Oral Presentations

The 2023 Mercer University School of Medicine and College of Pharmacy Joint Research Conference

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Session 1

Clinical Research

OP - 1

Title: BMI Effects and the Success of Spinal Cord Stimulators

Authors: Harrison Hughes, Zach Hartman, Chad Evans, Johnny Cargill, Douglas Pahl,

Abstract:
Background: Back pain is one of the most common patient presentations in both the emergency and primary care setting with a lifetime prevalence of 84%. Spinal cord stimulators (SCS) act on Aβ sensory fibers in the dorsal columns which produce analgesia through altering of pain pathways and are a non-medication based therapeutic option for back pain. We present a novel investigation of the effect of a change in BMI on the efficacy of SCS in addition to describing significant associations with BMI at surgery and at follow-up.
Methods: IRB approved retrospective chart review of 462 patients who received an SCS implant. The outcome metric analyzed was the pain visual analogue scale which was recorded preoperatively and at each clinical follow-up. Phone calls were made to patients, and they were asked whether they believed the SCS implant was successful at reducing their pain adequately. 68 patients responded to the phone call surveys.
Results: Patients who gain weight tend to report more successful pain management following SCS implantation than those who lost weight. A change in BMI led to a difference in SCS success while the BMI at surgery did not have a statistically significant difference in outcomes. Discussion: Monitoring BMI throughout the duration of patient clinical visits both pre- and post-operationally may serve as a prognostic indicator for whether SCS treatment will succeed as a therapeutic option for a particular patient.
Conclusions: Reduction in BMI may not be a clinical indication of back pain improvement in patients treated with a SCS.

OP – 2

Title: The Role of Educational Programs in Combatting Antimicrobial Resistance: Insights from a Survey of Critical Access Hospital Respondents

Authors: Thomas W. Bagwell1, **Jack H. Lambert**, Shondia Evans, Raybun Spelts, Rafael Ponce, Kenneth I. Onyedibe

Abstract:
Introduction: Antibiotic resistance poses a significant threat to healthcare systems especially in critical access hospitals (CAHs) where resources and specialized antimicrobial stewardship (AMS) training are limited.
Methods: An educational conference focusing on AMS for healthcare practitioners in CAHs was conducted. The educational program featured speakers in infectious disease who conducted didactic lectures, interactive sessions, and case-based learning involving antibiograms. A survey was administered before and after the conference to attendees to measure antibiotic related knowledge.
Results: In total, 30 participants completed the pre-survey and 19 participants completed the post-survey. Pre-survey data show that 47% of participants were pharmacists and 33% were infection control specialists. Approximately 83% of respondents had roles in AMS or infection control within their hospital. From pre-survey (27%) to post-survey (58%), there was a 31% ($p=0.029$) increase in respondents who correctly chose "empiric" therapy when asked what type of therapy an antibiogram should guide. Similarly, respondents who were confident in their ability to interpret an antibiogram also increased from 67% (20/30) to 100% (19/19) ($p=0.005$). When asked about the minimum number of isolates to create an antibiogram, 23% (7/30) in the pre-survey and 95% (18/19) in the post-survey answered correctly. Additionally, correct responses to case study prompts increased in the post-survey.
Conclusion: Our results indicate that the educational program improved participant knowledge of and confidence in antibiogram use. Resource limited settings can benefit from partnerships with infectious disease and AMS experts. Similar educational interventions are low-cost activities that could contribute to the fight against antimicrobial resistance.

OP – 3

Title: Cross Sectional Analysis of Temporal Artery Biopsy Providers Across a Large Multi-State Healthcare Network

Authors: Mikalah Maury; Priya Arya; Karling Gravenstein, Robert Liebman

Abstract:
Background: Temporal artery biopsy has been the longstanding gold-standard test for diagnosing Giant Cell Arteritis. This study aims to elucidate which specialists perform this procedure and how training to perform these biopsies might vary across the United States.
Methods: A cross-sectional analysis a large multi-state healthcare system spanning 1/1/2016-12/31/2022 of all patients >18 years old undergoing temporal artery biopsy. Chi-square analysis of difference of observed counts of surgical specialty, differences of positive diagnosis, and differences in positive diagnosis by reported specialty all by region was done. Mean procedure length was also compared against reported surgeon specialty. A covariance matrix with unequal group variances was used due to differences in group sizes.
Results: 3,825 patients undergoing this procedure across the US were sampled. The percentage of general surgeons was significantly higher in the Midwest (53.6%) than the South (37.2%) and West (36.3%). The percentage of vascular surgeons was significantly lower in the West (30.4%) compared to the Midwest (40.7%), Northeast (47.4%), and South (44.5%). The percentage of positive diagnoses was significantly higher for vascular surgeons (32.7%) compared to cardiothoracic surgeons (23.6%), general surgeons (27.7%).
Conclusion: The specialty performing most of these procedures varies with region and there is a significant difference in rate of positive diagnosis that varies with surgical specialty. This data can have serious implications regarding the importance of standardized training to perform this procedure in the various surgical and non-surgical residency programs, some of which have no formal training currently.

OP - 4

Title: Ghanaians' awareness of Expedited Partner Therapy and if Ghana's Ministry of Health should promote it

Authors: Kenric B. Ware, PharmD, MBA, AAHIVP | Akua Kuffour, BS Pharmacy

Abstract:
Introduction: Expedited Partner Therapy (EPT) helps to lower chlamydia and gonorrhea infection and reinfection rates. The purpose of this study was to assess EPT awareness among Ghanaians and if they would support Ghana's Ministry of Health (MOH) promoting it.
Methods: Community residents and pharmacists throughout Ghana participated in the study by completing a survey in-person or online with their feedback analyzed by demographics such as gender, age, religion, relationship status, and sexual orientation.
Results: Three hundred and seven Ghanaians, 223 community residents and 84 pharmacists, submitted a survey online or in-person, with most participants being female, Christian, heterosexual, 21-30 years of age (community residents) and 31-40 years of age (pharmacists). Eighty-two percent of respondents had not previously heard of EPT. Sixty-six percent of respondents were in support of Ghana's MOH promoting EPT. No demographic variable significantly predicted awareness of EPT nor support for Ghana's MOH to promote EPT. Community residents in relation to pharmacists were less aware of EPT. Community residents in comparison to pharmacists were more in favor of Ghana's MOH promoting EPT.
Conclusions: Overall awareness of EPT was low with greater pharmacist than community resident recognition of it. Despite being more familiar with it than community residents, pharmacists were more hesitant to agree with Ghana's MOH promoting EPT. Increasing awareness of EPT and addressing reservations that exist about it could translate into EPT becoming an option to decrease Ghana's chlamydia and gonorrhea rates in the future.

Session 2

Medical Education

OP - 5

Title: Examining the Perception of the Health Equity Navigator Program as a channel to addressing the Health Needs and Barriers among Rural and Underserved Georgians.

Authors: Ransome Eke, Jerica McCrary, **Victoria Brown** & Jimmy Asbell

Abstract:
Background: Efforts to achieve equity in the US healthcare system focus on reducing disparities and improving access while also addressing societal factors impacting health. However, there's limited research on the impact of health equity navigators on health resource access. This study examines the perception and effectiveness of MUSM's health equity navigators' program (HENP) in reaching medically underserved and rural Georgia communities.
Methods: This CDC-funded program, primarily focused on addressing disparity and inequity in COVID-19 vaccination, employed multiple approaches, including health fairs, youth STEAM camps, and collaboration with local organizations across 12 counties in Georgia Public Health District 4. The study uniquely included MUSM's Teddy Bear Clinic to familiarize children with healthcare settings. A Survey Monkey survey was used to inform and gauge participant perceptions about the HENP, and data was analyzed via Microsoft Spreadsheet.
Results: Of the 156 participants, the majority were from rural areas (67%), identified as Black/African American (65%), female (85%), and were employed (65%). Initial awareness of the role of health equity navigators was limited prior to our study, but after education about the HENP program, over 71% agreed on its critical role in aiding their understanding and navigation of healthcare resources, heightening awareness of available services. Similarly, many (68%) believed that health equity navigators would positively impact attitudes toward healthcare access and efficiency of service utilization.
Conclusion: This study underscores the potential of HENP initiatives to bridge information gaps and enhance healthcare utilization in marginalized settings. The multifaceted strategy that combines education, engagement, and empowerment is well-aligned with the overarching objective of promoting equitable healthcare access and favorable outcomes. As the next steps, policymakers, healthcare practitioners, and community leaders could integrate similar health equity navigator programs tailored to meet local needs, thereby further mitigating health disparities and advancing overall health equity within underserved regions.

OP – 6

Title: Pediatric Orthopedic Trauma: Finding the Right Approach

Authors: Reagan Williams, **Andrew Jackson**, Joseph Slattery

Abstract:

Emergency Medical Technicians (EMTs) are consistently the first responders handling out-of-hospital pediatric traumatic emergencies. Like all medical professionals, EMTs have continuing education (CE) requirements that are necessary for renewing license credentials biannually. However, finite department resources within Emergency Medical Services (EMS) agencies limit EMTs to online CE courses. Creating a model that allows EMS departments to provide CE credits for EMT personnel will allow these providers to refine, and certainly improve, "muscle memory" through simulation exercises. In collaboration with Mercer University School of Medicine's Simulation Laboratory, a hands-on simulation-based education (SBE) model was constructed to reinforce the ATLS (advanced trauma life support) guidelines and facilitate in-person training for Chatham County EMS personnel. While this systematic trauma care training has laid the foundation for both generalization and advancement in traumatic situations, its heavy focus on adult patient scenarios has resorted to less attention and training being given to healthcare professionals with the pediatric population. Currently, injury is the number 1 killer of children ages 1 to 18 years in the United States. While the extent of managing childhood injury is complex and varies based on region, in-person training exercises offer a vast improvement for handling traumatic emergencies when compared to online training modules. Therefore, a pilot program was constructed by Mercer University School of Medicine students to enhance the training regimens of Chatham County EMS. This program works through simulation exercises to efficiently manage spinal immobilization, pelvic binders, and splinting of long bone fractures in pediatric traumatic emergencies.

OP – 7

Title: AI and ChatGPT: What role do they play in medical and scientific research.

Authors: Anna Krampl; Carolyn Klatt; Anna Dunson; Kim Meeks

Abstract:
AI models, such as ChatGPT, have opened the doors to a variety of possibilities for physicians. It's been noted that physicians use ChatGPT to perform research, summarize patient care, write letters, and even—when stumped—ask for ideas on how to diagnose patients. Medical librarians will explain and demonstrate ChatGPT with live research questions. Searches will reveal how ChatGPT takes data and synthesizes and redistributes information in a natural language format. Will also reveal why the system, designed to combat plagiarism, is not meant to conduct research with. Librarians will discuss situations when ChatGPT can be used and when it should be avoided.

OP - 8

Title: Implementation of Spark, an open source solution for the team-quiz

Authors: Reid Proctor, Renee Hayslett

Abstract:
Background: Conventional Team Based Learning (TBL) uses paper IF-AT cards to deliver a team-quiz. We observed the use of IF-AT cards in various settings and identified that their use could be challenging in a large classroom setting. We sought to implement an electronic platform that would facilitate efficient delivery of the team-quiz.
Description: In the Fall of 2018 we began integrating TBL within our pharmacy program. To reduce logistical challenges in the large classroom, which includes distributing and collecting IF-AT cards, time to grade them, and additional personnel needed to facilitate this paper-based process, we implemented the Spark system. Spark is a web-based platform and is based on the Moodle system, an open source software program. Spark is used in conjunction with the Respondus® lockdown browser, making it a secure system to deliver an assessment. Spark, like the IF-AT cards, supports an answer until correct function along with additional capabilities such as fill-in-the-blank and select all that apply, thus allowing greater flexibility with question types. In addition, Spark has been used to effectively deliver a variety of application activities.
Evaluation: Using Spark to support TBL has resulted in a number of benefits.
- Eliminated the need to distribute or collect any type of a paper quiz.
- Immediate collection of the team-quiz results.
- Implementation of additional question types beyond single-selection multiple choice.
- Supported a greater range of application exercises beyond multiple choice questions within the large classroom.
- Provided a cost friendly solution.
Conclusion: We have found Spark to be a valuable and efficient system and will continue to develop how we use it in TBL.

OP – 9

Title: Understanding the factors that influence matriculation and persistence in Black medical students.

Authors: Mincey, K., **Richardson, B.**, Johnson, R., Heraut, M.

Abstract:
Purpose: The Association of American Medical Colleges' (AAMC) Strategic Plan lists 10 action plans one of which is focused on understanding how systemic barriers, such as racism and access to quality education, may negatively impact diversity in academic medicine. Thus, the purpose of this study was to understand the factors that impact the matriculation and persistence of Black medical students.
Method: A qualitative phenomenological study using Tinto's Model of Institutional Departure as an organizing framework was used for this study. Participants were asked a series of questions covering topics related to their goals, their medical school experience, their preparation for medical school, what could improve their medical school experience, and advice for future Black medical students.
Results: Forty in-depth semi-structured interviews were conducted during the fall 2022 term from October to December with Black medical students enrolled in over 16 US or Caribbean medical schools. Findings reported that two factors impacted matriculation for Black medical students (exposure to the medical field and resources, particularly financial resources). Findings also reported that three factors impacted the persistence of Black students once in medical school (diversity, support, and emotional resources).
Conclusion: The five factors identified by participants that impact matriculation and persistence for Black medical students can be used by medical schools to increase their enrollment and graduation of Black students.

OP – 10

Title: Medication Assisted Treatment (MAT) Training

Authors: Allen Tindol, Courtney Civelli, Hannah Hardwell, Paula Kamara, and Sherrie Williams.

Abstract:
As an outgrowth of a federal grant to dispense naloxone, fentanyl and xylazine test kits, identify resources for the prevention and treatment of opioid use disorder (OUD), and unify the effort to address and control OUD in several counties in Georgia, we formed a Medication Assisted Treatment (MAT) Training Team consisting of medical students, a public health expert, a telehealth specialist, and a physician faculty member. The purpose of the team was to provide education and training on opioid use disorder, naloxone rescue, buprenorphine treatment, drug testing, and awareness of recent governmental efforts and resources to address the opioid crisis. By holding educational sessions around the State of Georgia, MAT Training seeks to educate medical students, residents, physicians, university faculty, and members of local communities regarding the utility of a "whole patient" approach to treating substance use disorders. A newly developed website facilitates outreach and education, and directs persons with OUD and their families to local and regional resources useful in effectively combatting OUD. This project highlights the importance of opioid use disorder, various options for patient treatment, and community resources to help patients and their families cope with OUD in a sustainable fashion, while reducing the stigma associated with the disorder.

Session 5

Epidemiology

OP – 11

Title: Genomic and physiological characteristics for survival in melanoma: a genetic epidemiology study

Authors: Ashlyn Fletcher and David Hollar

Abstract:
Melanoma is the most fatal type of skin cancer that originates from the malignant transformation of melanocytes. Melanoma genomes are some of the most highly mutated genomes of all cancers. Melanoma often involves disrupted cell signaling, cell cycle regulation, and transcriptional regulation arising from various genetic mutations. We explored mutation patterns for People experiencing Melanoma (PeM) in the National Cancer Institute (NCI) Genomic Data Commons (GDC), which contains detailed, deidentified genomic data on 86,962 people who have/had cancer with 2,885,293 mutations in 22,501 genes. The database included genetic data on 913 people with primary cutaneous melanomas, 296 of which had complete mutational genomic data. Random selection was used to select a sample group of n =105 for analysis. Mutational genomic data of the 10 most mutated genes in PeM was collected from the sample. Statistical analysis (SPSS version 27) was performed to assess the impact of each mutation, assess for prognostic value of each mutation, and compare mutations between patients with cutaneous melanoma. Logistic regression analyses showed nonsignificant positive associations between titin (TTN) and the histone deacetylase LRP1B and survival, whereas mucin 16 (MUC16), the serine/threonine protein kinase B-raf (BRAF), and the cub and sushi domain protein (CSMD1) were negative. Consistent with previous research, CSMD1 proved to be one of the most damaging mutations with a significant negative association with vital status. Research indicates a need for further analyses to evaluate prognosis and vital status in melanoma cases and to expand personalized genomic profiling for risk genes.

OP – 12

Title: Differences in hospitalization cost and duration of hospital stays among patients with inflammatory bowel disease, comparing those with and without Clostridium difficile infection

Authors: Ransome Eke, Ameena Ali, **Jin Moon**, Yenamala Reddy, Isaiah Ware, Mikalah Maury

Abstract:
This study aimed to address the limited knowledge about the impact of Clostridium difficile infection (CDI) on hospitalization costs and lengths of stay for individuals with inflammatory bowel disease (IBD). Such insights are crucial for healthcare management. We analyzed data from the national inpatient database, utilizing ICD-10 diagnostic codes to identify cases of IBD (K50 and K51) and CDI (A04.7, A04.72, A04.71) admitted in US hospitals from 2016 to 2019. We gathered information on hospitalization costs, length of hospital stays, patient demographics, severity of illness and risk of mortality subclass, and hospital characteristics. The Lasso regression machine learning regularization technique was employed to identify accurate hospital cost and length of stay predictors. We employed descriptive statistics and multivariable analysis using SAS version 9.4 to examine associations. The study found that the primary determinants influencing hospital charges and stays for IBD patients were the severity of illness and the mortality index. Notably, CDI amplified the risk of extended hospital stays and increased costs exclusively in patients with Crohn's disease (RR, 1.29, p=0.01). Other factors contributing to prolonged stays and higher costs included the major and moderate loss of function, major and moderate mortality risks, hospital region and size, urban hospital location, and rural patient status (p-values < 0.05). In conclusion, this research underscores the significance of the severity of illness and mortality index as key drivers of hospitalization costs and lengths of stay. It further highlights that CDI specifically affects cost and length of stay in patients with Crohn's disease.

OP – 13

Title: Management of Chronic Disease in a Rural Clinic During COVID-19 Lockdowns

Authors: Garret Pierzchajlo, Bonzo Reddick

Abstract:
Purpose: There is concern in primary care journals over the deterioration of control of chronic conditions during the COVID-19 pandemic. The objective of this study was to assess whether lockdowns affected the control of these conditions in a family medicine office.
Methods: This study was a retrospective cohort study selecting for two diseases: diabetes mellitus (DM) and/or chronic kidney disease (CKD) in a family medicine practice. We assessed control of chronic diseases by measure of hemoglobin A1c (HbA1c) and estimated glomerular filtration rate (eGFR), comparing these values before and after the first major lockdown in Georgia. Electronic medical record data was analyzed for significance utilizing a two-tailed t-test.
Results: We found HbA1c and eGFR values did not significantly differ after the pandemic lockdown when compared to before. The sample size of CKD patients was small, but in the DM population patients remained relatively well controlled both before and during the pandemic. Despite concerns that patients may avoid physician offices during the lockdown, the number of visits did not differ significantly given the benefit of telehealth availability.
Conclusions: Control of DM did not differ after the lockdown likely due to the use of telehealth and a well-controlled, established patient population. Future studies should assess uninsured populations or those without a medical home which may yield different results.

OP -14

Title: Age-Specific Associations between Maternal Smoking During Pregnancy and Blood Lead Levels in US Children: Exploring Associations and Age-Dependent Vulnerabilities

Authors: Ian Sellars, and Yudan Wei,

Abstract:

Lead exposure remains a significant public health concern and has been associated with numerous negative health outcomes. Nevertheless, the evidence supporting the relationship between maternal smoking during pregnancy and blood lead levels (BLL) in children is lacking. This cross-sectional study aims to examine the association between maternal smoking and BLL in 18,946 US children aged 1-15 years who participated in the 1999-2016 National Health and Nutrition Examination Survey (NHANES). We analyzed the time-trend of lead exposure (BLL $\geq$ 3.5 µg/dL) in children by maternal smoking status during pregnancy for each NHANES cycle and revealed a time-dependent decrease in lead exposure for both groups. Using multivariable logistic regression analyses, we analyzed the association between maternal smoking during pregnancy and high BLL in the study participants. Age-dependent declines in the association between maternal pregnancy smoking and elevated BLL were found. After adjusting for potential confounders, children aged 1-5 years and aged 6-10 years whose mothers smoked during pregnancy had significantly increased odds of high BLL, with an OR of 1.88 (95 % CI: 1.32-2.68) and 1.79 (1.07-2.98), respectively, compared to children whose mothers did not smoke. No significant association was observed for older children aged 11-15 years. Our findings reveal a potential association between maternal smoking during pregnancy and elevated BLL in US children, with patterns highlighting probable age-related vulnerability. This study enhances our understanding of lead exposure sources and underscores maternal smoking's role in adverse health outcomes, warranting further investigations to address the limitations of this study.

Session 6

Biomedical Research

OP -15

Title: Nanobody targeting of LINE-1 retrotransposon-derived peptides in complex with MHC class I molecules on the surface of tumor cells.

Authors: Lloryn Cylin, Pamela Cook

Abstract:
Current immunotherapy efforts seek to manipulate T-cell receptor (TCR) interactions with Major Histocompatibility Complexes (MHC), which process and display peptides from mutated or upregulated intracellular proteins on tumor cells. A promising strategy includes the use of TCR mimics, monoclonal antibodies that similarly recognize specific MHC-peptide complexes. Nanobodies, which are the antigen-binding domain of antibodies found in camels and llamas, are smaller and more stable alternatives to conventional monoclonal antibodies or their single-chain counterparts, scFvs. This project aims to isolate nanobodies from a synthetic phage display library that will recognize peptides derived from LINE-1 retrotransposon, which are upregulated in cancer and presented by MHC class I (MHC I) molecules on the surface of tumor cells. The nanobody library will be constructed using degenerate primers to introduce diversity via overlap extension PCR. The resulting library will be biopanned against in vitro MHC I-LINE-1 peptide complexes. Assembly of the in vitro complex consist of: identification of promising MHC I-LINE-1 peptide pairs, expression and prurification of relevant MHC and Beta-2 microglobulin (B2M) proteins, folding of the MHC I complex with LINE-1 peptide, biotinylation, and final purification by size exclusion chromatography (SEC). Stability of the MHC complex will be confirmed using MALDI-TOF mass spectroscopy and gel electrophoresis. The complex will then be immobilized on streptavidin resin for biopanning, and selected nanobodies will be expressed and purified using histidine tag affinity chromatography. Nanobodies will be further tested for their ability to target MHC I-LINE-1 complexes across different tumor cell lines.

OP – 16

Title: How does COVID-19 increase thromboembolic cerebrovascular complications? An animal study

Authors: Stan Heath, Veronica Hermanns, and Mohammed Abdelsaid

Abstract:

Background: COVID-19 doubles the risk for acute ischemic stroke in patients with cardiovascular
disorders; the molecular mechanisms are unclear. We hypothesize that SARS-CoV-2 spike protein exacerbates stroke and neurovascular complications via increasing coagulation and decreasing fibrinolysis by disrupting the renin-angiotensin-aldosterone system (RAAS) balance.
Methods: MCA/FeCl3 thromboembolic model was induced in humanized ACE2 knock-in mice. Mice treated with Losartan, an angiotensin receptor blocker, after one day of SARS- CoV-2 spike protein injection. Brain infarction and cerebral blood flow were assessed between groups. Cognitive impairment was assessed using a Novel object recognition test. D-dimmer, Tissue factor -3 (TF-3), and Plasminogen activator inhibitor-1 (PAI-1) were measured using ELISA and Western blot. Human brain microvascular endothelial cells (HBMEC) were exposed to hypoxia with/without SARS-Co-V2 spike protein and were analyzed for coagulation factors, inflammation, and RAAS balance.
Results: SARS-CoV-2 spike protein decreased cerebral blood flow, increased neuronal death, and decreased cognitive function in hACE2 after stroke. Moreover, SARS-CoV-2 spike protein increased TF-3 coagulation factors and decreased fibrinolysis with increased PAI-1 expression in hACE2 and HBMVEC. Losartan reduced spike protein- induced infarction and improved cerebral blood flow and cognitive function. SARS-CoV- 2 spike protein caused RAAS system imbalance by increasing AT1R and downstream inflammatory signal. Moreover, spike protein decreased the protective RAAS arm by decreasing AT2R and MAS receptors in hACE2 mice.
Conclusion: SARS-CoV-2 spike protein exacerbates hypercoagulation and inflammation, leading to increased cerebrovascular damage and cognitive dysfunction. However, the AT1R blocker, Losartan, restored the RASS balance and reduced COVID- 19-induced thromboembolic cerebrovascular complications.

OP – 17

Title: A new antelope species (Antidorcas) from mid-Pleistocene Ngobit site, Central Highlands of Kenya

Authors: Kirera F., Omuombo C., Malit, N., Waweru V., Nderitu F., Kinyua R., Chege L., Muge S., Kinyanjui R. & Grossman, A.

Abstract:
Analysis of vertebrate fossils and depositional environments from the least explored regions of the Central Highlands of Kenya (CHK) affords us an insight into the evolution of faunas, floras, and habitats in the upland ecosystems during the Plio-Pleistocene of East Africa. Recent paleontological investigation in the region has yielded a diverse vertebrate fauna including proboscideans, perissodactyls, carnivorans, artiodactyls, primates, reptilians and rodents. Among the discoveries, we have documented a new species of an extinct antelope from mid-Pleistocene deposits of Ngobit, Laikipia plains. The new species is represented by several horncores and dental remains. Both morphological and phylogenetic analysis of the remains supports Antidorcas kinyuae nov. sp. as a new taxon. Some autapomorphies (unique derived features) include robust and stocky horncores, which sharply bend backward, and extremely thick central enamels on molar teeth. While the phylogenetic analysis places A. kinyuae nov.sp. as the sister group to extinct A. bondi, the general morphology of horncores resembles those of A. recki and extant springbok (A. marsupialis). This discovery, among other vertebrates, expands our understanding of the diversity and range expansion of the Antidorcas genus in East Africa. It further shows that the CHK region served as an upland refugia during periods of extreme climatic variability

OP – 18

Title: Formulation, Evaluation, and in vitro permeation of 4-phenylbutyric acid as potential antidote treatment for Lewisite-mediated skin toxicity

Authors: Sharvari Kshirsagar, Nethra Viswaroopan, Meheli Ghosh, Ritesh Kumar Srivastava, Jasim Khan, Suhail Muzaffar, Mohammad Athar, Ajay K. Banga

Abstract:
Lewisite is a chemical warfare agent intended for use during the World Wars but is reportedly present in stockpiles in several countries. Accidental exposure of lewisite to civilians remains a threat to public health. Lewisite causes severe irritation, erythema, edema, and blistering. 4-phenyl butyric acid (4-PBA), improves protein folding, reducing the endoplasmic reticulum stress caused by lewisite in the skin. The present study aimed to develop a topical formulation for sustained 4-PBA delivery. 4-PBA microsponges were prepared using the oil-in-water emulsion solvent evaporation method. The optimized batch F7 with highest drug loading, encapsulation efficiency, and particle size (50.34 ± 4.32 μm, n=10) was further used to develop a topical gel formulation with carboxymethylcellulose sodium (CMC) and carbopol 980 NF as gelling agents. F7 gels were tested for in vitro permeation using Franz diffusion cells and dermatomed human skin (n=4). Compared to control (41.52 ± 2.54 μg/cm2), F7 microsponges in PBS showed a sustained permeation profile, as well as significantly lower total delivery (14.16 ± 1.23 μg/cm2). F7 in carbopol 980 gel (0.75%w/w) showed a significantly lower total delivery than control (12.55 ± 1.41 μg/cm2). Furthermore, F7 in CMC gel (10% w/w) showed a significantly lower total delivery (10.09 ± 1.23 μg/cm2) than the control. For both carbopol and CMC gels, the total delivery was not significantly lower than the microsponge in the PBS, indicating that microsponges sustained the release of 4-PBA. The gel helped to develop a formulation that was easy to apply while not further reducing the delivery significantly.

OP - 19

Title: PAR-1 increases microglial exosome secretion contributing to inflammation after stroke

Authors: Kathryn Lockwood, Chang Chung,

Abstract:
Ischemic strokes kill roughly 3.3 million people each year. While blood reperfusion is an important part of recovery following brain ischemia, it counterintuitively increases inflammation in the recovering areas due to microglial activation. Evidence suggests that Protease Activated Receptor-1 (PAR-1) mediates neuronal injury in cerebral ischemia, but mechanistic details are unclear. To test a hypothesis that microglial exosome secretion is increased by PAR-1 signaling after ischemic brain injury, we used immunofluorescence staining to measure expression levels of CD63, a marker of exosomes. We measured CD63 levels in microglial cells treated with PAR-1 activated peptide and found that CD63 levels were significantly elevated compared to untreated cells. CD63 expression was also significantly greater in the area surrounding the PAR-1 treated microglia, suggesting that exosome excretion was increased. We then examined the level of CD63 present during reperfusion following an ischemic stroke in mouse brains suffering from middle cerebral artery occlusion (MCAO). We found that the hemisphere with MCAO had significantly higher levels of CD63 than the other six hours after stroke. We also found significant changes in endothelial cell morphology and cytoskeleton upon exosome treatment. There was a greater percentage of small circular endothelial cells in the exosome treated group. We believe that this change in morphology could have some effect on blood brain barrier integrity, thus making it more permeable to additional inflammatory mediators. Future research should include study of microglial exosome contents and how these contents contribute to inflammation during ischemic stroke reperfusion.

OP – 20

Title: Immunomodulatory Effect of AMD3100 on Human Bone Marrow Non-Hematopoetic Mesenchymal Stromal Cells

Authors: Rhett N. Parr, Sarah Temple, Tyler U. Faircloth, Yenamala U. Reddy, Denton A. Lord1, Isabella M. Hogan, Raghavan Chinnadurai

Abstract:
AMD3100 (PlerixaforTM) is an FDA-approved mobilizer of hematopoietic stem cells (HSCs) from bone marrow to circulating peripheral blood for stem cell harvesting. AMD3100 in combination with Granulocyte colony-stimulating factor (GCSF) has improved HSC harvests and reduced the need for invasive bone marrow harvesting. AMD3100 and its interactions with HSCs have been extensively explored in current literature; however, its effects on non-hematopoietic stem cells, such as mesenchymal stromal cells (MSCs), received little attention. Recently, MSCs have emerged as a potential treatment for multiple inflammatory diseases. Here we aimed to investigate the effect of AMD3100 on MSCs isolated from four deidentified primary human bone marrow aspirates. 3-(4,5-Dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) metabolic analysis revealed that AMD3100 produced no toxic effect on MSCs, nor does it effect MSC metabolism kinetically. Indoleamine 2,3-dioxygenase (IDO) is a potent immunosuppressive enzyme of tryptophan catabolism and plays a role in MSC immunomodularity. Flow cytometry analysis demonstrated that AMD3100 increased the expression of IDO under TNFa/IFNg stimulation. CXCR4 and CXCR7 are two principle receptors targeted by AMD3100 in HSCs, so CXCR4/CXCR7 was evaluated in MSC populations. MSC surface staining revealed no detection of CXCR4/CXCR7 using flow cytometry, only being captured intracellularly. This reveals that AMD3100 does not require the surface expression of CXCR4 or CXCR7 to impose its modulatory effect on MSCs. This study suggests that the cellular target of AMD3100 extends beyond that currently described in HSCs but to other non-hematopoeitic stem cells as well, opening the possibility of its use across various stem cell types.

OP - 21

Title: The Serotonergic Psychedelic N, N-Dipropyltryptamine Prevents Seizures in a Mouse Model of Fragile X Syndrome via an Apparent Non-Serotonergic Mechanism

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Abstract:
Serotonergic psychedelics (SPs) are well-known as serotonin 2 receptor (5-HT2R) agonists. Tryptamine-based SPs, e.g., psilocin, also possess agonist activity at 5-HT1-type receptors and other 5-HTRs and have efficacy in treating various neuropsychiatric disorders. We and others have shown that 5-HT1R agonists prevent audiogenic seizures (AGS) in an Fmr1 knockout (KO) mouse model of fragile X syndrome, a monogenic disorder. Here we report that a similar psychedelic tryptamine, N,N-Dipropyltryptamine (DPT) completely prevents audiogenic seizures (AGS) in Fmr1 knockout (KO) mice at a 10 mg/kg intraperitoneal dose, but not at lower doses (3 or 5.6 mg/kg). Despite showing an agonistic activity at 5-HT2A, 5-HT1A, and 5-HT1B receptors in vitro, neither pretreatment with selective inhibitors of 5-HT2A/2C, 5-HT1A, nor 5-HT1B receptors blocked DPT's antiepileptic effects; a pan-5-HT receptor antagonist also was ineffective. We also performed a dose-response experiment to evaluate DPT's engagement of 5-HT1A receptors in vivo. DPT elicited 5-HT1A-dependent effects only at doses greater than 10 mg/kg; further proving that DPT's antiepileptic effects were not mediated by 5-HT1A receptor activation. We also found that the selective sigma1 receptor antagonist, NE-100, did not block DPT's antiepileptic effects, suggesting DPT activation of sigma1 receptors was not crucial to its antiepileptic properties in the AGS assay. Separately, we observed that DPT and NE-100, at high doses, caused convulsions that were qualitatively distinct from AGS. In conclusion, we found that DPT dose-dependently blocks AGS in Fmr1 KO mice, but neither 5-HT receptor nor sigma1 receptor blockade prevented this action.