being number of ammonia labs ordered. Additional demographic variables including age, race/ethnicity, and gender were collected. All analyses were performed using the statistical software SPSS (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp.).

Results: 2.42 (SD = 2.480) ammonia labs were ordered per patient visit during our study period. There was a statistically significant difference ($p<.001$) with the LOS when we compared patients who had 1 lab ordered versus patients who had 2 or more labs ordered.

Conclusion: Our findings showed that the targeted hospital, on average, ordered 2.42 ammonia per patient visit with HE during the study period. In conclusion, physicians within the hospital seem to be managing patients with HE different than the AASLD recommendation, thus our goal is to ensure quality improvement within this hospital.

Savannah – 20

Impact of Climate Change on Dermatophyte Infections

Eliza G. Malcom, Victoria H. Glover

Abstract

The global rise in fungal infections, coupled with increasing resistance to current antifungal medications, has emerged as a major public health threat. In response, the World Health Organization (WHO) recently published a list of the most threatening fungal pathogens. Climate change exacerbates this issue by altering the geographic distribution of fungi and increasing human exposure through shifts in temperature, weather patterns, and human behavior. Dermatophytes—a group of fungi that cause superficial infections of the skin, hair, and nails—affect about 25% of the global population. Although these infections typically manifest superficially as tinea infections, they can become invasive in immunocompromised individuals, highlighting their potential severity.

Our study sought to investigate how dermatophyte species adapt to climate change-driven shifts in environmental and host factors, focusing on Savannah, Georgia, and surrounding areas. We hypothesized dermatophyte infection rates are directly influenced by climate-related changes in environmental conditions, host behaviors and immune competence, and fungal sporulation. This study consisted of three key components: (1) a comprehensive literature review on dermatophytes and climate change, (2) a clinical survey of local physicians regarding the prevalence, diagnostic practices, and treatment for dermatophytosis, and (3) a field study collecting sand samples from local beaches to analyze fungal species and diversity.

The literature review synthesized current knowledge on how dermatophytes might adapt to evolving environmental conditions, suggesting a potential increase in virulence and resistance. The clinical survey with local physicians involved gathering data on their clinical experiences with dermatophytosis, including presentation, diagnosis, and treatment. Preliminary findings indicate a rise in dermatophyte infections, linked to climate-related factors like warmer, more humid conditions, and behavioral changes such as exposure through increased tourism.

For the field study, sand samples from Tybee and Daufuskie Islands were collected using keratin feathers to collect fungal spores. Samples were cultured and DNA sequencing was used to identify dermatophyte species & distribution. These findings could guide public health strategies, clinical diagnostics, and future research on fungal infections in the context of climate change and mitigating their effect on global health.

Savannah – 21

AI-Powered Neuropathology: Automated Gray Matter Segmentation for Biomarker Analysis

Bhuvaneshwari Muchandi (M2), Juan Carlos Vizcarra , PhD, Dr. David Gutman, MD PhD Emory University School of Medicine

BACKGROUND: Computational analysis in neuropathology has received tremendous interest with the potential to advance our understanding of Alzheimer's disease and related dementias. Artificial intelligence (AI) models, given large well-labeled datasets, can effectively perform complex tasks at or above human performance. Recent studies have successfully deployed AI pipelines for detection of neuropathological biomarkers, such as neurofibrillary tangles in whole-slide-images. However, labeled images for downstream analysis are needed to detect which brain region the neuropathological biomarkers originate from.

OBJECTIVE: The study aims to develop automated detection of gray matter regions in WSIs for downstream testing of established AI pipelines in neuropathology.

***STUDY DESIGN, SETTING, AND POPULATION**: The study involves manual annotations of gray matter regions on Bielschowsky silver stained WSIs from the Emory ADRC digital cohort. These annotations are used to train UNET semantic segmentation models for automated detection of gray matter regions on a larger cohort of non-annotated WSIs. Co-registration to immunohistochemically stained WSIs (amyloid beta, tau, TDP-43) is then applied for each case, to define gray matter annotations across stains. Established AI pipelines are then deployed in these regions to assess improvement on original results.

RESULTS: 300 gray matter masks have been generated and an initial classifier has been trained using the YOLOv8 (You Only Look Once) model developed by Ultralytics. We are in the process of validating the accuracy of our initial model, and increasing the size of our labeled data set.

CONCLUSIONS: While the project is ongoing, our initial results demonstrated the feasibility of developing an automated gray matter segmentation model to further promote understanding of biomarkers associated with clinical care.

Savannah – 22

Topical Paclitaxel Therapy for Treatment of Chronic Anal Fissures: A Pilot Study

Dr. Shahriar Sedghi, Akshay Ranabhotu, Anjali Patel

Abstract

Anal fissures are a common anorectal disorder caused by a tear in the anoderm below the dentate line. Crohn's disease, trauma, and passage of hard stools are associated with formaRon of fissures. Treatment opRons include fiber, NSAIDs, stool soSeners, and topical relaxants. While topical relaxants have demonstrated efficacy for acute anal fissures, only subopRmal effects have been documented for resoluRon of chronic anal fissures over 6 week duraRon, especially among lesions containing fibroRc Rssue, furthering hyperplasia/hypertrophy in anal papillae. Since scar Rssue formaRon and fibroblast proliferaRon are implicated in the pathogenesis of chronic anal fissures, we propose the use of an anRmitoRc agent, Paclitaxel, in the treatment of chronic anal fissures via inhibiRon of smooth muscle cell (SMC) and fibroblast proliferaRon. Paclitaxel has been successfully used in coronary drug eluRng stents (2.5-7.5 mg), balloon dilators for esophageal and colonic strictures (26-155 mg), and vascular (2 μg/mm2) and urological strictures. PaRents with chronic anal fissures (n=8, 3 males, 5 females) unresponsive to concurrent conservaRve approaches (including one paRent with Crohn's disease and two others with previous failed lateral sphincterotomy) were treated with addiRonal compounded topically applied Paclitaxel gel (5mg/gm) for 3-8 weeks. Presence of fissures was confirmed in all paRents prior to treatment via sigmoidoscopy. Rectal pain and bleeding were retrospecRvely assessed following Paclitaxel regimen using a standardized quesRonnaire. Significant reducRon in pain scores were recorded following treatment ($p < 0.001$), and rectal bleeding was completely resolved in 7/8 paRents. Further, four paRents consented to a follow-up speculum exam, of which 3/4 demonstrated complete fissure resoluRon (Fig. 1), and 1/4 had parRal reducRon in fissure size. Data from this pilot study suggests that Paclitaxel may have a role in treatment of chronic anal fissures and warrants future invesRgaRon uRlizing controlled studies.

Savannah – 23

SI, Depression, and Quality of Life as a Unilateral AKA and Bilateral AKA

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Abstract

Patients undergo significant emotional changes after a limb amputation [1] with external factors and quality of life being major contributors to the physical and psychological adjustment process. [2,3] When quality of life is significantly impacted after a major life event like a disabling amputation, there is emotional and cognitive incongruence between the amputees' life expectations. [3] There is also a stratification of disability based on the type of disability and the severity of the disability, which play a major role in patients' ability to maintain their independence. [4]

A 58 y/o white M with a PMHx of CHF, DVT, HLD, bilateral above the knee amputations, HTN, previous MI, and peripheral artery disease presented to the voluntary inpatient psychiatric unit with substance abuse, depression, anxiety, and suicidal ideation with the intention to detox from cocaine and find placement for an assisted living facility. His first AKA was of the right leg in 2016 due to a failed atherectomy during a femoral popliteal artery procedure. He then had an AKA performed on the left leg in 2023. He was hospitalized for substance abuse, depression, and suicidal ideation as a unilateral above the knee amputee in 2020 and again as a bilateral above the knee amputee in 2024.

When comparing his experiences after each amputation, he stated that the second amputation was more devastating to his quality of life because he was more severely disabled and could not perform his ADL without assistance.

The major mental health stressor that led to his increased drug abuse and SI was his loss of independence. As a patient transitions from being a unilateral above the knee amputee to a bilateral above the knee amputee, quality of life is severely impacted, and an amputee's mental health should be monitored during similar life transitions to avoid suicide attempts.

Savannah – 24

Osteoporosis Screening Guidelines and Introduction to Management

David Posas

Background and Objective

Osteoporosis affects over 10 million men and women in the United States, with a higher incidence in women. The incidence is 4:1 for women greater than men, and the average age of onset is 50-70 years, most commonly affecting northern European, Asian, and Hispanic ancestry. The diagnosis is primary or secondary—primary regards postmenopausal women, the most common, and senile. Drug-induced/iatrogenic, endocrine/metabolic, and neoplastic/multiple myeloma causes of osteoporosis are secondary. Many risk factors can affect the onset age and increase the fracture risk.

Methods

A guideline-directed search for osteoporosis screening and management utilizing MeSH Terms on PubMed, Web of Science, and Google provided abundant information. Data extraction came from AAFP, USPSTF, ACP, NAMS, and ACOG, followed by a data synthesis and, finally, an interpretation of data.

Results

Screening for osteoporosis is currently at the age of 65 with no risk factors and younger than 65 with increased risk factors for osteoporosis and osteoporotic fractures. The gold standard for osteoporosis diagnosis is a central dual-energy x-ray absorptiometry (DEXA) of the hip and lumbar spine. Other methods include a peripheral DEXA scan and a quantitative ultrasound (QUS). Clinical risk assessment tools help identify the risk of osteoporosis and osteoporotic fractures. Treatment focuses on pharmacological therapies for reduced bone resorption and increased bone mineralization. Monitoring therapy within the guidelines relies on DEXA evaluation scans and pharmacologic approaches to reduce osteoporotic fractures

Conclusion

A combination approach of prevention, screening, and management starts with improving lifestyle and behavioral modifications. Pharmacotherapy is essential for managing osteoporosis, which starts with initial bisphosphonates. Other pharmacologic options are PTH analogs and SERMs. Osteoporosis is sometimes an overlooked disease, but with improved screening utilities and management options, prevalence may increase, provided improved treatment of the disease.

Savannah – 25

Pathophysiology of Angiotensin II-Mediated Cardiac Failure: A Perspective From Macrophages

Kelly Carter[1], Eshan Shah[1], Jessica Waite[1], Dhruv Rana[2], Zhi-Qing Zhao[1]

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Abstract

Uncontrolled hypertension, an inability of the body to reduce blood pressure levels, is a major chronic condition that contributes to morbidity and mortality from cardiovascular diseases. This leads to many pathological changes that occur throughout the systemic vasculature. It is driven by the processes of vascular remodeling and inflammation with key players in the process being Angiotensin II and CCR2+ macrophages. This study investigates the roles of both Angiotensin II and CCR2+ macrophages vasculature involvement in the development and progression of hypertension. Angiotensin II and its potent vasoconstricting, pro-inflammatory properties help to progress the effect through the AT1 receptor. This in turn leads to endothelial dysfunction and vascular smooth muscle cell hypertrophy. Additionally, CCR2+ macrophages are initially recruited to the tunica adventitia of the vascular smooth muscle, before migrating to the tunica media, in response to Angiotensin II. They play a key role in structural changes that are observed within hypertensive vasculature. This review helps observe the histopathological changes Ang II and CCR2+, highlighting the mechanisms that further the disease progression, paving way to offer potential therapeutic targets to help with hypertension prognosis. In efforts to investigate the Angiotensin-II-histopathological alterations and CCR2+ macrophage vascular infiltration in the development of hypertension, the PubMed database was utilized using various primary articles between 2015 and 2024 with key words “Angiotensin II,” “cardiac hypertension,” “macrophages,” “heart failure,” and “vascular injury.” Further analysis on the mechanism of Ang II and CCR2+ macrophages signaling in their effect on endothelial cells and vascular smooth muscle cells can guide future processes in therapeutic target and agent development. For example, dissecting the signaling pathway of AT1R, role of NADPH oxidase, and other downstream effects can substantially reveal targets to prevent hypertension progression.

Savannah – 26

Papillary Thyroid Carcinoma of the Ovary Presenting as a Dermoid Cyst

Renee Ricci, DO1; Alicia Farris, MD2; Dina Linfoot, MD; MacLaren Durkee M.S, B.S MS23; Kenley Tyler, B.S MS23

Abstract

Struma ovarii is a rare ovarian tumor, with only roughly 200 documented cases. This tumor is defined by the presence of thyroid tissue that comprises more than 50% of the overall mass of the ovary. Struma ovarii was initially described in the early twentieth century and continues to be defined by the World Health Organization (WHO) as a monodermal teratoma consisting of predominantly thyroid parenchyma. In rare cases (less than 10% patients), this tissue is biologically active, and can result in hyperthyroidism, though most patients' laboratory values are unremarkable. Histologically, these lesions strongly resemble benign thyroid tissue with variably sized follicles. These commonly stain positive for TTF1, PAX8, and Thyroglobulin, identical to thyroid tissue. Additionally, there is a possibility for malignant transformation to occur in these patients, but this was only observed in approximately 5% of struma ovarii cases. Within these tumors, papillary and follicular carcinoma are the more common malignancies that occur in ovarian stroma. In many instances, the follicular variant is more aggressive. In some cases, a history of primary carcinoma in the thyroid occurred with ovarian metastasis, however, this is not always the case.

The objective of this case report is to discuss a very rare malignancy of the ovary, as there are insufficient data guiding the approach to treatment and prognosis of these tumors.

Savannah – 27

Pathophysiology of Angiotensin II-Mediated Cardiac Hypertrophy: A Perspective from Macrophages

Jessica Waite[1], Kelly Carter[1], Eshan Sandip[1], Dhruv Rana[2], Zhi-Qing Zhao[1]

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Abstract

Cardiac hypertrophy is defined as the formation of new sarcomeres resulting in an increase in cardiac mass. Hypertrophy begins as a compensatory mechanism to maintain contractile force against elevated ventricular wall stress resultant of hemodynamic burden, whether due to hypertension, aortic stenosis, valve regurgitation, or as result of myocardial injury, however, has the potential to result in maladaptive cardiac remodeling and reduced cardiac function. This pathological process is influenced by a variety of regulatory processes, of which includes a number of downstream reactions that occur in response to Angiotensin-II (Ang-II) induced macrophage stimulation. Macrophages are stimulated by Angiotensin II to release inflammatory mediators such as oxygen free radicals, cytokines, and chemokines while promoting transendothelial migration of monocyte-derived macrophages via upregulated expression of integrin adhesion molecules on monocytes and endothelial cells. CCR2- cardiac resident macrophages carry out anti-inflammatory M2 activity, however in response to Angiotensin-I/ATR1 stimulation, an influx of bone-marrow derived CCR2+ macrophages carry out pro-inflammatory M1 activity, largely dominating the anti-inflammatory action of resident macrophages. These CCR2+ macrophages release a large number of cytokines, promote, fibroblast proliferation, and cause maladaptive cardiac remodeling via Smads-mediated signaling pathways. These reactions are involved in the development of cardiac hypertrophy, evidence by the inhibition of Angiotensin-II induced vascular and myocardial injury when Angiotensin II AT1 Receptor is antagonized or when the peripheral circulation of macrophages has been depleted. PubMed search of keywords: Angtiotensin-II (Ang-II), Macrophages, and Hypertrophy. This review updated the recent findings from 2015-2024 in Angiotensin-II mediated cardiac hypertrophy by macrophage activation. This review was conducted to discuss Angiotensin-II-mediated pathologic hypertrophy, particularly focusing on macrophage signaling pathways, as well as how this information challenges the current and future treatment of hypertrophic and heart failure patients.

Savannah – 28

Boosting Survival: Abdominal Lifting and Compression Outperforms Traditional CPR in Cardiac Arrest

Reagan Williams MS-3

Introduction: Early and effective chest compressions are crucial in CPR for cardiac arrest patients, but despite this, the restoration of spontaneous circulation (ROSC) remains low, leading to research into alternative methods. Traditional CPR (T-CPR) can be insufficient in some cases, prompting the exploration of active abdominal lifting and compression CPR (ALC-CPR) as a potential solution. This technique enhances pressure changes in the thoracic and abdominal cavities and may improve survival rates. Comparing clinical outcomes between ALC-CPR and T-CPR is essential for understanding its efficacy. This study aims to evaluate the effectiveness of ALC-CPR compared to conventional methods. **Methods:** The National Library of Medicine online database was searched for peer-reviewed articles published within the past 10 years (2013-2023) comparing traditional CPR to abdominal lifting and compression. **Results:** Compared to the T-CPR group, the ALC-CPR group showed an increase in the restoration of spontaneous circulation (ROSC) rate (22.9% vs. 8.8%, $P > 0.05$). However, the ALC-CPR group demonstrated significantly better outcomes 30 minutes after CPR, including improved heart rate (HR), mean arterial pressure (MAP), arterial partial pressure of oxygen (PaO2), and end-tidal carbon dioxide partial pressure (PETCO2). Additionally, the time from cardiac arrest (CA) to ROSC was significantly shorter in the ALC-CPR group compared to the T-CPR group (6.3±1.8 minutes vs. 11.2±1.4 minutes, $P < 0.05$). The 24-hour survival rate, along with the overall survival and discharge rates, were also significantly higher in the ALC-CPR group compared to the T-CPR group. **Conclusion**: In conclusion, ALC-CPR demonstrates superior advantages in enhancing blood oxygenation and better neurological outcomes. Key factors such as PaO2, PaCO2, and PETCO2 significantly influence CPR success, with PaCO2 and PETCO2 serving as valuable predictors. Additionally, ALC-CPR outperforms T-CPR in improving hemodynamics and pulmonary ventilation, leading to higher rates of ROSC and successful resuscitation.

SAVANNAH Epidemiological

Savannah – 29

Human Leukocyte Antigen association with disease and cancer burden in the state of Georgia: a genetic epidemiology study

Lauren Ashlyn Fletcher, Dr. David Hollar

Abstract

Background: The human leukocyte antigen (HLA) locus in the chromosomal position 6p21 encodes six HLA genes that have critical roles in the regulation of the immune system and other molecular and cellular processes. Variations of this segment of the human genome are associated with numerous cancers and diseases, including autoimmune disorders, such as diabetes, rheumatoid arthritis, and psoriasis.

Methods: For this project, HLA data for the state of Georgia was collected and assessed on a county level. Individual HLA allele frequencies and homozygotic allele frequencies were determined for 89 counties that had adequate data. The allele frequencies were assessed for correlation with rates of HIV infection, diabetes mellitus, breast cancer, colon cancer, and melanoma. Statistical analyses included the local Moran's I to assess spatial autocorrelation, Bivariate Local Indicators of Spatial Association (BiLISA) to assess the statistical significance of the local Moran's I, and scatter plots to observe for relationship between the variables of an HLA allele and the disease or cancer type of interest.

Results: There were relevant patterns of various cancer rates across Georgia. For example, HLA-C7 homozygosity showed a Moran's I = 0.116 for melanoma rates, with higher spatial autocorrelation between northern Georgia counties, and lower correlation between southern counties. A similar pattern was seen with melanoma for HLA-DQA1 homozygosity. There was a substantial Moran's I = 0.238 between HLA-DR53 homozygosity and melanoma, plus associations between this allele and HIV rates.

Conclusions: HLA mapping provides valuable insight into individuals' risk of disease and cancer development for population health assessments and screening interventions. Further HLA mapping and analysis should be performed to determine further associations and assess the risks a particular HLA genotype can carry.

Savannah – 30

Barriers to Breastfeeding Leading to Early Cessation: Risk Factors and prevention Strategies

Peyton Matt, Dr. Chris Scoggins

Abstract

Breastfeeding offers numerous health benefits for both infants and mothers, including optimal nutrition, immune support, and reduced illness risk. However, in Georgia, many mothers stop breastfeeding earlier than recommended. The American Academy of Pediatrics (AAP) suggests exclusive breastfeeding for the first six months of life. Yet, data shows only 39.9% of infants in Georgia are exclusively breastfed at three months, with only 18.7% continuing through six months. Many barriers exist that can lead to early cessation of breastfeeding for women across all cultures and socioeconomic status, even after successful breastfeeding initiation. A comprehensive data collection and literature review was conducted to identify key factors influencing breastfeeding duration and outcomes. Key barriers contributing to early breastfeeding cessation include low income, limited education, and insufficient family support. Women with lower socioeconomic status often face financial pressures and a need to return to work early, which impacts breastfeeding duration. Additionally, lower education levels can lead to a lack of understanding about breastfeeding benefits, while inadequate family support can further undermine breastfeeding efforts. Institutional barriers also play a significant role, particularly in rural areas where there is a shortage of healthcare providers and support services. To address these issues, several strategies are proposed. Increase access to breastfeeding education through classes, handouts, and trusted online resources in OBGYN practices. Boost support from healthcare providers, including lactation consultants, to offer consistent guidance during the postnatal period. Use telehealth services to support mothers in rural areas where access to specialists is limited. Lastly, advocate for supportive policies such as paid parental leave and workplace breastfeeding breaks. By identifying and understanding these barriers, healthcare providers can better support mothers in overcoming challenges and achieving successful breastfeeding outcomes. Emphasizing education and comprehensive support throughout medical training is crucial for improving breastfeeding rates and duration.

Savannah – 31

Medicare Reimbursement for Obstetric Procedures For 2000 to 2024

Corie Salvi, Sahan Vangala, Emely Sandres

Abstract

The United States National Healthcare Expenditure for Medicare increased five-fold from 2000-2021. Although Medicare only covered 11,000 births in the United States, Medicaid covered in 1.49 million in 2021. Both commercial insurance and Medicaid follow the trends of Medicare reimbursement rates for physicians. Thus, Medicare rates are essential to understand trends in payments to obstetrician-gynecologist physicians. The objective of this study is to understand payment trends for obstetrics over the last 24 years. Using the National Summary Data File from the Centers for Medicare & Medicaid Services (CMS) website, the top 20 Current Procedural Terminology (CPT) codes for obstetrics were queried via most billed services for obstetrics. These CPT codes were plugged into a query "The Physician Fee Schedule Lookup Tool" to receive reimbursement data from 20070-2023. For each CPT code in this time frame, every geographic locality available was taken for analysis, rendering 2,248 distinct reimbursement rates over the United States. Per-year averages were calculated to simplify the analysis. Each averaged CPT code was adjusted for inflation by using consumer price index from the Department of Labor's Bureau of Labor Statistics' most recent data. The general consumer price index was used instead of the healthcare consumer price index to observe purchasing power changes of these physicians over this time frame. All data analysis was performed using R statistical software version 4.3.1. Statistical significance was set at $P < 0.05$. Institutional review board approval was not required for this study due to the publicly-available, aggregate nature of the data. 29% total average decline in reimbursements for the top 20 billed codes in obstetrics in the last 24 years. Reimbursements have been on the decline in the last 2 decades. Our goal is to tie this decline to federal policy changes.

Savannah – 32

Child Maltreatment Reporting during COVID-19 Lockdown

Taylor Schwarz[1], Madeleine Poling[2], Alika Reid Croy, BS, MPH[3], Yudan Wei, MD, Ph.D.[4]

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Background & Objectives: Existing studies have provided indisputable evidence that the risk of child maltreatment (CM) during public emergencies is significantly increased, however, current evidence demonstrated a paradoxical reduction in CM reporting during the COVID-19 pandemic. To assess how lockdown measure implementation and the subsequent compromise of traditional surveillance mechanisms resulted in substandard identification and documentation of CM during this period, a comprehensive analysis of literature was conducted.

Methods: Literature search was conducted through Science Direct and PubMed to obtain information regarding CM trends, risk factors, and differential impacts among socioeconomic classes before, during, and after the COVID-19 pandemic. Twenty-two (22) peer-reviewed publications were identified and reviewed, and their findings were synthesized.

Results: School closures during the COVID-19 lockdown inhibited interaction between children and educational personnel who historically serve as principal maltreatment reporting sources. The essentiality of the relationship between child and educator is evident upon dissection of the 39% reduction in Child Protective Services (CPS) report intake during this period, which reveals that reports provided by teachers and daycare providers decreased by 90% and 65%, respectively. Not only did social isolation hinder identification of victimized children by mandated reporters, but it also introduced unparalleled economic instability that perpetuated familial conflict and parental mental health deterioration, thus exacerbating the risk of maltreatment. This is illustrated by the significantly increased proportion of substantiated cases received by CPS throughout the pandemic, indicating that a larger quantity of severe cases occurred during this time. Differential impacts of the pandemic were observed across various demographic and social factors, including rural-urban landscape, socioeconomic status, and racial and ethnic backgrounds.

Conclusion: The study calls for targeted interventions to address these disparities and recommends refining telehealth protocols, maintaining continuity in education, and enhancing mental health outreach to mitigate the effects of future global health crises. Longitudinal research is essential to fully understand the long-term consequences of such crises on child welfare and to develop effective strategies for future prevention and intervention.

Savannah – 33

Evaluating the Development and Efficacy of FDA-Approved RSV Vaccinations in Older Populations

Ellie Stark B.S./M.S. and Garrett Streat B.S., PharmD. Dr. Devi Rajan, PhD

Equal Contribution to authors

Abstract

Respiratory syncytial virus (RSV) is a significant illness causing morbidity and mortality in infants, young children and older adult populations. Currently, three FDA-approved RSV vaccines are indicated for the prevention of RSV infection in adults aged 60 years and older. We performed a comprehensive literature review of the currently available vaccines to better understand the challenges faced throughout development and analyzed their efficacy at preventing RSV in older adults. Primary sources from the phase 3 trials of each of the vaccines were collected and analyzed. Until recent years, understanding the exact pathogenesis and immunogenicity of RSV has been challenging. The broad age-related risk and the initial vaccine's catastrophic side effects delayed vaccine development for nearly 60 years. Arexvy was shown to have an efficacy of 82.6% (96.95% CI, 57.9 to 94.1) at preventing RSV-related lower respiratory tract infection (RSV-LRTI) and a 94.6% (95% CI, 65.9 to 99.9) efficacy in patients with comorbidities compared to 72.5% (95% CI, 30.0 to 90.9) without coexisting conditions. Abrysvo was determined to have an efficacy of 66.7% (96.66% CI, 28.8 to 85.8) against RSV-LRTI with at least two signs or symptoms and 85.7% (96.66% CI, 32.0 to 98.7) for at least three signs or symptoms regardless of comorbidity status. The third and most recent vaccine, mREVSIA, produced an efficacy of 83.7% (95.88% CI, 66.0 to 92.2) against RSV-LRTI with at least two signs or symptoms and 82.4% (96.36% CI, 34.8 to 95.3) against the disease with at least three signs or symptoms with minimal differences regarding comorbidity status. This study aimed to compare efficacy profiles in older adults with and without comorbidities and interpret the need for yearly booster doses in individuals at risk of contracting RSV infection.

Savannah – 34

Community-Oriented Primary Care in Rural and Indigenous Geographies: A Review of the Literature

Maggie Zeigler, Zaid Al-Husein, and Elia Nicole Nelson (**equal contributors**)

Abstract

Despite attempts to improve the health of rural and underserved Americans, the US healthcare system continues to see gaps in care when attempting to reach these communities. This literature review explores the previous use of the community-oriented primary care (COPC) model to determine its use in rural Georgia and tribal Oklahoma. This review underscores the successes and failures seen by programs that utilized COPC while applying its principles to the American healthcare system and determining the directions American healthcare could move should COPC be applied. This literature review further explores common barriers faced when attempting to implement COPC, such as lack of funding, inadequate community support, low literacy rates, scarce community resources, and an absence of COPC in medical education.

Current literature describes the lack of COPC's use in its entirety, stating that many providers are using only parts of the whole model, if it is being used at all. This partial implementation can lead to underrepresentation and potentially skew the understanding of COPC practices in contemporary healthcare settings. Additionally, the literature on the implementation of COPC in Indigenous populations is notably sparse. Several articles detailing COPC projects founded both domestically and internationally were reviewed, and the ultimate conclusion was made that COPC can be effective when all parties involved fully engage in the process and feed the project with community support. While action has been taken to improve American healthcare with the passing of the Affordable Care Act, there remains a need for commitment to community engagement at the systemic, organization, and patient levels. This review highlights what is missing, where COPC fits in the future of American healthcare, and makes a call-to-action for community stakeholders to review the benefit COPC may have in the aforementioned communities and to predict the influence it may have on such populations.

SAVANNAH Medical Education

Savannah – 35

Rural Georgians' Perspectives on Organ Donation

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Abstract

Rural and medically underserved areas of Georgia face a diverse array of health disparities. Life Link of Georgia, an organ procurement organization, disclosed organ donation rates in a meeting with members of the University School of Medicine Bioethics and Medical Humanities program. Irwin, Ben Hill, and Coffee counties reported an astonishingly low organ donation rate in the last decade. The 3 counties have an aggregate population of about 70,000 citizens, and there were roughly 50 cases of organ donation or organ transplant.[2] This report is a qualitative study of rural Georgian's perspectives on organ donation. The objectives were to identify cultural and religious beliefs influencing these perspectives and exploring barriers to organ donation in these communities. 21 one-on-one interviews were conducted. These interviews were recorded and transcribed. Data analysis adopted *A Step-By-Step Guide to Qualitative Data Coding* involved manual coding of interview transcripts to gather insights and identify trends to establish themes. [1] Four themes were found after analyzing the data (1) Little knowledge and promotion suggestions, (2) religious ambiguity, (3) overall positivity with prevalent skepticism and misconceptions about donation process, and (4) low awareness/education on organ donation and logistical barriers. Most interviewees had a positive outlook on organ donation. However, the participants reported many different types of beliefs, misconceptions, and factors that could possibly be a factor causing low rates of organ donation. This study exposes a lack of educational outreach on organ donation in these areas as numerous participants reported evidence that supported theme 4 on multiple occasions in separate interviews. Qualitative research on rural Americans' perspectives on organ donation has not been explored on various academic journals.

Savannah – 36

Cryptic Crosswords: Using Crossword Puzzles as Study Aids for Biochemical Sciences

Angabin Matin, PhD, Tilak Patel, M2, Jay Branch, M2

Abstract

Background and Objective: Medical education is considered to be one of the most rigorous and challenging to learn, teach, and apply. Recalling the amount and detail of information necessary to succeed requires the utmost attention to detail, recall of information, and application of concepts at a higher level of critical thinking. The aim of our study was to create an education tool for masters and doctorate students in the biomedical department of Mercer University to improve testing scores and retain information in the long-term.

Method: We used a three step process to create each puzzle. The first step was to determine the key terms in each chapter of the book, Molecular Biology of the Cell 7th edition. The second step was to outline each of the crossword puzzles according to the number of characters in each key word, determine common characters among the key words, and include spacing and or hyphens if necessary. This process was done using a puzzle generation tool from the website Discovery Education. The third part of the study was to create clues for each of the puzzles using AI for generating the clues.

Results: Each puzzle had two separate clues; the first clue was a direct scientific definition from the information within the chapters of the book, while the second clue were cryptic clues including play on words, synonyms, metaphors, and other literary devices not found in the chapters of the book and or other outside resource materials.

Conclusion: Future direction of this study is to compare and contrast the use of scientific clues and cryptic clues to determine the effectiveness of each and comparing the results of students groups and their success in retaining and applying material used to create the crossword puzzles.

Savannah – 37

Creating and Implementing a Medical Education Escape Room for Pediatrics Residents

Stephanie Clarke and Cole Williams (Equal Contributors)

Abstract

Escape rooms are live-action, team-based role-playing games in which individuals are "trapped" in a room and must work together to discover clues and solve puzzles in order to progress through the story and ultimately escape. They have been utilized in education as a game-based learning (GBL) approach (Shah et al., 2023). Here, we designed an escape room based on the Accreditation Council for Graduate Medical Education's (ACGME) learning standards for pediatric residency programs. Groups of fourth year medical students interested in pediatrics, pediatric resident physicians, and pediatric attending physicians were given an hour to complete a pediatric escape room designed to test their knowledge and hone their clinical and communication skills. They were then asked to complete a post-activity evaluation survey. While the study is ongoing, preliminary results indicate positive attitudes toward the escape room as a GBL approach, as well as subjective alignment with the ACGME learning standards for pediatric residency programs. Escape rooms continue to demonstrate positive learning outcomes, and medical education may be fortified with greater implementation of GBL activities such as these.

Savannah – 38

Reducing the Potentially Inappropriate Medication Prescription Rate in Internal Medicine Discharge Summaries for Older Adults: a Quality Improvement Inititative

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Abstract

Background: The Beers Criteria®, put together by The American Geriatrics Society (AGS), is a list of potentially inappropriate medications (PIMs) for use in older patient population (65+). As a vulnerable population due to age and the propensity for polypharmacy, older adults are particularly at risk for adverse effect if PIMs are prescribed. This quality improvement project aims to assess the local rate and types of PIMs being prescribed to geriatric patients in the Internal medicine service and propose strategies to reduce medical complications from these medications.

Methods: Using a three-month lookback period (March-May 2024), 329 internal medicine inpatient encounters were identified. Of this initial sample frame, 170 interactions met the project parameters. The discharge summaries of 90 females (mean age 75.3 ± 0.61 years) and 80 males (mean age 75.4 ± 0.61years) with a mean hospital stay of 5.0 days (± 0.35 days) were evaluated and medication lists were compared to the 2023 Beers Criteria® list. Medications appearing on the Beers criteria were noted and the total number of medications appearing on the discharge summaries were recorded.

Results: 80% (137/170) of included internal medicine interactions contained PIMs on the discharge medication lists. The average number of medications on patient's discharge summaries was 2.32 medications (standard error of 0.12) with 27 medications making up the top 50% of inclusions. The three most prescribed medications included pantoprazole (16.04%), opioids as a class, gabapentin (9.12%) and the spironolactone (5.35%).

Conclusion: The findings show the prescription rate of PIMs to be very high among the Internal Medicine service. These results indicating available opportunity for education and resources to aid in reducing PIM rates and associated complications in a vulnerable population.

Savannah – 39

Reading Reimagined: Trends in Medical Student Usage of E-Books Over Time

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OBJECTIVE

Our study aims to analyze trends in electronic book (E-book) usage over the last nine years to determine whether E-book usage by medical students in their didactic years has changed over time. We seek to identify whether textbooks are still used as a medical student primary resource, or if they're being replaced by third-party learning platforms.

METHODS

A single-center study was conducted to compare the total annual usage of E-books across three publishing platforms using nine texts that remained on the mandatory reading list between 2014 and 2024 at Mercer University School of Medicine. According to available historical data, one publishing platform was assessed for total E-book usage trends across nine years (August 2014 to July 2024) and two other platforms were assessed for total E-book usage across eight years (August 2016 to July 2024). Total E-book usage was adjusted for the fiscal calendar and variations in matriculating class size.

RESULTS

Visual trends in usage were analyzed with line graphs. We discovered fluctuations in the use of E-books during three time periods within the last nine years when adjusting for increasing class size. Some E-books seem to decrease in usage while others increase or remain constant. All data is consistent with continued usage of E-books over the last nine years regardless of general per-text usage trends.

CONCLUSION

This data suggests the continued use of E-books by medical students during didactic years despite growing popularity of third-party resources. While individual books may increase or decrease in their annual usage, students generally continue to use medical library E-books to complete required readings. This information can be used to make informed decisions regarding medical school resource management. Future studies should consider the proportions of E-book versus third-party resource usage by medical students to quantify E-books as a continued primary resource.

Savannah – 40

Behavior Modification Tools: Token Economies

Grace McCorkle

Abstract

Individuals in rural areas face difficulties in accessing healthcare and healthcare information. The autistic community specifically is impacted by these healthcare deserts. Not only do autistic individuals struggle to find healthcare providers near them, but they are also challenged with finding information and providers they can trust. The goal of this research was to address the resource gap autistic individuals and their caregivers face in Georgia. There were two methods used to close this information gap, both of which added useful information to our website https://www.autismtoolkit.org. First, I served as an educator and wrote scientifically backed articles about various autism topics, ranging from behavioral modification tips to historical figures in the establishment of autism as a clinical diagnosis. For this portion of my project, I wrote the following articles: "Assistive Technologies Guide: Communication", "Behavior Modification Tools: Token Economies", "Transitional Skills", "Occupational Therapy: What Is It and What Can It Help With?", and "Important People in the History of Autism". Second, I was a broker, connecting individuals to resources in their community. I called different Applied Behavior Analysis (ABA) clinics in certain regions of Georgia and gathered wait times and insurance plans accepted. This information was compiled, published, and organized by region on our website. I contacted a total of 94 ABA clinics across Northwest, Northeast, Atlanta Metro, and East Georgia. Of the 46 clinics that answered the phone, the average wait time was 2.13 months and 87% accepted private and public insurance. Cumulatively, this research highlighted the difficulties in gathering scientifically backed information about autism and the challenge of contacting ABA clinics. These results help explain autism resource deserts in Georgia and encourage further research into providing accessible information to autistic individuals and better connecting them with their communities. Eventually, we hope to close the information gap.

For my poster presentation, I will specifically focus on the article I wrote titled "Behavior Modification Tools: Token Economies."

Savannah – 41

The Serotonin Hypothesis of Autism

Avery C. Meeks and Dr. Sarah Rotschafer
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Abstract

Rural medicine in Georgia suffers from inadequate health care. Physicians in such towns are a valuable few and often lack major resources compared to the metropolitan and urban areas of Georgia. In addition, residents in these areas have little medical knowledge and a lower literacy level. The autistic community is one group that specifically suffers from this health care crisis. Not only do autistic individuals struggle to find clinics offering ABA therapy covered by their insurance plan, the resources available to gain a better understanding of the disorder and to provide direction for their more advanced care is very limited. I utilized two methods to help alleviate the autistic resource desert. First, as an educator, I wrote articles covering important autistic topics to narrow the resource gap and increase the number of reliable medical knowledge. To gather information for these articles, I restricted my resources to only credible peer reviewed articles or trustworthy websites. On our website, http://autistmtoolkit.org, I published the following articles: "Autism and the Serotonin Hypothesis", "What Is Aspergers?", "Why is Proprioceptive Input Helpful for Autistic Kids?", "Autism Severity Ratings: What are they?" and "Sensory rooms and Autism". Secondly, as a broker of my community, I linked autistic individuals with the specific resources in their area. I called 54 clinics across the Metro Atlanta region to gain information about wait times and insurance plans accepted. Out of the 56 clinics I contacted, only 35 clinics were reachable and offered ABA therapy. The average wait time for ABA therapy at these clinics was 4-8 weeks. Both private and public insurances are accepted at the clinics within the Metro Atlanta area. More specifically, Blue Cross Blue Shield and Medicaid are both accepted at all 35 clinics I contacted.

Savannah – 42

Psychoeducational Evaluations and Autism

William Newman, Sarah Rotschafer

Abstract

Autistic people and their families struggle with inadequate healthcare access and, as a result, are ill-informed on the disorder. This is a systemic issue throughout the country and state of Georgia and is exacerbated in rural areas. The goal of this research was to address both issues to improve health outcomes for the autistic community. There were two facets to the research: one addressing the information shortage, the other addressing the provider shortage. The Autism Toolkit, http://autistmtoolkit.org,is a website dedicated to helping autistic people and their families understand the disorder, find treatment, and provide care. It was created through a grant from the National Library of Medicine (NLM), a part of the National Institutes of Health (NIH). Six articles were written for the website: "Dopamine Hypothesis of Autism", "Autism and the Senses: Olfaction and Taste", "The Link Between Brain Size, White Matter, and Autism", "Undiagnosed Autistic Adults", "Caregiver Mediated Intervention", and "Psychoeducational Evaluations and Autism". These articles were written with the hope that autistic people and their families would have a more comprehensive understanding of autism from a neurologic, social, governmental, and treatment perspective. The second facet of the research consisted of calling Applied Behavior Analysis (ABA) clinics and compiling information on their availability, wait times, and insurance. 138 clinics were contacted throughout Northeast, Middle, Southwest, and Southeast Georgia, as well as Metro Atlanta. In total, the average wait time was 4.4 months, with 6% of clinics only accepting public insurance, 12% only accepting private insurance, and 82% accepting both. Ultimately, this research should equip the autistic community with the information necessary to better understand the disorder and to better understand treatment availability. This poster will focus on the article, "Psychoeducational Evaluations and Autism"

Savannah – 43

The exploration of adverse childhood experiences and their relationships with tertiary factors affecting juvenile criminal recidivism

Logan Reid

Abstract

The relationship between juvenile delinquency and adverse childhood experiences has been well explored and documented in the field of behavioral psychology. However, researchers are just now beginning to explore the relationships between these adverse experiences and the influence they have on tertiary factors affecting the frequency of recidivism in juvenile delinquents. This review was completed in hopes of gathering an understanding of the available information regarding this topic and where there is room for further exploration. This review extracts data from multiple studies that aim to make sense of the relationships between juvenile recidivism and adverse childhood experiences and trauma through an evaluation of tertiary factors. Papers relevant to the research question published 2009-2024 were identified using various databases. Included publications were selected from various countries using recidivism as a primary outcome for convicted juvenile delinquents under the age of 18 with an additional look into the involvement of tertiary factors and their influence on the relationship. Fifteen publications that evaluated the base relationship and included a tertiary factor of exploration were included. All the publications evaluated contain information regarding the relationship between adverse childhood experiences and recidivism. However, the tertiary factors were split into eight different groups. All the articles indicated significant relationships between the tertiary factor explored and recidivism in juvenile delinquency. However, for some of the factors, only one article exploring said factor was included, indicating a need for a greater amount of information. More information needs to be explored regarding how different tertiary factors affect this relationship. While many of the studies listed here explored tertiary variables and found correlations, not enough of these explorations exist to make definitive conclusions. Continued exploration of these concepts is essential to better understanding the juvenile delinquent and in what ways can preventative measures be taken, and treatment be implemented.

Savannah – 44

Health Literacy and Colorectal Cancer Screening

Nicholas Sagul and Blake Durrence

Abstract

Colorectal cancer is the second highest cause of mortality due to malignancy among men and women combined. In 2024, it is estimated (by the American Cancer Society) that 106,590 and 46,220 new cases of colon and rectal cancer will be diagnosed in the United States, respectively; summing to 152,810 new cases of colorectal cancer. Colorectal cancer primarily affects individuals who are 55 years or older. However, the age of incidence has steadily trended downward in recent years. The intended purpose of this study is to accrue quantitative data on health literacy about colorectal cancer screenings in rural Georgia. The data collection method was an interview format with patients in Marion County, Georgia, at Phoebe Primary Care of Buena Vista clinic aged 45 years or older. The study participants were asked a series of questions followed by a presentation of a fact sheet from the CDC. After the fact sheet was read and analyzed with the participants, they were encouraged to ask questions or voice any uncertainties regarding screening, the importance of understanding risk factors, and regular monitoring in high-risk populations. The questions asked before the presentation and discussion were repeated, and their new responses were recorded. The results show a 15.4% and 38.5% increase in positive responses to the likelihood of receiving colorectal cancer screening after the interview was conducted in participants whose highest level of education was high school and the total study population, respectively. Future studies assessing the most effective approach to presenting health information to individuals with a high school degree or less could further improve awareness of colorectal cancer and compliance with preventative screening.