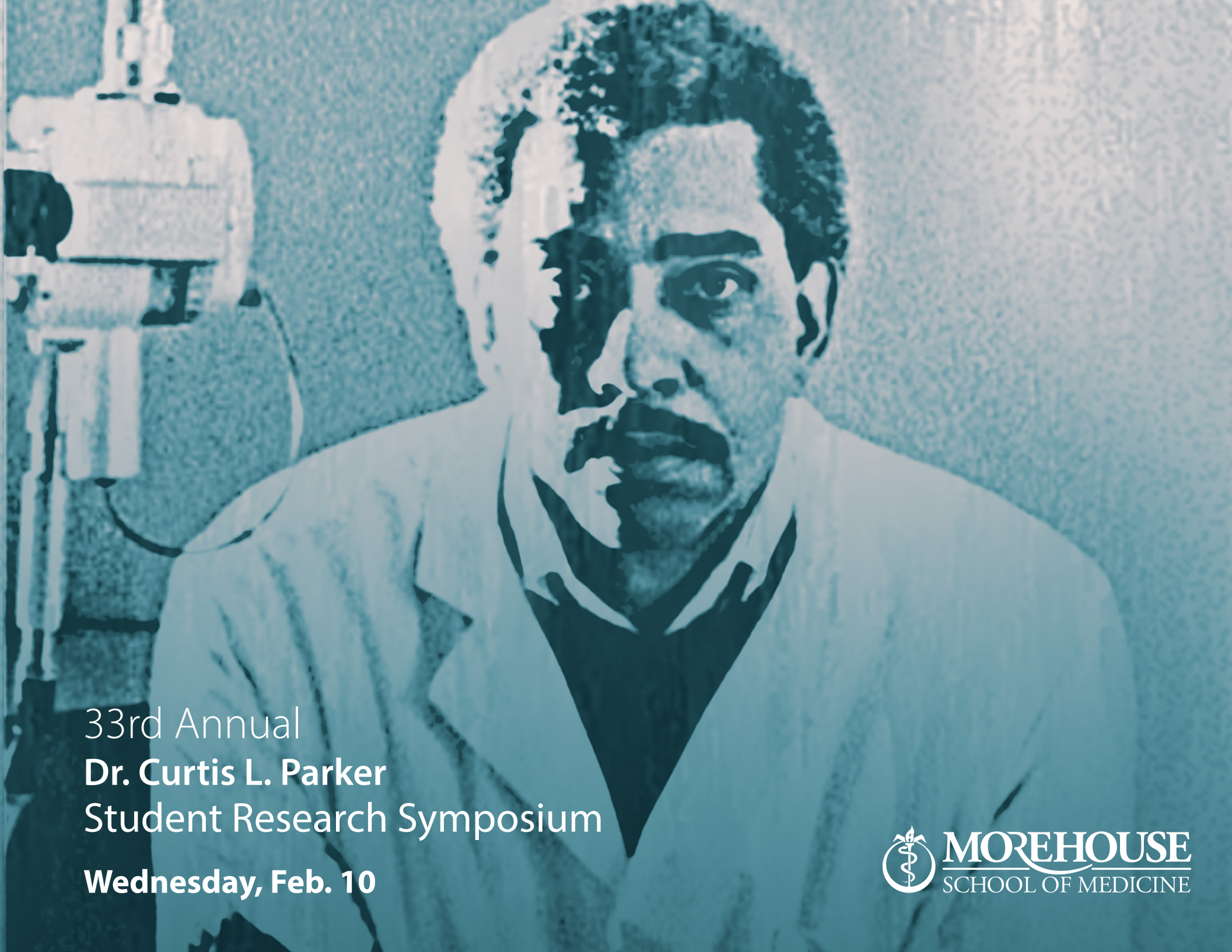


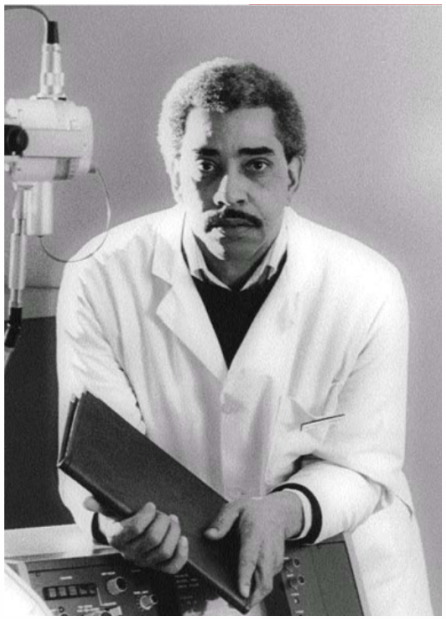
33rd Annual

Dr. Curtis L. Parker

Student Research Symposium

Wednesday, Feb. 10

MOREHOUSE SCHOOL OF MEDICINE



Curtis L. Parker, Ph.D.

1942-1998

Curtis L. Parker was chairperson of the Department of Anatomy from 1989 until his death in 1998. Dr. Parker served as Associate Dean for Basic Science and Research from 1992 to 1996, and acting Dean from July 1995 to December 1995. He was chairperson of the Student Academic Progress and Promotion Committee and served as chairperson or a member of virtually every major committee at Morehouse School of Medicine (MSM).

Dr. Parker joined our institution in 1983 as Associate Professor of Anatomy and rose to the rank of Professor in 1985. Prior to coming to MSM, he was an Associate Professor at (Clark) Atlanta University from 1981 to 1983 and an Assistant Professor at Bowman Gray School of Medicine from 1975 to 1980.

Dr. Parker was an outstanding biomedical research scientist and a primary facilitator in providing opportunities for aspiring research students to interact with scientists of national and international acclaim. His untiring efforts made it possible for some ninety medical students to participate in the Fellows Program at the Center for Disease Control and Prevention. This program was the catalyst for a Student Research Day Symposium at MSM. The MSM-based Symposium was designed to provide a venue for MSM trainees from all programs, and trainees from other institutions from across the State of Georgia, to present their research findings and experiences.

On November 6, 1998, Dean E. Nigel Harris proclaimed Student Research Day at Morehouse School of Medicine as the Curtis L. Parker Student Research Symposium.

Foreword

All student participants are commended for their industrious efforts in the advancement of science. The Research Symposium Committee encourages your continued pursuits and optimistically anticipates your success.

Awards*

The ***Curtis L. Parker Award*** is given to the most outstanding oral or poster presenter in the Ph.D. student category.

The ***Graduate Education in Biomedical Science Award*** is given to the most outstanding oral or poster presenter in the master student category.

The ***Honorable Louis B. Stokes Research Award*** is given to the most outstanding oral or poster presenter in the undergraduate student category.

The J***ay Romans Medical Student Research Award*** is given to the most outstanding oral or poster presenter in the medical student category.

The ***Postdoctoral Research Award*** is given to the most outstanding oral or poster presenter in the postdoctoral category.

The ***Graduate Education in Public Health Award*** is given to the most outstanding oral or poster presenter in the public health category.

**In the circumstance where there are no competitors in a presentation category, the sole presenter will receive a certificate of participation.*

The Honorable Louis B. Stokes

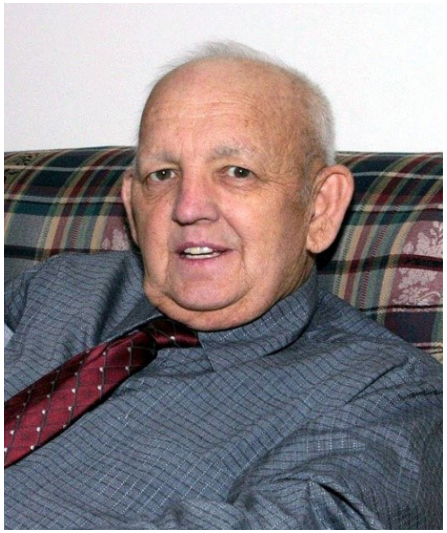
1925 - 2015

The Honorable Louis B. Stokes, U.S. Congressman (retired) began his political career when he was elected to the U.S. House of Representatives in 1968 making him the first African American member of Congress from the state of Ohio. The thrust of Congressman Stokes' career focused on advocacy for the poor and disadvantaged, especially those in urban America. He served under six Presidents during his 30 years in Congress.

Congressman Stokes led pioneering efforts for minority health; the education of minority health professionals, minority science and engineering professionals; the enhancement of science and engineering infrastructure for research and education at HBCUs; and K-12 mathematics and science education programs focusing on state, urban and rural school districts with significant minority enrollments. Some of the programs for which Congressman Stokes is the architect and sustained sponsor and advocate are: the Minority Biomedical Support (now MBRS) Program, Research Centers of Excellence in Minority Institutions, Office of Minority Health, Research and Minority Health Professions Training Act and the K-12 Summer Science Camps Program.

Congressman Stokes played a pivotal role in the quest for civil rights, equality and social and economic justice throughout his tenure in the United States Congress. His work in the area of health led to his appointment as a member of the Pepper Commission on comprehensive Health Care, and he was the founder and chairman of the Congressional Black Caucus Health Braintrust.

When the Honorable Louis Stokes retired in 1999, he became the first African American in the history of the U.S. Congress to retire having completed 30 years in office. He was appointed to serve as vice chairman of the PEW Environmental Health Commission at the Johns Hopkins School of Public Health and was appointed by former Health and Human Services Secretary Donna E. Shalala as chairman of the Advisory Committee on Minority Health. Congressman Stokes was the recipient of innumerable distinguished service awards, recognitions, certificates of appreciation, and honorary degrees.



Reverend Earl Jay Romans

1927 - 2004

Chaplain (Lieutenant Colonel) (retired) Earl Jay Romans was a minister in the Christian Church and served as senior minister at First Christian Church of Jonesboro, GA at the time of his death.

Reverend Romans was known as a "soldier's chaplain" and was loved and respected for his sense of humor and commitment to the men and women who served with him. Always leading by example, he could be found "in the ditches or in the air" with his troops. His trademark at all times, good or bad, was "Thumbs Up!"

During his career Reverend Romans received the following awards: Meritorious Service Medal (4), Army Commendation Medal (2), Master Parachutist Badge, Pathfinder Badge, Army Achievement Medal, National Defense Service Medal, Armed Forces Expeditionary Medal, Army Service Ribbon, and Overseas Service Ribbon.

Reverend Romans wanted to donate his body to the Morehouse School of Medicine for student teaching and research. However, because his body could not be utilized for this purpose, the Jay Romans Medical Student Research Fund was established in an attempt to carry out his wish to support student research at MSM.

KEYNOTE SPEAKER

Otis Webb Brawley, M.D.
Professor of Oncology
John Hopkins School of Medicine
Bloomberg Distinguished Professor of Oncology
Johns Hopkins Bloomberg School of Public Health
Baltimore, Maryland

Dr. Otis Brawley is a clinician-scientist who leads a broad interdisciplinary research effort of cancer health disparities at the Johns Hopkins Bloomberg School of Public Health and the Johns Hopkins Kimmel Cancer Center, working to close racial, economic, and social disparities in the prevention, detection, and treatment of cancer in the United States and worldwide.

Dr. Brawley's research focuses on developing cancer screening strategies and ensuring their effectiveness. He has championed efforts to decrease smoking and implement other lifestyle risk reduction programs and provide critical support to cancer patients and concentrate cancer control efforts in areas where they could be most effective.

Dr. Brawley currently leads a broad interdisciplinary research effort on cancer health disparities at the Bloomberg School of Public Health and the Johns Hopkins Kimmel Cancer Center, striving to close racial, economic, and social disparities in the prevention, detection, and treatment of cancer in the United States and worldwide. He also directs community outreach programs for underserved populations throughout Maryland as the Kimmel Cancer Center's Associate Director for Community Outreach and Engagement.

Dr. Brawley is a graduate of the University of Chicago's Pritzker School of Medicine. He completed an internal medicine residency at University Hospitals of Cleveland, Case-Western Reserve University, and a fellowship in medical oncology at the National Cancer Institute, at the National Institutes of Health (NIH).

He is a former Professor of Oncology and Hematology and Deputy Director for Cancer Control at the Winship Cancer Institute at Emory University in Atlanta, GA. Dr. Brawley also served as the Chief Medical Officer at the American Cancer Society, where he was responsible for promoting the goals of cancer prevention, early detection, and quality treatment through cancer research and education. He also co-chaired the U.S. Surgeon General's Task Force on Cancer Health Disparities and filled various roles at the National Cancer Institute at NIH.

Dr. Brawley is a member of the National Academy of Medicine and recently received the Martin D. Abeloff Award for Excellence in Public Health and Cancer Control from the Maryland State Council of Cancer Control. The award was established to recognize advancements made in cancer control practices that influenced the field of public health on a statewide, national, or global scale.

PROGRAM

Wednesday, February 10, 2021
Morehouse School of Medicine

WELCOME

9:00am – 9:15am

Sandra Harris-Hooker, Ph.D.
Professor, Department of Anatomy and Pathology
Vice President and Executive Vice Dean for Research and Academic Administration

ACKNOWLEDGEMENTS AND PROCEEDINGS

Alec Davidson, Ph.D.
Associate Professor, Department of Neurobiology

ORAL PRESENTATIONS

9:15-9:30 am	Kai Brady	Abstract #O-01
9:30-9:45 am	Alexis Clark	Abstract #O-02
9:45-10 am	Fatima Garba	Abstract #O-03
10-10:15 am	Stephanie Lundy	Abstract #O-04
10:15-10:30 am	Vanessa Morman	Abstract #O-05
10:30-10:45 am	Heather Ngai	Abstract #O-06
10:45-11 am	ShaKyra Richardson	Abstract #O-07
11-11:15 am	George Sankar	Abstract #O-08

VIRTUAL MEET & GREET WITH KEYNOTE SPEAKER *(STUDENTS ONLY)*

11:30-12:30pm

POSTER SESSION

12:45pm-2:00pm

INTRODUCTION OF KEYNOTE SPEAKER

2:15pm

Valerie Montgomery Rice, M.D.
President and Dean
Morehouse School of Medicine

KEYNOTE ADDRESS

"Cancer Control in the 21st Century"

Otis Webb Brawley, M.D.
Bloomberg Distinguished Professor of Oncology and Epidemiology
Johns Hopkins University

PRESENTATION TO KEYNOTE SPEAKER

3:30pm

THREE MINUTE THESIS® COMPETITION

3:45pm

Moderator: Danita Eatman-Daniels, Ph.D.
Associate Professor, Department of Medical Education

1. Ariel Armstrong
2. Jade Avery
3. Krista Cabret
4. Kaylin Carey
5. Ivory Ellis
6. Lawrence McKinney
7. Sha'kayla Nunez
8. Kiam Preston, Jr
9. Krystal Roggerson
10. Tankya Simoneaux
11. Corey Young

PRESENTATION OF STUDENT AWARDS

4:30pm

33rd Annual Curtis L. Parker Student Research Symposium

Virtual Quick Reference Guide

Main Zoom Room: https://zoom.us/j/95532542512

Welcome
Oral Presentations
Introduction of the Keynote Speaker
Keynote Address
Presentation to the Keynote Speaker
Three-Minute Thesis Competition®
Student Awards

Virtual Meet & Greet with Keynote Speaker *(Students Only)*:

https://zoom.us/j/93760662311

Poster Presentations

Cancer & Reproductive Health
Cardiovascular Disease & Associate Disorders
Infectious Diseases (Platform A)
Infectious Diseases (Platform B)
Neuroscience
Community-based Population Studies (Platform A)
Community-based Population Studies (Platform B)
Community-based Population Studies (Platform C)
Community-based Population Studies (Platform D)

Virtual Poster Presentations

Research Areas: "Cancer & Reproductive Biology"

Zoom Host: Ms. Pamela Alexander

Student	Abstract Title
Olayinka Adebayo	Bradykinin Receptor Subtype 1 (BDKRB1) Gene Co-expression and Correlation with Multiple Myeloma Progression
Pendleton King	TRPM7 is a Potential Prognostic Factor in Malignant Glioma and is Associated with Glioma Stem Cell (GSC) Markers
Awa Mbodj	Differential Neuregulin-1 and ErbB Receptors Expression Support Corpus Luteum Function
Melayshia McFadden	The Effect of Paclitaxel & Fisetin Treatment on Platinum-Resistant Ovarian Cancer
Daniel Walters	Obesity-associated Leptin Restricts Anti-cancer Drug, Bortezomib- induced Cell Death in LnCap Prostate Cancer Cells

Research Areas: "Cardiovascular Disease & Associate Disorders"

Zoom Host: Ms. Lisa Jones

Student	Abstract Title
KeAsiah McLauglin	Exosomes from Adipose-derived stem cells promote recovery of blood perfusion in mouse ischemic hindlimb via delivery of miR-31
Samuel Owusu	Factors Associated with the use of Complementary and Alternative Therapies Among Patients with Hypertension and Type 2 Diabetes Mellitus in Western Jamaica: A Cross-Sectional Study
Darlington Pobee	Outcomes Following Surgical Palliation with an Aorto-Pulmonary Shunt for Ductal Dependent Circulation
Frantz Soiro	Sociodemographic and Regional Disparities in the Prevalence of Coronary Heart Disease among Persons 18 Years and Over in the United States

Research Area: "Infectious Diseases (Platform A)"

Zoom Host: Mr. Tawain Kelly

Student	Abstract Title
Jessica Robinson *Learning Community: Innovation*	Assessing Communal Response and Resources Within NPU-T of Atlanta During COVID-19
Shriya Tanti	Parental Perspectives Regarding The Impact Of The COVID-19 Pandemic On Their Children
Alizah Ali	Adverse Mental Health Outcomes Associated with COVID-19 Outbreak related Quarantine in the Asian Population of the United States
Andreya Antoine *Learning Community: Integrity*	The Effect of the COVID-19 Pandemic on the Psychosocial Health of Residents and Staff at the City of Refuge Homeless Shelter.

Virtual Poster Presentations

Research Area: Infectious Diseases (Platform B)

Zoom Host: Ms. Hazel Bryant

Student	Abstract Title
Kiara Vann	The Effects of Cigarette Smoke on HIV-Induced nAChRα7 Expression and GSKβ Activation in a Transgenic Rat Model Neurocognitive Impairment
Morgan Coleman	Functional Identification of Senegalese Herb Used to Treat HIV-1 Infection
Nikolas Holloway *Learning Community: Wisdom*	Qualitative Assessment of Community Needs of Educare Atlanta and Surrounding Mechanicsville Neighborhood During Global COVID-19 Pandemic.

Research Area: "Neuroscience"

Zoom Host: Ms. Lonna Whitaker

Student	Abstract Title
Tamarah Bratcher	Effects of Cimetidine on Lead Induced Neurotoxicity in SH-SY5Y Cells
Brittany Bush	Sleep is Necessary for Resilience to Social-Defeat Stress
Lacey Foster	Effect of Endogenous Modulators of ASIC1a on Acidosis-Mediated Neuronal Injury
Tionna Johnson	Characterization of the Novel RNA-Binding protein TRIM2 in SH-SY5Y Neuroblastoma Cell Line
Ashley Middlebrooks	The Effects of Serotonin on Long Term Potentiation in the Dentate Gyrus: Characterization of Possible Sex Differences
Leila Njoya	The Effects of Low-Level Lead Exposure on the Integrity and Function of Human Brain Microvascular Endothelial Tissue

Research Area: "Community-based Population Studies (Platform A)"

Zoom Host: Dr. DeQuan Smith

Student	Abstract Title
Ene Anteyi	Effects of Gender Norms on Condom Use Self Efficacy among African American Adolescents
Tony Hansberry *Learning Community: Compassion*	Compassion Learning Community Health Course Fall 2020 Tuskegee Airmen Global Academy Needs and Assets Assessment
Benazir Hassen	HPV Anal Cancer in Black Men: The Role of At-home Self Collection to Decrease Anal Cancer Disparities
Lindsay Stanford	Medicinal Cannabis and Older Health Disparity Populations: What's the Deal?
NaSiya Taylor	Examining the Association between PTSD and Depression in People with Epilepsy

Virtual Poster Presentations

Research Area: "Community-based Population Studies (Platform B)"

Zoom Host: Ms. Caloria Osborne

Student	Abstract Title
J. DeCreny-Jackson	Examining the Impact of Psychosocial Vulnerability on Heart Failure Outcomes
Briyanna Phillip	The Relationship between Socioeconomic Status and Anxiety in African American Men with Heart Failure
Sanaai Wynn	The Role of Nutrition in Cancer Prevention
Luis Valdez *Learning Community: Knowledge*	Using a Community Needs Assessment to Identify Health Intervention Priorities within the Paul L. Dunbar Elementary School Community

Research Area: "Community-based Population Studies (Platform C)"

Zoom Host: Ms. Helen Tyree

Student	Abstract Title
Shawn Crowley *Learning Community: Leadership*	Identifying Health Needs of Seniors Living in a Subsidized Independent Living Facility in Metro-Atlanta
Nikki Jones	A Pediatric Community Health Needs Assessment to Optimize Resources and Address Identified Community Needs in Thomaston, GA
Ariel Jordan	Findings from a Large Safety Net Hospital in Georgia regarding Inflammatory Bowel Disease Patients' Awareness and Perceptions of the Restroom Access Act
Yong-Jei Kwon	Development of Radio-frequency Identification-based Electronic Health Record System for Use in Rural and Inaccessible Communities

Research Area: "Community-based Population Studies (Platform D)"

Zoom Host: Ms. Yolanda Gantz

Student	Abstract Title
Taha Elseaidy	Avascular Necrosis of the Femoral Head in Patients with Sickle Cell Disease: A Scoping Review
Aliza MaKhani *Learning Community:Excellence*	Community Health Diagnosis of an Urban Predominantly African American Community
Affra Mohamed	The Effect of Sleep on Resilience to Social Stress in Female Mice
Mariah Rolle *Learning Community: Service*	An Assessment of Opportunities and Threats to Community Health and Well-Being in NPU-T

ORAL ABSTRACTS

0-01

Localizing ubiquitin ligase binding sites of Rev-Erbα

Authors: Kai Brady 1; Ting-Chung Suen, PhD 2; Jason P. DeBruyne, PhD 2

1. Morehouse School of Medicine Neuroscience Institute BSMS Program,
2. Morehouse School of Medicine Pharmacology and Toxicology Department

Mentor: Jason DeBruyne
Morehouse School of Medicine

Background/Significance:

On the molecular level, the circadian rhythm is generated by the rhythmic expression and degradation of core clock proteins. The rhythmic expression and degradation of Rev-Erbα is required for proper circadian clock function Therefore, understanding the role ubiquitin ligases play in the protein's regulation is important. In this project we seek to identify which region of REV-ERBα contains the ubiquitin ligase binding site(s) for SIAH2, SPSB4, and FBXW7. We predict that the ubiquitin ligase binding sites do not overlap for SIAH2, SPSB4, and FBXW7 as disrupting each produces unique effects on REV-ERBα rhythmicity. Determining these specific sites will provide insights as to how these ubiquitin ligases regulate REV-ERBα and may help to reveal their specific roles in this process.

Methods:

We have systematically removed amino acids from Rev-Erbα to create deletion mutants that span the entire sequence. We also inserted tags for detection with antibodies. We measured the rate of degradation of these mutants by treating with cycloheximide and MG132 to compare the stability of these mutants with or without additional ubiquitin ligases. We plan to test the ability of the deletion mutants to interact with each ubiquitin ligase and the ability of the ligases to transfer ubiquitin to the substrate through immunoprecipitation and ubiquitination assays. Data are typically analyzed using a two-way ANOVA.

Results:

Preliminary data shows that the C-terminal deletion mutant with the last 200 amino acids removed, degrades at a similar rate to the wildtype REV-ERBα when co-transfected with SIAH2. This suggests that the ubiquitin ligase binding site for SIAH2 does not lie at the C terminal of REV-ERBα. This same deletion mutant shows increased stability compared to wildtype when co-transfected with SPSB4 which suggests the SPSB4 binding site lies in this region. Thus, Siah2 and Spsb4 appear to interact with different parts of the REV-ERBα protein.

Conclusions and Implications:

Overall, we believe that the ubiquitin ligase binding region on Rev-Erbα will be revealed by systematic deletions at the N terminal and C terminal of the protein REV-ERBα. Without the binding region, there will be limited interaction between REV-ERBα, and its ubiquitin ligases as detected by immunoprecipitation assays. Our deletions may have also disrupted the ubiquitination region of Rev-Erbα. We also may observe differences in ability to be ubiquitinated by E3 ligases which can also affect the stability of the mutants. Our ultimate goal is to identify the precise regions of REV-ERBα required for interaction/degradation by each ligase to determine the precise and direct role of each specific ligase-REV-ERBα interaction within the circadian clock.

Acknowledgment of Funding: This work is supported by the NIH NIGMS grant R35 GM127044 (JPD). KB was also supported by a grant from the Simon's foundation.

0-02

Molecular Mechanism-Based Diagnostics for BRCA1 Associated TNBC

Authors: Alexis Clark BS 1*; Jingyao Xu MD 1; Yunlong Qin MD, PhD 1; Kristiana McLarty BS 1; Shai Waldrip BS 1; Kirat Sandhu BS 1; Sothivin Lanh BS 1; Loni Sneed BS 1; E. Shyam P. Reddy MS, PhD 1 and Veena N. Rao MS, PhD 1

1. Cancer Biology Program, Department of OB/GYN, Morehouse School of Medicine

Mentor: Veena N. Rao, PhD, MS
Morehouse School of Medicine

* Presenting author

Background and Significance:

Triple Negative Breast Cancer(TNBC), BRCA1 mutations, and variants of uncertain significance (VUS) are highly prevalent amongst young African-American Women (AA). Due to the lack of hormone receptors in TNBC, there are no current targeted therapy or biomarkers for early detection. BRCA1 missense mutant alleles, also known as VUS, arise challenges when classifying cancer malignancy. Therefore, the risk of developing TNBC is unknown in women with BRCA1 VUS alleles. It is hypothesized that the amino-terminal domain of the tumor suppressor gene, BRCA1, can contain driver mutations that may cause loss of function and TNBC development or contain passenger mutations that maintain WT BRCA1 function.

Methods:

We tested this hypothesis by transfecting BRCA1/1a and its various mutant (K109R, C61G, I26A) plasmids into patient-derived BRCA1 mutant TNBC cells and studied the various functions such as in vivo association of BRCA1 and Ubc9 by immunofluorescence analysis, induction of SIRT1, growth/tumor suppression activity using colony suppression assay and scratch migration assay. These studies will characterize the function of the various BRCA1 VUS mutant alleles in TNBC.

Results:

Our results indicate for the first time BRCA1/1a I26A to function like WT BRCA1/1a. Unlike K109R and C61G mutants, the I26A mutant was shown to bind to Ubc9, has homologous recombination (HR) activity, lacks E3 Ubiquitin ligase activity, inhibits growth/migration of TNBC cells and induces SIRT1.

Conclusions and Implications:

This is the first study highlighting the association between Ubc9 binding, HR activity, loss of BARD1- dependent E3 Ubiquitin ligase activity, growth/tumor suppression and SIRT1 induction of I26A mutant BRCA1 protein in TNBC cells. BRCA1 regulates the proliferation of TNBC cells through Ubc9 binding. The results of this study will further advance precision oncology, provides guidelines for early detection, prevention, and reduction in cancer health disparities.

Acknowledgement of Funding: 1. Georgia Cancer Coalition Distinguished Cancer Scholar Award, 2. NIHMD U54MD007602 3. U54 RR02613, 5P20RR11104, 4. NIHMD under NIH award 2S21MD000101, 5. MSM/TU/UAB Cancer Center Partnership grant #5U54CA118638-13, 6. VOYA foundation., 7. It is the Journey Inc. and Ga Core grant., 8. Breast cancer partnership grant It is the Journey Inc, a Cure in our lifetime and Ga CORE.

0-03

Molecular delineation of MST4-ZW10 signaling in stimulus-coupled gastric acid secretion

Author: Fatima Garba

1. Department of Physiology, Morehouse School of Medicine, 2. Department of Physiology, Keck Center for Organoids Biology, 3. Morehouse School of Medicine

Mentor: Xuebiao Yao, PhD

Background/Significance:

The digestive function of the stomach depends on acidification of the gastric lumen which requires apical trafficking and ultimate insertion of gastric proton pump H, K-ATPases into the plasma membranes of parietal cells. This hormone-regulated H,K-ATPase translocation occurs concomitantly with extensive remodeling of the apical membrane due to vesicular membrane fusion, which is governed by ezrin-MST4 signaling complex in the activation of acid secretion (Yao & Smolka, 2019). 60% of adults worldwide experience some type of gastroesophageal reflux disease associated with aberrant H, K-ATPase trafficking. In addition, Helicobacter (H.) pylori, a pathogen colonized in the stomach, has been linked to GERD and gastritis. Therefore, a better understanding of mechanistic insight regarding ezrin signaling cascade and regulation is of great importance in clinical setting. Our recent study revealed an important regulatory network involving MST4 kinase and its effectors such as ZW10 in gastric parietal cell secretion. However, little is known regarding the molecular mechanism by which MST4-ZW10 operates in gastric acid secretion.

Methods:

Immunostained parietal cells were examined under a laser-scanning confocal microscope (LSM510 NLO, Carl Zeiss) scan head mounted transversely to an inverted microscope (Axiovert 200, Carl Zeiss) with a 40 × 1.0 numerical aperture (NA) PlanApo objective. Single images were collected by an average of 5 scans at a scan rate of 5-6 min/scan. Optical section series were collected with a spacing of 0.5 µm in the z axis and ~25-27 sections through the ~12-µm thickness of the cultured parietal cells. The images of double labeling were be collected simultaneously using a dichroic filter set with Zeiss image processing software (LSM 5, Carl Zeiss).

To characterize the distribution of ZW10 dynamics in stimulated parietal docking and partition of H,K-ATPase to the apical membrane of parietal cells, we performed a fractionation experiment using cultured parietal cells infected with adenoviral GFP-ZW10 followed by histamine stimulation.

Results:

To address this question, we evaluated how MST4 interacts with ZW10 using in vitro binding assays. These studies involved a detailed analysis of the structural determinants of MST4 which mediate direct MST4-ZW10 contacts. Our immunofluorescence studies show that ZW10 co-localizes with H,K-ATPase in the gastric parietal cells during activation. Western blotting analyses validated that ZW10 also exists in the immunoprecipitates of MST4 in secreting parietal cells but not non-secreting parietal cells. Western blot analyses indicated that the H,K-ATPase subunit is redistributed to the apical plasma membrane upon histamine stimulation. Our newly completed in vitro phosphorylation experiment demonstrated that ZW10 is a bona fide substrate of MST4 and the phosphorylation site of ZW10 by MST4 was mapped by mass spectrometric analyses.

Conclusions and Implications:

Currently, we are evaluating how MST4-elicited phosphorylation of ZW10 operates gastric acid secretion in parietal cells as better understanding of the molecular mechanisms underlying parietal cell MST4-ZW10 signaling is of great significance in understanding the cellular physiology of gastrointestinal secretion, and is also expected to be of great benefit in leading to development of MST4-targeted pharmacological strategies for correcting the pathology seen in H. pylori and SARS-CoV-2 infection.

Acknowledgment of Funding: National Institutes of Health Grant DK56292, CA146133 and DK115812

0-04

MIR-378B Is Important in Modulating the Pathological Outcome of Chlamydia Infection

Authors: Stephanie Lundy1, Zenas George2, Debra Ellerson2, Kahaliah Joseph2, Helen Zhang, Carolyn M. Black2, Uriel Blas-Machado3, Francis O. Eko1, Joseph U. Igietseme1, 2, Qing He1, 2 and Yusuf Omosun1, 2.

1. Department of Microbiology, Biochemistry & Immunology, Morehouse School of Medicine,2. Centers for Disease Control & Prevention (CDC) and 3. Department of Pathology, University of Georgia College of Veterinary Medicine.

Mentor: Yusuf Omosun, PhD
Morehouse School of Medicine

Background/Significance:

We have shown that miR-378b was significantly differentially expressed during chlamydia infection and reinfection. In this study, we tested the hypothesis that miR-378b was involved in determining the pathological outcome of chlamydia infection.

Methods:

We developed miR-378b knockout (KO) mice using Crispr/Cas and infected them along with their wild type control with chlamydia.

Results:

Infectivity result showed that miR-378b KO mice were not able to clear their infection compared to the wild type, their chlamydia burden was high throughout the period of infection. However, gross pathology results showed that miR-378b KO mice did not show much pathology after two infections compared to wild type mice. In addition, the pregnancy and fertility rate for miR-378b KO mice was comparable to uninfected wild type mice.

Conclusions and Implications:

This is interesting as it demonstrates that miR-378b is important in regulating chlamydial pathogenesis but not necessarily the immune response against chlamydia leading to a reduction in infectivity.

Acknowledgment of Funding: NIH grant 8G12MD007602, U54MD007588 and S21MD000101 from the NIMHD. Q.H. was supported by NIH NIGMS grant 1SC1AII03041-01A1; Y.O. was supported by NIH NICHD grant 1SC2HD086066-01A1 and by the Morehouse School of Medicine T Pilot Project Program under Award Number UL1TR002378.

0-05

A Health IT based Psychoeducational Intervention for African American Prostate Cancer Patients

Authors: Vanessa Morman BSPH; Brian Rivers PhD, MPH

Mentor: Brian Rivers PhD, MPH
Morehouse School of Medicine

Background/Significance:

Although Cancer Clinical Trials (CCTs) are essential to developing effective cancer treatments, this promise of research is not realized by all. There remains an underrepresentation of African Americans (AAs) and other minority groups in CCTs, and it is poorly understood how these groups might benefit from tailored cancer treatments. Safety-net hospitals play a major role in treating AA cancer patients. The infrastructure and community resources of safety-net hospitals are integral to recruitment and enrollment of AAs patients in CCTs. This report is a qualitative evaluation of the barriers and facilitators of AA recruitment and retention in CCT participation among stakeholders at a safety-net hospital.

Methods:

We conducted a multi-level, qualitative assessment of the factors influencing AA participation in CCTs at a safety-net hospital in the southern United States. Research staff and clinical trial navigators involved in the study were trained, and the moderator guide was modified. Four professional stakeholder groups were recruited for one-on-one interviews.

Results:

This study identified themes about barriers and facilitators to CCT participation at a safety-net hospital from the stakeholders' perspective. Adapted from the Ford Model for Minority Recruitment, themes were listed under 5 categories: Motivation, Opportunity, Awareness, Acceptance/Refused, and Retention.

Conclusions/Implications:

The present manuscript presents a process to discover information about barriers and facilitators to AA participation in CCTs and to understand CCT participation among eligible AA cancer patients. Data collected from stakeholder groups about potential barriers to improve AA recruitment and retention in CCTs will be valuable in the development of innovative interventions.

Acknowledgement of Funding: Grant Number 5U54CA118638-12

0-06

Comparison of Characteristics, Aneurysm Growth, Matrix Metalloproteinase-9 Levels and C-Reactive Protein Levels Between Men and Women Affected by Abdominal Aortic Aneurysm

Authors: Heather Ngai1, Michael Terrin2

1. Morehouse School of Medicine
2. University of Maryland School of Medicine

Objective:

Abdominal aortic aneurysms (AAAs) affect more men than women, although women have been reported to have faster growth rates and increased rupture rates at smaller diameters. This study explored sex differences in characteristics, aneurysm growth and clinical outcomes in men and women enrolled in the Non-invasive Treatment of Abdominal Aortic Aneurysm Clinical Trial (N-TA3CT).

Method:

261 participants were randomized in N-TA3CT. At least 2 CT scans were completed in patients for aneurysm growth analysis. Patient characteristics, aneurysm growth, matrix metalloproteinase-9 (MMP-9) and C-reactive protein (CRP) levels, observed adverse outcomes, and clinical outcomes such as repair and death were compared across men and women with small infrarenal AAA.

Results:

Among those with baseline maximum transverse diameter 4.5 cm or less, women had significantly faster aneurysm growth rates than men (difference: 0.05 cm/year (95% CI -0.09 to -0.006), p = 0.03). Women (12/37) were more likely than men (36/214) to have a family history of AAA (32.4% vs.16.1%, difference: 16.3%, 95% CI 14 to 33%, p = 0.02).

Conclusions:

Within the size range studied in women, their abdominal aortic aneurysms grow faster than men's. Women with abdominal aortic aneurysms have a family history of abdominal aortic aneurysm more frequently than men do. Regardless of gender, those with a family history are more likely to have faster growing aneurysms. The 0.05 cm/year difference in growth rate would have clinical consequences over the course of five to ten years by which women would exceed pushing women faster to the boundary of interventional threshold at 5.0 cm much more quickly.

0-07

Route of administration determines the efficacy of a VCG-based Chlamydia abortus vaccine

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Mentor: Francis O. Eko, PhD
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Background:

Chlamydia abortus (Cab) is an obligate intracellular, gram negative bacterium and the etiologic agent of ovine enzootic abortion (OEA) in sheep, goats and cattle. Cab poses a zoonotic infection risk for pregnant women, which may lead to reproductive disorders. There is a need for a vaccine to protect against infection and development of adverse reproductive outcomes. The aim of this study was to investigate if route of vaccine delivery influences protective immunity. Thus, we assessed the ability of a Cab vaccine comprising of the N- and mid- terminal regions of the polymorphic membrane protein D protein (Pmp18.3) formulated in Vibrio cholerae ghosts (VCG-Pmp18.3) to protect against intranasal infection following mucosal and systemic delivery.

Methods:

Groups of female CBA/J mice were immunized three times, two weeks apart with VCG-Pmp18.3 either via intranasal (IN), intrarectal (IR), or sublingual (SL) mucosal routes or subcutaneous (SC) or intramuscular (IM) systemic routes. Serum samples were collected two weeks post-immunization to assess antibody levels. Antibody avidity and neutralization was also assessed. To assess protection against C. abortus infection, mice were challenged intranasally with Cab AB7 four weeks after the last immunization. Vaginal swabs were collected and changes in body weight were recorded to monitor the infection. Twelve days after challenge, splenocytes were harvested for cytokine analysis.

Results:

The results revealed lower levels of chlamydia specific antibodies in serum of mucosal groups compared to the systemic groups. However, the antibodies produced by the mice immunized via mucosal routes had a higher binding avidity. Only the IN, IR, and IM immunized groups induced cross-reactive neutralizing antibodies against Cab B577. The IN and IR groups shed significantly lower ($p < 0.001$) Chlamydia EBs following intranasal challenge compared to the other routes. Irrespective of the administration route, VCG-Pmp18.3 elicited a Th1-type cytokine response as indicated by the high levels of Th-1 associated IFN-γ and the low levels of the Th-2 associated IL-4 cytokines.

Conclusions:

VCG-Pmp18.3 delivered via mucosal routes, IN and IR were most protective against Chlamydia infection. The results confirm that route of administration impacts the efficacy of VCG-Pmp18.3.

Acknowledgment of Funding: This work was supported by PHS grants R01AI41231 and R01AI26897 from the National Institute of Health (NIH).

0-08

Socioeconomic Disparities in Head and Neck Cancer Stage at Presentation and Survival in California

Authors: George B. Sankar, BS 1; Albert Y. Han, MD, PhD 2; Maie A. St. John, MD, PhD2,3,4

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Mentors: Albert Y. Han, MD, PhD

Background/Significance:

This objective of this study was to characterize socioeconomic status (SES) of patients who were diagnosed with head and neck cancer (HNC) using the Surveillance, Epidemiology, and End Result (SEER) database and California Health Interview Survey (CHIS). The study sought to describe the impact of socioeconomic status and health behavior on head and neck cancer.

Methods:

The SEER registry and CHIS database were utilized to obtain clinical and county-level SES of HNC patients between 2011-2015. Patient data was then analyzed to determine predictors of advanced stage diagnosis and survival.

Results:

A total of 19085 cases of HNC were included. Patients were predominantly in their 60s, male, and white. Multivariate analyses revealed that the age at diagnosis, sex, race, primary tumor site, county poverty level, and county obesity levels were all significant predictors of stage at presentation. Univariate Cox proportional hazard regression also demonstrated that poverty and obesity were also predictors of poorer survival. However, when controlled for overall county-level health status and physical activity level, these were no longer significant in multivariable analyses.

Conclusion:

Advanced stage at diagnosis was associated with age, sex, race, tumor site and county poverty and obesity rates. However, poverty and obesity were not significant prognosticators for survival when controlled for overall health and physical activity, suggesting a complex relationship between SES and health. Our study underlies the urgent need for improved cancer screening especially in medically underserved areas.

POSTER ABSTRACTS

P-01

The effect of sleep on resilience to social stress in female mice

Author: Affra Nazineen Mohamed

Mentor: Christopher Ehlen, PHD
Morehouse School of Medicine

Background/Significance:

Sleep disturbances are a common symptom in stress-induced psychiatric illness such as anxiety, depression, and PTSD. This has led to the hypothesis that sleep may be part of the mechanism responsible for susceptibility or resilience to the behavioral effects of stress. It is well established that an increased prevalence of both sleep problems and neuropsychiatric disorders exists in women, yet there are few mechanistic studies investigating this relationship. The purpose of this study was to: 1.) determine if sleep amount and regulation is associated with resilience to social stress in females 2.) to determine if variations in sleep homeostasis, before social stress, predict maladaptive behavioral responses to the stressor.

Methods:

Female mice were socially defeated using the resident intruder paradigm, where social defeat stress leads to sustained changes in behavior. EEG (electroencephalogram) recordings were used to monitor sleep patterns before and after social stress in both baseline and sleep deprived conditions. EEG waveforms were then analyzed to determine differences in sleep regulation before and after social defeat stress in animals that were either susceptible or resilient to the behavioral consequences of social defeat.

Results:

We predict that female mice will have both a greater level of susceptibility to social defeat stress and reduced changes in sleep when compared to males. Furthermore, we predict that the decreased sleep-responses to social stress in females will be due to a preexistent decreased ability to compensate for lost sleep—when compared to males.

Conclusions/ Implications:

Successful completion of this study will provide an animal model with which to investigate how sex-differences influence the causal role of sleep in maladaptive behavioral responses to stress.

Acknowledgement/ Funding: GM127260 (Ehlen), MD007602 (Bond)

P-02

Community Health Diagnosis of an Urban Predominantly African American Community

Authors: Aliza Makhani 1, Dillon James 1, Oluwalamilola Babatola 1, Nolan Stubbs 1, Matthew Clopton 1, Elexa Walker 1, Nia Placide 1, Alhaji Foray 1, Samuel Owusu 1, Jake Cook 1, Rachel Terrell 1, Arrianna Higgins 1, Miles Simms 1

1. Medical Students at Morehouse School of Medicine

Mentor: Gilberte Bastien, Ph.D. and Gail G. McCray, MA, MCHES
Morehouse School of Medicine

Background:

Thomasville Heights is a predominantly African American neighborhood of Atlanta demonstrating low average income, high poverty, high homicide rates, high cardiovascular disease prevalence, and low educational attainment. The purpose of this assessment was to 1) expose medical students to community health and 2) collect qualitative data to inform possible interventions that can alleviate some of the socioeconomic pressures impacting the neighborhood. Our host site was Thomasville Heights Elementary School.

Methods:

We first conducted a Windshield Survey (WS) of Neighborhood Planning Unit (NPU) Z, one of 13 neighborhoods in Atlanta comprising Thomasville Heights. Next, we attended a monthly NPU-Z meeting with residents, agencies, and organizations serving NPU-Z to learn about current events and future developments in the neighborhood. Finally, we planned to conduct three Focus Groups (FG) and ten Key Informant (KI) Interviews over Zoom by creating guides and recruiting long-time school and community leaders.

Results:

The WS demonstrated that Thomasville Heights houses numerous churches, few recreational centers, limited transportation options, few healthy food options, and few health clinics. Of the ten KI's and three FG's, we were only able to conduct three KI's and one FG (N=3), recruited through a convenience sample. Prominent themes included mental health challenges and the need for more support, meeting needs of a vulnerable elderly population, gentrification, and poor living conditions. Community leaders are passionate to improve long-term outcomes for current residents and generations to come.

Conclusions:

The findings of this assessment demonstrate how various Social Determinants of Health can intersect and impact outcomes negatively. COVID-19 and limited time were two major limitations we encountered. From initial feedback, possible interventions include tutoring programs for students, developing a rodent abatement program, and equipping seniors with health information and resources. Next steps include presenting these findings to community representatives and determining what interventions are most desired.

Acknowledgment of Funding: Community Health Course, Morehouse School of Medicine, Gilberte Bastien, Ph.D. and Gail G. McCray, MA, MCHES,

P-03

Adverse Mental Health Outcomes Associated with COVID-19 Outbreak related Quarantine in the Asian Population of the United States

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1. Morehouse School of Medicine MD Program
2. Morehouse School of Medicine Psychiatry and Behavioral Science

Mentor: Farzana Bharmal, MD
Morehouse School of Medicine

Background/Significance:

The COVID-19 outbreak had reached the level of an official pandemic in early March 2020. The Asian community had been socially linked to the virus due to the Asian origin of COVID-19. Paired with general stressors related to the pandemic such as isolation, the Asian community residing in the United States had a disproportionate number of stressors such as the anti-Asian attacks, increased micro-aggressions, and threats to their immigration status.

Methods:

A cross-sectional study was conducted to investigate the specific factors that further contributed to increased feelings of depression and anxiety in the Asian community residing in the United States. Specifically, this study analyzed scarcity, familial structure, mental health discussions within the community, immigration, micro-aggressions, and anti-Asian attacks in 439 Asians and compared them to 1059 Non-Asians. To compare the two groups, multivariate anova tests were conducted. Regression analysis was conducted between the different scales and the mental health scale to determine which factors most influenced negative mental health outcomes in this population.

Results:

The Asian community was more likely to fear for their immigration status, effects of the anti-Asian attacks on the stature of the Asian community, and had reported more micro-aggressions since the start of the COVID-19 outbreak. There was a significant association between negative mental health outcomes and these extrinsic factors for the Asian community (P-value <2.2E-16).

Conclusions and Implications:

These findings give direction to practitioners when addressing the unique stressors that may impact the Asian community during the COVID-19 pandemic.

P-04

The Effect of the COVID-19 Pandemic on the Psychosocial Health of Residents and Staff at the City of Refuge Homeless Shelter

Authors: Andreya Antoine 1; Isaiah Walker 1; Alexandria Williams 1; Mackenzie Ellsberry 1; Emily Bullington 1; Dave Delima 1; Brandon Julmisse 1; Ireoluwa Mobolaji 1; Uchechi Ohanu 1; Kajalen Pogue 1; Khadija Shalbi 1; Valdemar Wany 1; Domonique White 1

1. Morehouse School of Medicine, Doctor of Medicine (MD) Program

Mentors: Kofi Kondwani, Ph.D., M.S.; Mary Langley, Ph.D., MPH, RN, ICPS
Morehouse School of Medicine

Background/Significance:

The City of Refuge (CoR) is a faith-based organization in Atlanta, Georgia, located in the neighborhood planning unit K (NPU K). CoR provides assistance for homeless women and children through housing, food, healthcare, job training, and financial literacy support. Approximately 83% of the community is composed of African American's with low graduation rates, low median household incomes, and higher multi-disease prevalence. We investigated the environment, thoughts and opinions related to the social determinants of health and COVID-19 on the psychosocial health of the CoR residents and staff.

Methods:

Authors conducted a windshield survey of NPU K, CoR resident and staff focus groups, and key informant interviews. The focus groups and key informant interviews were conducted via phone and zoom. Informants were selected based on their neighborhood responsibilities. Qualitative analyzes for all three methods consisted of categorizing individual concerns and ranking the frequency of similar comments.

Results:

The windshield survey of the CoR neighborhood indicated a poor, underserved population. NPU K was determined to be in the heart of a food desert. Moreover, access to fresh produce has been reduced due to the ongoing COVID-19 pandemic. Within the resident focus group, a poor diet for CoR residents was identified. Resident frequently mentioned they were lonely because they could not leave CoR due to COVID-19. The staff focus group expressed concerns for their safety and of their family by continuing to work.

Conclusions and Implications:

Our investigation suggest there is a need for short and long-term reductions in stress and an increase in exercise. Non-clinical interventions should target the mental and physical wellness of residents and staff. Group centered activities such as meditation and exercise may promote community cohesiveness while reducing stress for this and other populations. Further research should be conducted within this population to evaluate the efficacy of group interventions.

P-05

Findings from a Large Safety Net Hospital in Georgia regarding Inflammatory Bowel Disease Patients' Awareness and Perceptions of the Restroom Access Act

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Background/Significance:

The Restroom Access Act, also known as Ally's Law, is a law in place in 16 states that allows any person with a medical condition requiring emergent bathroom access, including inflammatory bowel disease (IBD) patients, to be able to use any on-site toilet in a public facility without restrictions. Many patients with IBD experience flares, which often consists of intractable abdominal pain and an imminent need to defecate. The fear of having such flares, particularly in a public location, can be worrisome for an IBD patient and can affect quality of life. The aim of our study is to assess patient awareness of the Restroom Access Act in a state where the law is nonexistent and provide IBD patients' perspectives on the need for such a law.

Methods:

We hypothesized that none of the IBD patients in our study would be aware of the existence of the Restroom Access Act. We also hypothesized that 25% of the IBD patients in our study had been denied restroom access at a public facility in Georgia. We reviewed electronic medical records (EMR) of IBD patients at a large safety net hospital to obtain data regarding ED admissions for flares. A standardized questionnaire was administered over the phone to assess if patients had previously needed emergent restroom access, had ever been denied restroom access at a public facility, awareness of the existence of the Restroom Access Act, and view of whether it should exist in Georgia. Microsoft Excel and SPSS software version 21 were used for data management and analyses. Two-sided P-value < 0.05 was considered statistically significant.

Results:

62 patients were included in the study, 54.8% were female and 45.2% were male. The mean age was 46 years and majority were African American (85.5%). 56.5% had Crohn's disease, 38.7% had Ulcerative Colitis, and 4.8% had both. 48.4% had been admitted less than 5 times for flares. 58.1% stated they avoid social outings due to fear of having a flare. 72.6% had emergently needed bathroom access while at a public location during a flare. 33.9% of patients had been denied bathroom access at a public facility in Georgia. 95.2% had never heard of the Restroom Access Act prior to this survey and 98.4% thought the Restroom Access Act should exist in Georgia.

Conclusion:

Our study revealed the majority of our IBD patients were unaware of the existence of the Restroom Access Act. There was no association between frequency of flares and severity of disease and restroom access denial ($p=0.14$). Given that >50% of patients avoid social outings and >25% have been denied restroom access, restroom access denial could negatively impact quality of life. With this study, we highlight the need for a Restroom Access Act to be passed in Georgia to ensure IBD patients are no longer being denied what should be a basic human right.

P-06

The Effects of Serotonin on Long Term Potentiation in the Dentate Gyrus: Characterization of Possible Sex Differences

Authors: Ashley Middlebrooks; Morris Benveniste, Ph.D.

Mentor: Morris Benveniste, Ph. D.
Morehouse School of Medicine

Background/ Significance:

Learning and memory are thought to be correlated with the cellular mechanisms that control synaptic plasticity (Kandel, 2001; Kraus et al., 2017). Long Term Potentiation (LTP) is a type of synaptic plasticity in which excitatory postsynaptic potential (EPSP) amplitudes are increased over a long period in response to an induction stimulus. LTP can be observed in the hippocampus and is associated with spatial memory in rodents and short-term memory in humans. Selective serotonin reuptake inhibitors (SSRIs) are commonly used to treat depression. Activation of serotonin receptors (5-HTRs) can modulate both synaptic transmission and LTP. Differences in the degree of LTP between sexes have been explored in the CA1 region of the hippocampus (Qi et al., 2016), but not in the dentate gyrus. This study investigates serotonergic modulation of LTP in the dentate gyrus to determine if differences exist between sexes.

Methods:

Extracellular field recordings in combination with the in vitro slice preparation of the mouse hippocampus is used to evoke and measure EPSPs. Long Term Potentiation is induced using a 200 Hz high frequency stimulation protocol. A Pt/Ir stimulation electrode is placed in the upper 2/3 of the molecular layer of the dentate gyrus to evoke EPSPs in the medial perforant path. A recording electrode filled with ACSF is placed in the molecular layer of the dentate gyrus to record the EPSPs. EPSP slopes are measured 60 minutes after the induction stimulus and compared with a 15-minute baseline before the induction stimulus to determine the degree of LTP.

Results:

Preliminary results show a trend suggesting a difference in the kinetics of short-term potentiation of the EPSP slope after the induction stimulus, but more data needs to be collected to determine significance. Serotonin causes a reduction in synaptic transmission as measured by EPSP slope; however, it is not yet clear if the degree of LTP is independently affected by serotonin.

Conclusions/Implications:

Activation of 5-HTRs is increased by antidepressant drugs such as SSRIs. Women report more cognitive effects as a result of depression in comparison to men. Results from this project could potentially increase understanding of how depression can cause cognitive dysfunction and memory issues and could offer insight into sex related cognitive affective symptoms of depressed patients.

Acknowledgements: NINDS/ NIH for support through grant U54NS083932., Simons Foundation for support through an educational grant.

P-07

Differential Neuregulin-1 and ErbB receptors expression support Corpus luteum function

Authors: Awa Mbodj1, Saswati Banerjee2, Winston E. Thompson2 and Indrajit Chowdhury 3

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Mentor: Indrajit Chowdhury, Ph.D.
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Background/Significance:

The formation of a functional corpus luteum (CL) is an absolute requirement for reproductive success and is induced by the mid-cycle surge of luteinizing hormone (LH). CL growth and differentiation are tightly regulated by survival and cell death signals, including endocrine (LH), intra-ovarian regulators, and cell-cell interactions. Neuregulin-1 (NRG1) is a member of the epidermal growth factor-like factor family that mediates its effect through the erythroblastoma (ErbB) family. However, the detailed mechanisms associated with the interplay of NRG1 and its receptors in CL function is not known. Therefore, we examined the expression pattern of NRG1 and its receptors in the rat CL.

Methods:

For characterizing the spatial and temporal expression patterns of NRG1 and ErbB receptors in the rat CL during the pregnancy, ovaries were collected from adult female pregnant rats. Ovaries were fixed in 10% buffered formalin for making tissue blocks for immunohistochemistry. Followed by immunocolocalization of NRG1 and ErbB2/3 were done.

Results:

Immunolocalization of both NRG1 and ErbB2/3 suggest that both NRG1 and ErbB2/3 are differentially expressed in CL during pregnancy. Moreover, both NRG1 and ErbB2/3 are highly expressed in CL on day 14 compared to day 21.

Conclusions:

Collectively, these preliminary studies suggest that NRG1-ErbB2/3-signaling may have important physiological roles in CL function.

Acknowledgements: This study was supported in part by National Institutes of Health Grants 1 SC1 GM130544-01A1, 1SC3GM113751 and G12RR03034. This research was conducted in a facility constructed with support from the Research Facilities Improvement Grant C06RR018386 from the National Institutes of Health National Center for Research Resources.

P-08

HPV Anal Cancer in Black Men: The Role of At-home Self Collection to Decrease Anal Cancer Disparities

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Objective:

Black men have traditionally experienced higher morbidity and mortality rates across numerous health conditions when compared to white men and women. This is especially seen in HPV-associated anal cancer diagnoses and the associated health outcomes. The following commentary highlights how access to, and utilization of at-home self-anal collection may provide an approach to early detection of high-risk HPV serotypes.

Methods:

The commentary uses published literature illustrating the efficacy of self-collection and the social determinants of health that affect Black men's' access to health interventions. HPV-associated anal cancer prevalence and statistics were obtained from the National Program of Cancer Registries SEER*Stat Database: U.S. Cancer Statistics Incidence Analytic file 1998–2016 covering 100% of cancer diagnoses in the United States and supported by the Centers of Disease Control and Prevention.

Results:

Literature supporting the health disparities among Black men were used to illustrate the barriers that affect access to care including medical mistrust, poverty, and cultural/societal expectations. Studies that support the efficacy of self-collection methods and analysis via HPV DNA were used to highlight its usefulness in a harm reduction approach.

Conclusion:

Access to at-home self-collection is an appropriate step in decreasing mortality and morbidity among Black men with high-risk HPV serotypes as a means of harm reduction. At-home self-collection is a lower cost, convenient way of screening among Black men to reduce negative outcomes and increase early intervention for the prevention of anal cancer.

P-09

Sleep is Necessary for Resilience to Social-Defeat Stress

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PhD in Biomedical Sciences Program, Department of Neurobiology, Morehouse School of Medicine

Mentor: J. Christopher Ehlen, Ph.D.
Morehouse School of Medicine

Background:

Sleep disorders are known to be major symptom of neuropsychiatric disorders (ND) such as post-traumatic stress disorder (PTSD) and anxiety. This relationship has led to the hypothesis that sleep plays a mechanistic role in the induction or progression of ND. To investigate this relationship, we have employed a mouse model wherein social stress leads to a syndrome of maladaptive behavioral responses. Preliminary data from this model are the first to demonstrate that development of social avoidance is associated with differences in sleep regulation that exist both before and after exposure to social stress. These results prompted us to look at the effects of chronic sleep loss on response to social stress. Following this study, we also found that, by using local field potentials (LFP) in the medial prefrontal cortex (mPFC), that mice resilient to social defeat stress have an increase in sleep following sleep deprivation. We hypothesized that increased sleep loss will result in an increase of susceptibility to social defeat stress.

Methods:

We exposed C57BL/6J mice to sleep deprivation during the first eight hours of the light period during ten days of social defeat. Sleep deprivation was performed using an automated deprivation system with a rotating bar to maintain wakefulness. Social defeat was performed within the first hour of the active period and susceptibility to social defeat was determined using social interaction testing. Prior to experiments, social interaction was performed to establish a baseline social interaction ratio for comparison after the experiment was complete. To determine the effects of sleep within the mPFC, LFP and electroencephalographic (EEG) electrodes were implanted into C57BL/6J mice that were subjected to sleep deprivation to determine their ability to recover lost sleep. Mice were then allowed to recover for five days before undergoing ten days of social-defeat stress.

Results:

Following experimentation we found that there was decreased social interaction in mice exposed to chronic sleep deprivation in comparison to a control not exposed to sleep deprivation. We also found that resilient mice had a significant increased markers of sleep pressure within the mPFC indicating an enhanced ability to respond to lost sleep, when compared to mice susceptible to social stress.

Conclusion:

Mice that exhibit resilience prior to the experiment became susceptible to social defeat stress following chronic sleep loss. Therefore, we can confirm that increased sleep loss increases susceptibility following exposure to social defeat stress and this phenomenon increases as amount of sleep decreases. Increased markers of sleep pressure in resilient mice within the infralimbic cortex supports that sleep has an effect on stress response within the mPFC.

Acknowledgement of Funding: NIGMS SC1 GM120260, NIMHD 8G12MD007602

P-10

The relationship between socioeconomic status and anxiety in African American men with heart failure

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Mentor: Rakale C. Quarells PhD
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Background/Significance:

Low socioeconomic status has been shown to be associated with psychological problems such as anxiety and depression. In patients with heart failure, lower levels of education are associated with higher levels of anxiety. African American patients with heart failure have higher levels of anxiety than their non-black counterparts, however, the relationship between socioeconomic status and anxiety in African American men with heart failure remains unclear. The purpose of this study is to examine the relationship between education and anxiety in African American men with heart failure.

Methods:

Secondary data analysis was performed using cross sectional survey data from the formative phase of the Project UPLIFT study in AA men with HF. The surveys were interviewer-administered by phone. The 7-item generalized anxiety disorder measure assessed anxiety over the past two weeks. Descriptive analyses and analysis of variance (ANOVA) were conducted to examine the association between socioeconomic status and anxiety.

Results:

Thirteen AA men with HF participated in the study with ages ranging from 42-63 years old. Among the participants, 38.5% had some high school education, 38.5% graduated from high school, and 23.1% had some college education or above. The anxiety scores of the participants spanned across the full spectrum (0 to 21), with 69.2% of participants having minimal or mild levels of anxiety. The one-way ANOVA found that anxiety differed significantly by education level ($F=7.44$; $p=2.01$). Thus, participants who had some college education or more had the highest levels of anxiety, and those who only have a high school diploma had the lowest levels of anxiety.

Conclusions and Implications:

Our findings differ from previously published studies, and this may be due to our participants having the serious health condition of heart failure. Unfortunately, our study is limited by a small sample size, therefore a larger sample size should be considered in future studies.

Acknowledgment of Funding: This work was funded in part by U54MD008621.

P-11

Obesity-associated leptin restricts anti-cancer drug, bortezomib, - induced cell death in LnCap prostate cancer cells

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1. Biology Department of Morehouse College

Mentor: Jeffrey Handy, PhD
Morehouse College

Background/Significance:

One-third of the adult population in America is obese. Obesity has been shown to be a risk factor in cancer development for multiple cancers, including prostate cancer. Additionally, obesity leads to the development of aggressive forms of prostate cancer, resulting in poorer survival outcomes compared to metabolically lean individuals. The purpose of this study is to investigate the relationship between obesity, specifically the adipokine leptin, and how it affects therapeutic treatment.

Methods:

LnCap prostate cancer cells were cultured and divide into 6 well plates. The wells were treated with a fixed concentration of bortezomib (BZ) at 620nM. The wells were treated with increasing concentrations of leptin, from 6ng/mL to 60ng/mL. The cells were incubated for 24 hours, then collected for a viability assay. The relative faction of living cells was determined from the percent of cells that stained positive for calcein AM. One-Way ANOVA statistical tests were performed on the data to determine if the differences between the conditions were significant.

Results:

Viability of LnCap cells exposed for 24 hours to 620nM bortezomib was 65% of untreated samples. When LnCap cells were treated with bortezomib in the presence of obesity-associated leptin, the relative fraction of living cells increased, in a dosage-dependent manner, above what was observed in bortezomib-only treated cells.

Conclusions and Implications:

Our data suggests that obesity-associated concentrations of leptin desensitize LnCap cells to bortezomib. These in vitro findings suggest that elevated circulating leptin levels could desensitize obese patients to some anticancer therapies, at least partially explaining the relatively poor prognoses and therapeutic outcomes they experience.

Acknowledgment of Funding: James King Sr. Faculty Fellowship

P-12

Outcomes following surgical palliation with an aorto-pulmonary shunt for ductal dependent circulation

Authors: Darlington Pobee 1; Meena Nathan, MD, MPH 2

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2. Boston Children's Hospital Department of Cardiac Surgery

Mentor: Meena Nathan, MD, MPH, FRCS
Harvard Medical School

Background/Significance:

Babies born with complex congenital cyanotic cardiac defects are often dependent on a patent ductus arteriosus as a source (sometimes the only source) of pulmonary blood flow for survival. The modified Blalock-Taussig Shunt (mBTS) is a palliative procedure that provides a dependable source of pulmonary blood flow for patients with ductal dependent congenital cardiac defects. In this study, we performed a retrospective assessment of the outcomes following surgical palliation with a mBTS for patients with ductal dependent cardiac defects.

Methods:

This was a single center descriptive study involving retrospective review of patients who underwent a mBTS as their primary procedure for ductal dependent congenital cardiac defect at Boston Children's Hospital between May 2010 and February 2018. Clinical charts and databases were reviewed.

Results:

In this cohort of 56 patients, transplant-free survival rate in the first-year post-op was 89.3%. Unplanned re-interventions (surgical/ catheter or both) on the shunt in the first year of life was 19%. Postoperative hospital length of stay (median, IQR: 19.6; 13.5-34.7 days); postoperative ventilation (4.8; 3.0-7.2 days) and postoperative intensive care unit length of stay (9.9; 6.2-19.4 days) were in the range that is expected following surgery for congenital heart disease.

Conclusions:

The survival rate of patients who had a modified BTS placement was high, however, shunt-related complications leading to unplanned re-interventions was not uncommon and techniques to (a) maintain shunt patency and (b) prevent pulmonary over circulation (the two common causes of shunt interventions) are being investigated.

Acknowledgement of Funding: Harvard Catalyst | The Harvard Clinical and Translational Science Center

P-13

Effects of Gender Norms on Condom Use Self Efficacy among African American Adolescents

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1. Morehouse School of Medicine
2. Department of Community Health and Preventive Medicine, Prevention Research Center, Morehouse School of Medicine

Mentor: Rhonda Holliday, PhD
Morehouse School of Medicine

Background/Significance:

The rates of HIV and STI has increased among adolescents and condom usage is important in reducing those rates especially among African American adolescents. Condom use self-efficacy (CUSE) is a strong predictor of condom usage and adherence to traditional gender norms has been associated with decreased condom use self-efficacy. The aim of this study is to assess the relationship between perceived gender norms and condom use self-efficacy among adolescents aged 14-18 in Atlanta, Georgia.

Methods:

Baseline data collected from 263 adolescents using Redcap was analyzed. Eligibility for the study included being African American between the ages of 14 -18 and utilization of community resources. Condom use self-efficacy (CUSE) was measured using a 14 item 5-point Likert-type scale. Gender norms was measured using the 12 item Attitudes Towards Women Scale for Adolescents (AWSA) using a 4-point Likert-type scale. A Pearson Correlation was used to assess the association between gender roles and CUSE. Group differences in CUSE between traditional gender norms vs non-traditional gender norms was assessed with an Independent sample t-Test. SPSS Statistics was used for the analysis.

Results:

Results of the analysis showed significant group differences in CUSE scoring. Participants with traditional gender norms had higher CUSE scoring than participants with non-traditional gender norms ($t(196) = 2.075$, $p = 0.039$ (95% CI: 0.17, 6.78)). There was no significant correlation between gender norms and CUSE ($p = 0.119$). Boys scored higher on the gender norm scale compared to girls ($t(227) = 2.232$, $p = 0.027$ (95% CI: 0.14, 2.24)).

Conclusions and Implications:

Further research needs to be conducted to explore influences on the gender norm differences in CUSE among this population. There is a need to focus intervention and behavior change strategy related to gender role stereotyping and condom use at both genders, particularly girls, in this population.

Acknowledgment of Funding: Morehouse School of Medicine Summer Scholars in the Community (SSiC), Health Careers Opportunity Program grant, Centers for Disease Control and Prevention Grant 5U48DP005042-03

P-14

Sociodemographic and Regional Disparities in the Prevalence of Coronary Heart Disease among Persons 18 Years and Over in the United States

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Mentor: Gemechu B. Gerbi, MSc, PhD
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Background/Significance:

Heart disease accounts for about 1 in 4 deaths with coronary heart disease (CHD) being responsible for over 370,000 deaths per year. The objective of this study was to assess factors associated with the prevalence of CHD among persons aged ≥18 years in the United States (U.S.).

Methods:

Data were analyzed from the 2018 Behavioral Risk Factor Surveillance System (N=433,763), an ongoing, state-based, random-digit–dialed telephone survey of non-institutionalized adults aged ≥18 years residing in the U.S. A multivariable logistic regression analysis was conducted to estimate adjusted odds ratios (AORs) and 95% confidence intervals (95% CIs) for factors associated with CHD among persons aged ≥18 years in the U.S. Analyses were conducted using SAS version 9.4.

Results:

After adjusting for socio-demographic and region of residence variables, being male (AOR= 2.10; 95% CI= 2.01, 2.13); multiracial (AOR= 1.33; 95% CI=1.19, 1.47); aged ≥65 years; elementary education; and annual household income <$15,000 were associated higher odds of self-reported history of CHD diagnosis. Respondents residing in the Midwest (AOR= 1.19; 95% CI=1.13, 1.24), Northeast (AOR: 1.12; 95% CI, 1.10-1.18), and Southern region of the U.S. (AOR: 1.46; 95% CI, 1.40-1.53) had significantly higher odds of self-reported history of CHD diagnosis.

Conclusions and Implications:

The prevalence of self-reported history of CHD diagnosis differs by gender, age, race/ethnicity, level of education, level of income, and region of residence. To reduce geographic and socio-demographic disparities in the prevalence of CHD, prevention strategies should focus on populations most at risk for CHD.

P-15

Examining the Impact of Psychosocial Vulnerability on Heart Failure Outcomes

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Background/Significance:

Heart failure (HF) affects approximately 6 million Americans and is projected to increase in prevalence. Research indicates that inadequate social support is a predictor of poor outcomes in HF patients. The objective of this study was to conduct a rapid scoping review examining the impact of psychosocial vulnerability on hospital readmissions and quality of life (QoL) in HF patients and to identify any relevant limitations and trends. The research question was "what evidence is there for an association between social isolation, loneliness and hospital readmissions and QoL in HF patient subpopulations?"

Methods:

An online database search was conducted to perform a scoping review examining psychosocial vulnerability and how it affects hospital readmissions and QoL in HF patients. Studies were sorted by research design and variables of interest and the sample size of each study was plotted against its p-value. Scatter plots were constructed to visualize the density and significance of relevant literature.

Results:

Of the thirteen articles reviewed, n = 12 were observational studies and n = 1 was a clinical trial. Of the twelve observational studies, n = 5 pertained to loneliness and hospital readmissions, n = 4 pertained to loneliness and QoL, n = 5 pertained to isolation and hospital readmissions, and n = 2 pertained to isolation and QoL. The one clinical trial pertained to loneliness and hospital readmissions (n = 1).

Conclusions and Implications:

The scoping review supported previous studies by revealing a correlation between social isolation, loneliness, and poor HF outcomes. This scoping review revealed the need to routinely identify psychosocially vulnerable HF patients. Additional research needs to be conducted about psychosocially vulnerable populations who have been omitted from the research. In the future, it would be advantageous to implement routine screening and data collection about psychosocial vulnerability in HF patients.

Acknowledgment of Funding: Morehouse School of Medicine Summer Scholars in the Community Program, Health Careers Opportunity Program

P-16

Analyzing the Effectiveness of Remote Research Focused on Marginalized Groups

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Background/Significance:

Due to the COVID-19 Pandemic, in-person interactions for research are severely limited, yet virtual and online implementations can currently offer the best alternative to continue research, especially for populations commonly excluded from research. For example, Post Traumatic Stress Disorder (PTSD) disproportionately affects African American and Black women in urban American communities in comparison to other populations. Unfortunately, there is a lack of culturally tailored PTSD interventions developed to promote optimal help for affected African American/Black women despite the immense research on the disorder. Fortunately, there are studies such as Project GRIT which seek to address this disparity even in the midst of the pandemic, therefore requiring a virtual implementation to safely conduct the study.

Methods:

A literature review was used to determine the effectiveness of a virtual implementation of research with a marginalized demographic participant population. Databases such as PubMed Central and Galileo were utilized to ascertain relevant scholarly articles. Search queries containing keywords such as "online", "virtual", "participants" and "African Americans" were used. Additional viable literature was found through the references of the initially ascertained articles.

Results:

It was determined that virtual implementations of research can have an inclusive advantage. Notably, communication through trusted, virtual platforms allows for flexibility on both the researchers and participants behalf where lifestyle and transportation barriers may occur. Yet, a digital divide regarding efficient access to technology and Internet persists- typically for people of color and low socioeconomic groups. Additionally, privacy, ethical concerns, and necessary observational data may be hindered via virtual research. Further research is required to obtain a more comprehensive understanding of its advantages and disadvantages.

Conclusions and Implications:

To successfully conduct a virtual implementation of a proposed study with underrepresented participants, studies such as Project GRIT that focus on developing an intervention during the COVID-19 Pandemic for urban black women with PTSD, researchers need to bridge the digital disparity for participants in order to address the health disparity of the population. Virtual research implementations on marginalized individuals such as Black women contains the possibility of being more inclusive and flexible. Virtual research during the pandemic as well as after provides an avenue to increasingly promote research that addresses the abundance of health disparities of such populations.

Acknowledgment of Funding: Supported by the National Center for Minority Health and Health Disparities of the National Institute of Health under Award Number U53MD007602.

P-17

Assessing Communal Response and Resources Within NPU-T of Atlanta During COVID-19

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Background/Significance:

Mental and socioeconomic consequences of the COVID-19 pandemic remain unstudied among underserved and Black communities. The purpose of this analysis is to assess the pandemic's impact on existing disparities concerning 1. Mental health resources, 2. Access to healthy foods, and 3. Socioeconomic standing of families in NPU-T of Atlanta, Georgia. Students participated in service learning as part of MD1 training at the John H. Harland Boys and Girls Club, a safe after school environment for children and teens. Students sought to analyze the specific needs of the Boys & Girls Club and greater community. Needs assessments were conducted to begin developing suitable interventions.

Methods: Windshield Survey:

Windshield surveys were conducted to observe NPU-T via vehicle/on foot. Findings were documented with cameras and written notes.

Key Informant Interviews:

Student-led key informant interviews were conducted with five local community members over the course of one month. Students selected key informants and worked in pairs to facilitate interviews.

Focus Group Interviews

Three focus groups were conducted in small groups with Boys and Girls Club attendees (n=11) between ages 7 and 14. Participants were selected via convenience sampling.

All interviews were conducted via Zoom.

Results:

Observations showed that NPU-T is a predominantly Black community with varying degrees of infrastructure and limited healthy food options. Key informants noted increased community resilience during quarantine but expressed a need for mental health/ mentorship programs, and a disconnect between services offered and utilized. When surveying focus group participants, 72% felt neutral about virtual learning, 90% felt neutral about the Boys & Girls Club, and 72% stated they eat less healthy now than before the pandemic.

Conclusions/Implications:

The West End/NPU-T (Atlanta, GA) assessment depicted limited healthy food access. Key informant and focus group interviews indicated lack of social/mental health resources and parent engagement. The results imply need for NPU-T interventions targeting youth mentorship and mental/ physical health.

P-18

Exosomes from adipose-derived stem cells promote recovery of blood perfusion in mouse ischemic hindlimb via delivery of miR-31

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Mentor: Dong Liu, MD, PhD
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Background/Significance:

Ischemic disease is one of the leading causes of death in the United States, despite advancing approaches, therapies, and treatments in the world of medicine. Our previous studies have shown that exosomes from adipose-derived stem cells (ASCs) promote angiogenesis in mouse subcutaneously transplanted gel plugs via a delivery of microRNA-31 (miR-31). The goal of this study is to further explore the proangiogenic effect of exosomal miR-31 on a mouse hindlimb ischemia model.

Methods:

Exosomes were isolated from the culture medium of ASCs or miR-31-depleted ASCs by sequential centrifugations and subjected to nanoparticle tracking analysis. Mouse left femoral artery was permanently ligated. PBS, or various exosomes, was injected into the left adductor muscle at 0-, 4- and 8-days post-surgery. Blood perfusion in the hindlimbs was evaluated before and 0-, 3-, 7-, 14-, and 21-days after surgery with a non-invasive laser imaging system.

Results:

The isolated exosomes were at sizes ranging from 30-150 nm. The blood perfusion in the hind paw in mice administered normal exosomes exhibited better recovery than that administered PBS starting from day 3 ($p = 0.024$) post femoral artery ligation, while the blood perfusion in mice administered miR-31-depleted exosomes exhibited less recovery than that administered the corresponding control starting from day 14 ($p = 0.004$) post femoral artery ligation. The recovery of blood perfusion was enhanced 40.3% by administrating exosomes than PBS three weeks post-surgery. The enhancement was significantly impaired when using miR-31 depleted exosomes.

Conclusion:

Our results suggest that miR-31 mediates ASC-exosome induced recovery of blood perfusion in mouse ischemic hindlimb.

Acknowledgment of Funding: National Heart, Lung, and Blood Institute, SC1HL134212, National Institute on Minority Health and Health Disparities, U54MD007602

P-19

The Effects of Cigarette Smoke on HIV-Induced nAChRα7 Expression and GSKβ Activation in a Transgenic Rat Model Neurocognitive Impairment

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Background/Significance:

Cigarette smoke exposure is highly associated with neurocognitive impairment related to HIV-1 infection, with the number of impaired HIV+ individuals increasing despite the availability of effective antiretroviral therapies. The mechanisms that underlie the apparent interaction between cigarette smoking and HIV-1 infection are poorly understood

Methods:

Wild-type (WT) and HIV-1 transgenic (Tg) rats (n=40) were exposed to either smoke from cigarettes containing 0.7 mg of nicotine (regular cigarettes) or nicotine-free cigarettes; controls were not exposed. Lysates of prefrontal cortical and subcortical white matter from the animals were evaluated for changes in nAChRα7 (the nicotinic acetylcholine receptor α7 subunit) and GSK3β using Western Blot. Band densities were quantitated using Image Studio, and the values subsequently analyzed by ANOVA followed by a Tukey post-hoc test. All statistical analysis was performed using GraphPad Prism 8, and $p < 0.05$ is considered statistically significant.

Results:

Significant differences in nAChRα7 expression were observed between control wild-type vs control transgenic females (1.0596 ± 0.02 vs 1.5017 ±0.077; p≤0.01) and control transgenic males vs control transgenic females (1.5017±0.0773 vs 0.9043 ±0.0084; p≤0.01). Similarly, significant differences were detected in pGSK3β/GSK3β expression in nicotine-free control male rats vs nicotine-free transgenic males (0.7876± 0.249 vs 0.5820 ± 0.066; p≤0.05) and nicotine-free control females vs nicotine-free transgenic females (0.2872±0.046 vs 0.6565 ±0.1659; p≤0.01) and cigarette-exposed wild-type females vs transgenic females (0.412±0.104 vs 0.974 ±0.074; p≤0.05).

Conclusion:

These findings demonstrate genotype and sex-specific expression and activation of nAChRα7, which is expressed by astrocytes and microglia, and GSK3β. These proteins mediate cellular responses to nicotine and proliferative, inflammatory, and neurotoxic responses induced by regular cigarettes and their non-nicotine constituents. Therefore, our data suggest that nAChRα7 and GSK3 may play a role in the development of neuroinflammation and neurocognitive impairment in HIV-infected persons.

P-20

Effect of endogenous modulators of ASIC1a on acidosis-mediated neuronal injury

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Mentor: Zhigang Xiong MD, PhD
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Background/Significance:

Acidosis is a common feature of ischemic brain. Acid-sensing ion channels (ASICs) are proton-gated and voltage-independent cation channels demonstrated to play an important role in ischemic brain injury. ASIC1a channels are enriched in brain neurons and respond to acidic pH by mediating an inward current resulting in membrane depolarization. A threshold pH for ASIC1a activation is ~7.0, and the pH for half maximal activation is ~6.4. In addition to Na+, homomeric ASIC1a channels are permeable to Ca2+. These properties however may be altered by the presence of endogenous modulators.

Previous studies from our lab and others have demonstrated that endogenous modulators, including lactate and arachidonic acid, influence ASIC-mediated currents. However, it is largely unknown whether and how these modulators affect the outcome of acidosis-mediated neuronal injury. The objective of this study is to investigate the effects and detailed mechanisms of how arachidonic acid and lactate affect acidosis-mediated neuronal injury.

Methods:

Patch clamp will be used to determine how each modulator affects ASIC1a current amplitude and kinetics at acidic pH values relevant to brain ischemia. Cell viability assays and fluorescence imaging techniques will be used to determine the effects of these modulators on acidosis-mediated neuronal injury. Western blot will also be used to determine whether arachidonic acid and lactate increase surface trafficking of ASIC1a proteins.

Results:

It is expected that addition of arachidonic acid and lactate will potentiate ASIC1a currents in neurons and acidosis-mediated neuronal injury.

Acknowledgment of Funding: Mechanism of ASIC-mediated Neuronal Injury, NIH R01 Grant

P-21

The Effects of Low-Level Lead Exposure on the Integrity and Function of Human Brain Microvascular Endothelial Tissue

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Background/Significance:

The blood-brain barrier (BBB) serves to regulate the passage of harmful hydrophobic compounds to and from the neural parenchyma, playing a critical role in neural development and overall homeostasis (Weksler et al, 2005). During development, the BBB is particularly vulnerable to harmful substances. One well-documented harmful substance is lead. Used since antiquity, lead is a potent neurotoxin that has proven to induce a variety of harmful effects on the health and well-being of children, adults, and the elderly (Rocha and Trujillo, 2019). Of particular interest are the effects that high and low-level amounts of lead have in developing infants and children. Though the effects of lead are well documented at blood-lead levels (BPb) >10 ug/dL, recent studies suggest adverse effects occur at levels <5 ug/dL, which is the current threshold for action as determined by the Centers for Disease Control (Rocha and Trujillo, 2019; Sanders et. al., 2009). Previous studies have shown that lead is preferentially accumulated by brain endothelia resulting in a loss of normal barrier function (Goldstein, 1990). The highly restrictive permeability of the BBB results from the expression and successful function of several multidrug resistance proteins of the ATP binding cassette (ABC) transporter family that function as nonselective drug export pumps (Weksler, 2005). Inserted in the luminal cell membrane of brain endothelial cells, MDR1 (also known as P-gp) and BCRP efflux proteins constitute the first line of defense against substrate penetration (Weksler, 2005). For this reason, the detection and quantification of these proteins will be used as a proxy for measuring the function of the BBB, as these proteins greatly contribute to the BBB's selectivity. Few studies have examined the effects of low-level lead exposure on the BBB. We hypothesize that exposure to physiologically relevant concentrations of lead will result in a dose-dependent decrease in the viability and expression of MDR1 and BCPR in brain vascular endothelial cells.

Methods:

The hCMEC/D3 cell line was used as an in vitro model for human brain microvascular endothelial tissue due to its stability, full characterization, and expression of BBB-specific properties (Weksler et. Al., 2005). We will perform a dose-response using physiologically relevant concentrations of lead <5 ug/dL [0 uM (0 ug/dL), 0.048 uM (1 ug/dL), 0.097 uM (2 ug/dL), and 0.140 uM (3 ug/dL), 0.190 uM (4 ug/dL), 0.240 uM (5 ug/dL)] to assess hCMEC/D3 changes in cell viability using trypan blue exclusion. Changes in cellular function will be measured using ELISA to assess changes in MDR1 and BCRP protein expression.

Expected Results:

We expect to see a dose-dependent decrease in cell viability and protein expression of MDR1 and BCRP in hCMEC/D3 exposed to low levels of Pb.

Conclusions and Implications:

These findings suggest that low-level concentrations of Pb can affect the integrity and function of human brain microvascular endothelial tissue. The effects of low-level lead exposure on the BBB have not been extensively studied nor characterized, making this research a possible preliminary step towards the further characterization of the effects of low-level lead exposure and identification of a new biomarker for low-level lead exposure.

Acknowledgment of Funding: This study was supported in part by the National Institutes of Health Grant U54MD007602.

P-22

Medicinal Cannabis and Older Health Disparity Populations: What's the Deal?

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Background/Significance:

Medicinal cannabis is an emerging industry, both in the United States and globally. Few studies have examined medicinal cannabis use among those 65 years of age and older. The literature is further limited when discussing older adults falling within health disparity population groups. The Kessler Foundation and Morehouse School of Medicine are committed to advancing research on medicinal cannabis in underserved communities. This partnership represents the initial phase of a wide-scaled interdisciplinary initiative to establish a Natural Products Research Center. The purpose of this study is to identify and characterize studies related to the perceptions, attitudes, experiences, knowledge, and effectiveness of medicinal cannabis among older populations as well as the interventions used.

Methods:

Using the recommendations from the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, we are conducting a nine-month, systematic review of the existing peer-reviewed and grey literature to further characterize the study population and to identify barriers and facilitators, and evaluate interventions, as reported in studies published globally between 1 January 1996 and 31 May 2020.

Results:

Preliminary findings suggest that the older adults would like to be provided with better educational resources to learn about the therapeutic aspects of cannabis. Additionally, a highlighted barrier for medicinal cannabis use was the lack of support from physicians to facilitate access.

Conclusions/Implications:

The current literature is limited in the health disparity research related to medicinal cannabis in the 65 and older population, therefore there more research needs to be targeted towards this group. Findings of this study will serve as a basis to inform evidence-based medicinal cannabis research in this study population.

Acknowledgement of Funding: Kessler Foundation, Morehouse School of Medicine Summer Scholars in the Community (SSiC) Program, Health Careers Opportunity Program (HCOP).

P-23

Using a Community Needs Assessment to Identify Health Intervention Priorities within the Paul L. Dunbar Elementary School Community

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Background/Significance:

Paul L. Dunbar (Dunbar) Elementary school is located in Mechanicsville, Georgia where according to OASIS (2019) the quality of life is rated well below average. Dunbar and Morehouse School of Medicine (MSM) are partners to work on addressing the health needs of the Dunbar community through the MD1 Community Health Course. MSM students conducted a community needs assessment in fall, 2020. The purpose of this paper is to detail the findings of the needs assessment and outline possible health interventions moving forward.

Methods:

MSM students conducted a community needs assessment throughout fall, 2020 to understand Dunbar's health needs. This included windshield surveys, key informant interviews with faculty and staff, focus groups with the kids, and attending community meetings such as the Atlanta Public Schools meeting and NPU-V meeting. In addition, MSM students met with Dunbar 2nd and 3rd graders over ZOOM once each week and engaged in activities including stretching exercises, freeze dance, iSPY, reading, origami, etc.

Results:

Five main thematic areas emerged as a result of the windshield survey, key informant interviews, and focus group: academic help, mental health, nutrition, technology, and, foreign language assistance. Challenges experienced with COVID-19 and the virtual learning environment heightened the request for academic help in all areas. The student focus group had a 50/50 split between students being happy and others being sad. Additionally, there were numerous challenges expressed about technological needs and unstable Wi-Fi. Yet, 55% of key informant interviewees expressed having strong "community support" with strong partnerships and community outreach which help them assist families.

Conclusions and Implications:

Conducting a community needs assessment is pivotal for identifying the specific social determinants of health impacting a community. Based on the findings from the needs assessment, possible future community health interventions include: partnering with internet service providers to advocate for increasing the number Wi-Fi hotspots for better internet access; implementing 1-on-1 virtual Zoom sessions with kids struggling with school work; teaching adaptive coping strategies, meditation and deep breathing exercises to help with stress and managing emotions. Prioritization of interventions will be determined by the Dunbar community.

P-24

An Assessment of Opportunities and Threats to Community Health and Well-Being in NPU-T

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Faculty Mentors: Beverly Taylor MD, MPH
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Background/Significance:

Neighborhood Planning Unit T (NPU-T), like many predominantly African American communities in Georgia is faced with many threats to health equity. While NPU-T has above-average levels of cardiovascular disease, cancer, strokes, and infant mortality rates, this community also has awareness, support, and dedication among its' members. The purpose of this assessment was to: solicit community perspective on the most pressing health-related, community-level concerns; and, in collaboration with the John Hope Community Center (JHCC), develop community initiatives to improve the overall health of the residents despite the restrictions posed by the COVID-19 pandemic.

Methods:

Our primary data sources included: Google Maps and other public databases; a windshield survey of NPU-T; six key informant interviews with community educators, religious leaders, and parents; and a focus group. The key themes that were the emphasis of our qualitative analyses were: food/nutrition, mental health, and youth advocacy. We also performed a SWOT analysis using our qualitative and quantitative data. Lastly, we designed and facilitated a curriculum of service-learning engagement activities with students at JHCC in Gardening, Health and science, Robotics, and Art and movement.

Results:

Participants identified gentrification, inattention to mental health services, and food insecurity as the greatest risks to the overall health of community members in NPU-T. Gentrification was also evident during windshield survey data collection. Residents also noted that although new infrastructure is continuously being built, there has not been a commensurate investment in providing additional grocery stores, psychiatric/mental health services, or affordable housing. Schools, churches, and community centers within the area are attempting to address this by empowering and investing in their students and residents as much as their resources permit.

Conclusions and Implications:

Our assessment revealed that NPU-T is not in immediate health danger due to the presence of necessary resources for good health including transportation, food, hospitals, and green spaces. Our recommendations for community-level interventions include: a community members exercise program. We believe that these types of programs will be beneficial to resident health.

P-25

The Effect of Paclitaxel & Fisetin Treatment on Platinum-Resistant Ovarian Cancer

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Background/Significance:

Ovarian Cancer (OvCa) ranks fifth in cancer deaths among women in the United States, accounting for more than any other cancer in a female reproductive system. Although several types of OvCa, High-grade Serous Ovarian Cancer (HGSOC) is the most common, usually diagnosed at an advanced stage. The standard treatment of OvCa includes tumor debulking surgery and intravenous platinum-based chemotherapy. The chemotherapeutic drug, Paclitaxel, is a front-line agent for OvCa treatment. However, numerous patients either succumb to the disease or undergo relapse due to drug or therapy resistance, such as platinum resistance. Thus, combining therapies using the bioactive natural compound with anti-cancer potential can augment efficacy and overcome adaptive resistance. In particular, Fisetin, a flavonoid found in various fruits and vegetables, are safe, cost-effective, has multifaceted chemopreventive potential. In this study, we investigated whether Fisetin can reinforce the effect of paclitaxel on OvCa cells.

Methods:

The human OvCa cell lines (TOV-112D and OVCAR-3) were grown in RPMI-1640 media supplemented with 10% fetal bovine serum (FBS) and maintained 37°C and 5% CO2 incubator. Cell proliferation was estimated by MTT assay with varying concentrations of Fisetin, Paclitaxel, and a combination for different time intervals (24, 48, and 72h). The Live/Dead cell assay was performed using a cell viability imaging solution. Further, the expression of pro-, anti-, and apoptotic markers was detected by qRT-PCR and western blots.

Results:

The cell viability assay determined the optimal IC50 values of Fisetin, Paclitaxel, and a combination of both drugs in TOV-112D, and OVCAR-3 cells, respectively, at 48h. The live /dead cell assay determined Fisetin's effectiveness; dead nuclei were found more within the cells treated by IC50 values of a combination than Fisetin or Paclitaxel alone. Moreover, combination-treated cells from both cell lines resulted in the upregulation of pro- (BAK, BID) and apoptotic (PARP and Caspase-3) markers, which, in turn, downregulates the expression of anti-apoptotic (BCL-XL and MCL1) markers at both RNA and protein level. Altogether, Fisetin and Paclitaxel's combined treatment induces significantly higher apoptosis than the individual treated group alone.

Conclusions and implications:

Our results suggest that Fisetin and Paclitaxel's combination treatment can be a potential agent in augmenting efficacy and overcoming adaptive platinum-resistant therapy. These findings highlight the promising role of natural bioactive compounds and provide the rationale for further transitional research.

Acknowledgment of Funding: This work was supported by the National Institute of Health [Award Numbers SC1CA193758; U54CA118638]; and from the Department of Defense [Award Number W81XWH1810429].

P-26

Functional Identification of Senegalese Herb Used to Treat HIV-1 Infection

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Background/Significance:

Current treatment for HIV requires lifelong use of expensive drugs that can lead to drug resistance and toxin accumulation in the body. Our lab has been studying a minimally toxic, short-term herbal treatment used to treat HIV by traditional Senegalese healers. Traditional healers have been using this herb for many years to treat HIV patients; however, very little is known about the active agent. The purpose of this analysis was to characterize the active agent, a 30kD protein termed MoMo30, by determining its heat stability.

Methods:

Analyses were conducted by heating the active agent to varying temperatures of 40ºC, 60ºC, 80ºC, 100ºC, and autoclaving. Unheated MoMo30 was used as a control to compare against heated samples. An HIV infectivity assay was conducted to determine the effect of heat on the antiviral activity of MoMo30. The infectivity assay involved infecting MAGI cells with NL4-3 HIV and treating them with one of the varying heated or unheated samples of MoMo30. MoMo30 was added in 1:1, 1:10, and 1:100 dilutions. Cell culture incubated for 48 hours. Infected cells were visualized using β-galactosidase staining, then counted. ANOVA analysis was used to compare the antiviral activity of unheated MoMo30 with heated MoMo30.

Results:

For each dilution, the antiviral activity of unheated MoMo30 was not significantly different from that of all heated MoMo30 samples.

Conclusions and Implications:

The findings of this study suggest that MoMo30 is very heat stable. Even after autoclaving, MoMo30 still retains full antiviral activity. The unyielding nature of the protein provides insight into the structure and amino acid composition of MoMo30. Further research is needed to develop a complete profile of this protein.

Acknowledgment of Funding: African Herbal Treatment 100018-222001-21 Institutional Funds

P-27

Examining the association between PTSD and depression in people with epilepsy

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Mentor: Rakale Quarells, PhD
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Background/Significance:

Epilepsy is a condition diagnosed by the occurrence of 2 or more unprovoked seizures. Events such as seizures and/or community violence on the basis of racial discrimination are events that could lead to Post Traumatic Stress Disorder (PTSD) in Black adults with epilepsy. Previous studies have shown a link between PTSD and depression. However, this link has not been confirmed in people with epilepsy. Therefore, the purpose of this study is to examine the relationship between PTSD and depression in people with epilepsy.

Methods:

A total of 82 people with epilepsy participated in a cross-sectional survey completed as part of the Project UPLIFT study. The PTSD-8 and Patient Health Questionnaire-9 (PHQ-9) were used to measure the key variables of PTSD and depression. Descriptive and linear regression analyses were conducted to examine the relationship between PTSD and depression.

Results:

The study included 82 adults (69.5% women and 30.5% men) who self-identified as Black/African American. Ages included in the study were from 19-64 years. Participants had an educational range of never attending school to graduate school and beyond with a majority of participants having a high school diploma or more (87%). The score range for the PTSD-8 measure is 8-30 and the mean score reported was 17.7. Depression score ranges from 0-27 and the mean score reported was 9.9. Although 32.9% of participants had moderate depression, 46.3% of participants reported mild and minimal depression levels. The linear regression analysis was significant with an ($R2 = .20$; $p = .00$). This finding demonstrates that increases in PTSD was significantly associated with increases in depressive symptoms.

Conclusions and Implications:

It can perhaps be inferred that as depression is treated, PTSD will also be addressed. Project UPLIFT was found to successfully lower depression in people with epilepsy and may be effective at addressing PTSD in this population. Future studies should examine Project UPLIFT and people with PTSD.

Acknowledgement of Funding: This work was funded in part by the CDC #U48DP005042 [SIP 14-007]

P-28

A Pediatric Community Health Needs Assessment to Optimize Resources and Address Identified Community Needs in Thomaston, GA

Authors: Nikki Jones 1, Kirat Sandhu 1, Sothivin Lanh 1, Kristin Johnson 2

1. Morehouse School of Medicine Doctor of Medicine Program, 2. Kristin Johnson of Ross University School of Medicine Doctor of Medicine Program

Mentor: Ali Gemma, MPH, National Medical Fellowships

Background/Significance: Health outcomes in the United States can differ based on geographic location. The health service infrastructure, health service utilization, health status and access to care can be impacted by location which can create disparities distributed between cities and rural areas. Georgia is one of the many states that displays this disproportion in health disparities between the thriving metropolitan areas of the state and the rural communities of GA. Thomaston is a city located in Upson County, GA which is designated by the Federal Office of Rural Health Policy as rural at 46.91% of the county population. Additionally, 22.3 % of the total Upson County population are children under the age of 18 with 31% of those children living in poverty. Social determinants of health such as economic stability, neighborhood and physical environment, education and healthcare systems have an impact on health outcomes. Upstream prevention by addressing social determinants of health early on in a child or adolescent's life is of vital importance since it shapes an individual's long-term health trajectory and can shift the culture and health outcomes of an entire community.

Methods: A total of 6 community key informants participated in the study and were asked a set of 15 questions to gain insight on the critical needs and concerns for children and adolescent health and quality of health, community resources and assets, recent changes in the community, the strengths and weaknesses of the community along with difference in quality of health among different groups within the community. The Robert Wood Johnson Foundation and the University of Wisconsin Population Health Institute's 2019 County Health Rankings & Roadmaps program's online database was used to analyze community health indicators. Additional indicators were included from the Rural Health Information Hub for Georgia and the Annie E. Casey Foundation's Kids Count data center project.

Results: The needs of the pediatric population were identified and discussed with the most prevalent concerns being poverty, lack of mental health services, substance abuse, lack of health education, high teen birth rates, increase in children in foster care along with a lack of resident knowledge on how to access and utilize community resources. The social determinants of health that contributed to these health disparities were economic instability, neighborhood location, education, community and social context as well as the health care system in rural GA. The identified resources and community assets were the internal and external non-profit community service organizations, Upson County Medical Center, the Georgia Department of Public Health, Zoe Pediatrics, Upson County Community Service Board, Southern Crescent Technical College, the Upson County Chamber of Commerce, the Thomaston Police Department's Champs program, the Heritage Pregnancy and Family Health Center, Thomaston-Upson County School District.

Conclusions and Implications: Thomaston, a rural community in GA has sustained disparities in health outcomes due to social determinants of health including access to medical care, geographic location and economic stability. The Pediatric Community Health Needs Assessment (PCHNA) provided insight on the critical needs and concerns for children and adolescent's along with community organizations which can address these issues. Investments in early health care that supports brain and child development have documented high near-term returns in the form of increased school readiness, reduced special education, and reduced costs for grade retention and English language learning. They also generate long-term returns through higher graduation rates, greater employment and increased lifetime job earnings. All of these add up to a more productive workforce, a stronger economy and higher business profits. Thomaston has a wealth of support from longstanding members in the community as well as both in-house and external organizations willing to provide assistance. The issue lies in the residents becoming informed on how to access and utilize these given resources. The programs and initiatives identified in the PCHNA can enhance the quality of health and health care for children and families in the community through enhanced partnerships to improve visibility of these programs as well as access and use resulting in lasting sustainable relationships within the community.

Acknowledgment of Funding: Aetna/NMF Rural Health Scholars Program at Morehouse School of Medicine

P-29

Qualitative assessment of community needs of Educare Atlanta and surrounding Mechanicsville neighborhood during global COVID-19 pandemic

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Mentors: David Levine, MD, Elleen Yancey, PhD
Morehouse School of Medicine

Background/Significance:

Educare Atlanta connects children and families to a quality education beginning from birth to fifth grade. The school primarily serves low-income young children and families in Atlanta's Mechanicsville neighborhood. It also focuses on strong community partnerships to offer programs and services, such as professional development and family engagement, that build parents' skills and confidence. The purpose of this analysis was to assess the impact of COVID-19 on Educare Atlanta and the immediate community. Also, to see how various social determinants of health changed in the surrounding area of Mechanicsville in response to COVID-19.

Methods:

Information was pulled from a windshield survey, key informant interviews, community engagement events, NPU V meetings, and cross-analysis data sets. The windshield survey involved researchers driving around the city of Mechanicsville, learning more about the community by observing the community's available resources, demographics, landscaping, and boundaries. Community members were able to provide vital information through various key informant interviews. Interviews were conducted with consenting adults who hold influential roles in the community via email, Zoom, and phone call due to COVID-19. Researchers met members of Educare through community engagement events while bringing awareness to breast cancer. A focus group was set up to interview a larger population of teachers and parents, but no participants attended.

Results:

Educare Atlanta and the Mechanicsville community face several threats despite adapting to the COVID-19 pandemic. Interviews reveal ongoing gentrification and worsening relationships with local law enforcement. A lack of healthcare access and food desert classification continues to serve as vulnerability sources within the community. Decreased parent-teacher interactions due to the inability for outsiders to enter the building. Increasing difficulty in keeping students engaged in virtual course work and decreased parental abilities in providing equal learning opportunities.

Conclusions and Implications:

Our group findings indicated that the stress of achieving basic needs had been heightened by the introduction of COVID-19 to the world. It also led us to discuss several possible interventions. One, reconnecting with the existing relationship to the Atlanta food bank and developing distribution ideas outdoors as we could not enter the Educare building. Two community education ideas were also discussed – chronic illnesses that disproportionately affect African Americans and other ethnic minorities and community education on all things related to the COVID-19 pandemic. Three increased community engagement between Educare Atlanta and Morehouse School of Medicine through possible events. It is hoped that this study will bring awareness to the government and other professional agencies about where to focus their energies during a pandemic.

P-30

Bradykinin receptor subtype 1 (BDKRB1) gene co-expression and correlation with multiple myeloma progression.

Authors: Olayinka Adebayo 1; Eric Dammer2; Tiara Griffins1; Lawrence Boise3; Rajesh Singh1; Sanjay Jain 1; and James W. Lillard Jr.1

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Mentor: James W. Lillard, Ph.D., MBA
Department of Microbiology, Biochemistry, and Immunology

Background / Significance:

There is a gap in our understanding of the molecular mechanisms behind the chemoresistance seen in early multiple myeloma (MM) patients who receive standard treatment (i.e. Lenalidomide/revlimid, Bortezomib/velcade, and Dexamethasone (RVD)). The reason for the relatively high percentage of patients that progress after early RVD treatment is unknown. Therefore, the identification of clinically relevant clusters of co-expressed genes or biomarkers for MM progression in patients on RVD treatment would help identify novel mechanisms, drug targets, and prognostic markers.

Methods:

In this project, we employed a transcriptomic analysis approach to identify hub genes that correlate with MM progression and RVD chemoresistance. One of the most significantly expressed hub genes identified was the bradykinin receptor B1 (BDKRB1) gene, a G protein-coupled receptor. BDKRB1-signaling has been demonstrated in cell adhesion, signal transduction, and calcium flux, all of which can promote MM progression. The specific role of BDKRB1 in MM is undefined; therefore, an understanding of the molecular mechanisms mediated by BDKRB1 interactions in MM patients is urgently needed. To this end, we investigated the gene expression profiles and their correlation with MM clinical outcomes, using a novel weighted gene network co-expression analysis (WGCNA) method.

Results:

WGCNA constructed 21 modules using the MMRF COMMpass dataset (n = 175) based on gene co-expression correlations between RVD treatment and age at diagnosis and/or death. The grey60 module contained BDKRB1 and 247 other upregulated co-expressed genes, which were significantly and positively correlated ($p < 9.7E-07$, $R2 = 0.38$) with MM progression following initial RVD treatment. The top biological processes associated with this module include the G protein-coupled receptor protein signaling pathway, calcium influx, inflammatory response, regulation of growth, and biological adhesion. Notably, gene expression driven by NF-Kβ is known to be activated by the bradykinin-BDKRB1 signaling axis, which significantly correlates with the lethal molecular subset of MM, MM proliferation and patient survival. The receiver operator characteristic (ROC) curve analysis predicted BDKRB1 as a statistically significant biomarker for MM progression (p-values=0.00016).

Conclusions and Implications:

Our preliminary studies showed BDKRB1-signaling networks are significantly co-expressed and associated with MM progression. This is the first study to identify BDKRB1-associated gene networks and analyze their potential impact on MM progression. BDKRB1 is highly expressed in African Americans. AA is known to be 3 to 4-fold more likely to develop MM. Hence, the completion of my projects may shed new light on the impact of bradykinin-BDKRB1 signaling in MM progression, and RVD chemoresistance, and MM health disparities.

Acknowledgment of Funding: Pilot Project Award from MSM/Tuskegee University/UAB Cancer Center Partnership grant 5U54CA118638 and P30CA138292

P-31

TRPM7 is a potential prognostic factor in malignant glioma and is associated with glioma stem cell (GSC) markers

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Mentor: Mingli Liu M.D., Ph.D., MSCR
Morehouse School of Medicine

Background/Significance: Glioblastomas are a particularly belligerent type of glioma, a glial tissue malignant tumor in the nervous system, and are also the most abundant form of malignant gliomas, with as many as 10,000 new diagnosis of this disease annually. These heterogenous tumors can be categorized into four distinct types: mesenchymal, classical, proneural, and neural, with respect to their transcriptional profile. Transient receptor potential melastatin-related-7 (TRPM7) encodes a Ca2+ permeable nonselective cation channel fused with serine/threonine kinase at its carboxyl terminus. Our group found that the suppression of TRPM7 channels inhibited proliferation, migration, and invasion of malignant human gliomas, indicating that TRPM7 channels may represent a novel and promising target for therapeutic intervention of malignant glioma. Particularly, our group found that TRPM7 channels regulate glioma stem cells (GSC) growth/proliferation through STAT3 and Notch signaling pathways. The bioinformatics analysis from TCGA data showed a high TRPM7 mRNA expression is an unfavorable prognostic biomarker of overall survival (OS). Hence, we will test the hypothesis that TRPM7 protein expression is a potential prognostic marker for glioma patient outcome.

Methods: 1) We examined TRPM7 protein expression by immunohistochemical analysis (IHC) in a glioma brain tissue microarray (TMA) made from Chinese patients at BioCoreUSA (http://biocoreusa.com, Germantown, MD). 2) The expression of TRPM7 was determined using IHC. Immunostaining was performed using a rabbit TRPM7 primary antibody (Abcam). Non-specific reactivity of the secondary antibody was examined by controls without primary antibody and by replacing the primary antibody with premium rabbit IgG. 3) The GSC marker ALDH1 was evaluated and compared to TRPM7. 4) The staining intensity of cells in TMA was evaluated as negative or positive in three different bright field (≥100 cells/field). Semi-quantitative HSCORE was calculated for TRPM7 using the following equation: HSCORF=∑pi (i+1) where "I" is the intensity with a value of 0, 1, 2, or 3 (negative, weak, moderate or strong, respectively) and "pi" is the percentage of stained cells for each intensity. 5) One-way ANOVA was used to analyze TRPM7 expression between normal and glioma patients. Pearson correlation analysis was performed to determine possible correlation between the level of TRPM7 and ALDH1.

Results: 1) TRPM7 and ALDH1 protein were expressed in both astrocytoma and GBM tissues and weres located either on membranes or inside the cytoplasm or nucleus. Little to no staining was found in normal brain tissues. 2a): Quantification of the IHC results showed that TRPM7's positive nuclear staining was significantly higher in GBM (n=12, p=0.0398) compared to that of normal brain (n=10). Similarly, TRPM7's cytoplasm positive staining in GBM (p=0.0016), grade III astrocytoma (p=0.0047) and grade II astrocytoma (p=0.0017) was significantly higher than that of normal brain tissue. 2b): Next, we compared TRPM7's expression in different grades of glioma. We found that TRPM7's nuclear staining significantly increased in GBM (p=2.1600E-05) compared to that in grade II astrocytoma (p=0.0207), while TRPM7's cytoplasmic staining was significantly increased in GBM than that of grade II (p=0.0321).3a) Quantification of the IHC results showed that ALDH1 positive nuclear staining marginally increased in GBM (n=12, p=0.0511) than that of normal brain (n=8). ALDH1's cytoplasm positive staining in GBM (p=5.3063E-06) and grade III astrocytoma (p=0.0325) was significantly higher than that of normal brain tissue. 3b) Among different grades of glioma, we found that ALDH1's nuclear staining did not differ in glioma brain tissue compared to normal controls. However, ALDH1's cytoplasmic staining was significantly increased in GBM than that of grade III astrocytoma (p=2.1600E-05) and grade II astrocytoma(p=1.2300E-09). 4) By Pearson correlation analysis, a clearly direct correlation was observed between TRPM7 and ALDH1 for nuclear and cytoplasmic staining.

Conclusions: 1) The positive correlation between increased TRPM7 protein expression and glioma grade strongly indicates TRPM7's potential as a prognostic marker in glioma patients. 2) TRPM7 may directly or indirectly regulates the GSC marker ALDH1 in glioma.

Acknowledgement of Funding: This study was supported by NIH/NIGMS GM121230 and MSM Tx Pilot award.

P-32

Factors associated with the use of complementary and alternative therapies among patients with hypertension and type 2 diabetes mellitus in Western Jamaica: a cross-sectional study

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Mentor: Pauline E. Jolly, PhD

Background:

This study examined the prevalence and predictors of complementary and alternative medicine use among clinic patients with hypertension and/or type 2 diabetes mellitus in western Jamaica.

Methods:

A cross-sectional study using an investigator-administered questionnaire was conducted from May to August 2017. Data on sociodemographic factors, complementary and alternative medicine use, and knowledge and perceptions of complementary and alternative medicine were collected from the patients. Multivariable logistic regression analysis was used to examine associations between patient characteristics and knowledge and perceptions of complementary and alternative medicine and complementary and alternative medicine use.

Results:

A total of 362 patients were invited to participate and 345 (95.3%) completed the questionnaire; 311 (90.1%) had hypertension, 130 (37.7%) had type 2 diabetes mellitus and 96 (27.8%) had both diseases. Seventy-nine percent of the participants with hypertension and 65% with type 2 diabetes mellitus reported current use of complementary and alternative medicine. Self-reported knowledge of complementary and alternative medicine (none/poor vs average/good/excellent) was significantly associated with complementary and alternative medicine use for hypertension (AOR = 0.33, 95% CI = 0.13–0.87) and type 2 diabetes mellitus (AOR = 0.06, 95% CI = 0.01–0.37).

Conclusions:

Participants' perceptions of their knowledge and beliefs regarding complementary and alternative medicine strongly influence their use of complementary and alternative medicine. These findings can be used in designing educational interventions to promote the proper use, and mitigate detrimental effects, of complementary and alternative medicine in this population.

Acknowledgment of Funding: Minority Health International Research Training grant no. T37-MD001448

P-33

The Role of Nutrition in Cancer Prevention

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Mentor: Garfield Beckford, PhD
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Background/Significance:

Globally, cancer is the second leading cause of death and is responsible for one in six deaths. While only 5-10% of cancer is caused by inherited mutated genes, 90% of cancer is caused by genetic mutations by exposures, including environmental and occupational exposures as well as exposure to ultraviolet radiation from the sun. The most common risk factors of developing cancer include obesity and lack of physical activity. Approximately 30-40% of the most common cancers are preventable by dietary change and moderate physical activity.

Methods:

Norat et al. investigated the risk of colorectal cancer, by measuring the diets of 478,040 European men and women, who were cancer-free at the beginning of the study (1992-1998). After 4.8 years, a follow-up evaluation was recorded. Age, weight, height, fiber, folate, smoking, diet, and physical activity were taken into account. Willet's methods included dietary assessments, case-control studies, and cohort data.

Results:

After 4.8 years, 1329 subjects obtained colorectal cancer. 95% underwent histological verification; 855 colon cancers were detected, and 474 rectum cancers were detected. Intake of red and processed meat and colorectal cancer show a positive correlation (highest [>160 g/day] versus lowest [<20 g/day] intake, HR = 1.35, 95% CI = 0.96 to 1.88, while showing a negative correlation between fish and colorectal cancer (>80 g/day versus <10 g/day, HR = 0.69, 95 % CI = 0.54 to 0.88. In analysis of subgroups of red meat, colorectal cancer risk was significantly related to the intake of pork (for highest versus lowest intake, HR = 1.18, 95% CI = 0.95 to 1.48) and lamb (HR = 1.22, 95% CI = 0.96 to 1.55) but insignificantly associated with beef/veal (HR = 1.03, 95% CI = 0.86 to 1.24). Also, no less than 20% and no more than 42% of cancers can be avoided by dietary change. Relying mostly on case-control and cohort data, Willett roughly estimated that about 32% of several types of cancers are avoidable by diet.

Conclusions and Implications:

The risk of developing cancer can greatly be prevented by dietary change. The research proved that the consumption of red and processed meat significantly increases the risk of colorectal cancer. These risks can significantly decrease by limiting the consumption of red and processed meat and replacing it with fish instead.

Acknowledgment of Funding: This project was supported in part by GA-AL LSAMP (HRD-1305041 and 1826797) funded by the National Science Foundation (NSF).

P-34

Parental Perspectives Regarding The Impact Of The COVID-19 Pandemic On Their Children

Authors: Shriya Tanti1, Athena Mckay2, Theresa Kowalski-Dobson2, Susan Woolford2 along with MICHR - Community Engagement Program Aim II Committee

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Background/Significance:

The COVID-19 pandemic is rapidly evolving and has affected millions across the globe. Whether due to the infection itself or the lockdown, the pandemic has had a wide impact on families. In particular, it may have affected the physical activity, food intake, and non-academic screen time in many children, all of which serve as factors that can contribute to excess weight and overall health.

Methods:

A 40-item survey was developed and administered via Qualtrics to a convince sample of parents in Michigan with children age 17 and under living in their homes. Respondents were asked to report changes in outdoor playtime, physical activity, non-academic screen time, fruit/vegetable intake and processed food intake for their children. Parents were also asked to report household demographics and the age, height, and weight for their children in order calculate BMI percentiles.

Results:

Our ongoing analysis reflects data from 1313 respondents which represent 2,469 children. Fruit/vegetable intake (23%), physical activity levels (53%), and outdoor playtime (42%) were reported to decrease while processed food intake (36%) and recreational screentime (78%) increased. These factors significantly differ with household income and education level, weight status, and the age of the child.

Conclusion:

Our preliminary results indicate that these changes can lead to excess weight and increased obesity prevalence among children. Specifically, these changes seem to be the most drastic when compared to household income. The majority of our respondents live in a well-developed, affluent area in South Michigan. However, families living in that same area, with a household income >$50,000 seem to be the most impacted by the pandemic. These findings suggest that resource allocation strategies should not only focus on areas with great disparities but should also consider household income, regardless of zip code, to effectively address a myriad of challenges faced by families all over the country.

P-35

Avascular Necrosis of the Femoral Head in Patients with Sickle Cell Disease: A Scoping Review

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Mentor: Coleen Sabatini, MD

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Background:

Avascular necrosis (AVN) of the femoral head is likely caused by an ischemic event to the proximal femoral blood supply that can result in femoral head collapse and hip joint destruction. Certain medical conditions such as Sickle Cell Disease (SCD) have been shown to be associated with avascular necrosis. To date, there has not been an extensive review of the available literature on AVN of the femoral head that is associated with SCD. The aim of this study is to conduct a comprehensive review of the literature to map the available evidence on the epidemiology, diagnostic imaging, laboratory evaluations, treatment outcomes, and identify knowledge gaps in AVN of femoral head secondary to SCD.

Methods:

We conducted a scoping review using the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR). A combination of the medical subject headings (MeSH) terms and relevant words in the title or abstract were identified to four major bibliographic databases: PubMed, EMBASE, Scopus, and African Journals Online. The systematic review software, DistillerSR, was used to configure and manage available materials for the scoping review. Three levels of screening were utilized for our review: title and abstract review, full-text review for inclusion eligibility, full-text review for data extraction. The data and analyses from articles which passed all levels of screening will be included in the final scoping review analysis.

Results:

We identified 1205 records through database searching. After removing duplicates using DistillerSR software, two reviewers (CS, TE) individually reviewed the title and abstract of 565 records. Conflicts were solved by consensus and discussion. 326 records were excluded, and the remaining 239 full-text records are currently being assessed for inclusion eligibility. Our next step will be completing the full-text review for data extraction. Extracted data will be analyzed and summarized in the final manuscript, which will be divided into categories of epidemiology, diagnostic imaging, laboratory evaluations, and treatment outcomes.

P-36

Effects of Cimetidine on Lead Induced Neurotoxicity in SH-SY5Y Cells

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Mentor: Kennie Shepherd, PhD

Morehouse School of Medicine

Background/ Significance:

Lead (Pb) a naturally occurring element, has been demonstrated to be an occupational toxin as well as a ubiquitous environmental toxicant. Despite various preventative measures to reduce Pb accumulation and release in the environment, Pb exposure remains a public health problem. Pb induced toxicity has been demonstrated to be associated with oxidative stress. Although extensive research has addressed Pb induced toxicity, therapies to alleviate Pb induced toxicity are limited and have very serious side effects. Organic Cation Transporters (OCT's) have been demonstrated to be a target of toxicants, including metals. The present study examines the effects of cimetidine (a pan-inhibitor of OCT's) on Pb-induced neurotoxicity.

Methods:

First, Pb effects on reactive oxygen species (ROS) production will be assessed in the presence of cimetidine using the Fluorescein Marker (H2DCFDA). We will assess the effects of Pb on glutathione peroxidase activity, and glutathione levels, in the presence of cimetidine. We will assess the effects of Pb on mitochondria function in the presence of cimetidine using the MTT assay as well the JC-1 mitochondrial membrane potential assay. We will also assess the effects of cimetidine on Pb induced cell death using the trypan exclusion assay.

Results:

Pb caused a significant increase in ROS, and impairment of mitochondrial function prior to cell death. It is expected that cimetidine will prevent Pb induced oxidative stress, mitochondrial impairment, and cell death.

Conclusions and Implications:

The results further demonstrate oxidative stress is associated with Pb induced neurotoxicity. Also, the results from these studies may provide insight, into a different therapeutic strategy to attenuate Pb-induced neurotoxicity.

Acknowledgement and Funding: NINDS R25NS117365, NIMHD #5S21MD000101

P-37

Characterization of the novel RNA-binding protein TRIM2 in SH-SY5Y neuroblastoma cell line

Author: Tionna Johnson

Morehouse School of Medicine Master of Neuroscience Program

Mentor: Robert Meller, D. Phil,
Morehouse School of Medicine

Background/Significance:

The temporal and spatial expression of RNA is an essential part of neuronal development. RNA expression and degradation are regulated by RNA binding proteins.

TRIM2 is a newly characterized RNA binding protein which is highly expressed in brain. TRIM2 expression may play a critical role in proper neuronal development. The goal of my project is to 1) confirm the presence of TRIM2 in SH-SY5Y cells to develop an in vitro model to study in situ RNA-TRIM2 interactions, and 2) identify the specific RNA sequences that TRIM2 binds to.

Methods:

SH-SY5Y cells were obtained from the American Tissue Type collection and grown undifferentiated in MEM media supplemented with FBS. Cells were harvested and prepared for western blotting or grown on glass poly-D-lysine coated coverslips. Western blotting was carried out as previously described (Meller et al, 2008). TRIM was detected using a primary TRIM2 antibody and protein was visualized with chemiluminescence and digitally imaged (Li-Cor C-Digit). TRIM2 was also visualized using immunocytochemistry. Permeabilized and fixed cells were incubated with TRIM2 primary antibody and then an OR green conjugated secondary antibody. Fluorescence was visualized using a Zeiss Fluorescence microscope. RNA expression data from previously published SH-SY5Y studies was obtained and subjected to statistical analysis to determine TRIM2 expression levels using GraphPad PRISM 8, (Li et al, 2015).

Results:

Western blotting and immunocytochemistry confirmed expression of TRIM2 in the undifferentiated SH-SY5Y cell line. Statistical analysis using two-way ANOVA showed TRIM2 was gene expression is higher in undifferentiated SH-SY5Y cell line($p=.0024$). This observation was confirmed by RNA-seq analysis. RIP-Seq studies are in progress.

Conclusions and Implications:

The findings in this study confirm the presence of TRIM2 protein in the SH-SY5Y cell line through western blotting and immunocytochemistry. RNA expression is confirmed through RNA-Sequencing. Additionally, confirmation of TRIM2 as an RNA binding protein is validated through RNA-Immunoprecipitation followed by Sequencing.

Acknowledgement of Funding: Excellence in research: Spatial and temporal mechanisms of gene expression regulation, National Science Foundation: IOS-1956233 (PI: Meller)

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Compassion Learning Community Community Health Course Fall 2020 Tuskegee Airmen Global Academy Needs and Assets Assessment

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Mentors: Angela D. Wimes, M.A.2 David Hefner, Ed.D.2

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Background:

Tuskegee Airmen Global Academy (TAG) is a K-5 Title 1 elementary school in which 99% of students are African American, 81% are economically disadvantaged and 100% of students qualify for free or reduced lunch. In Fall 2020, Compassion assessed TAG's needs/assets to design an intervention that addresses an issue of importance. Academically, TAG students performed at a 20% and 16% proficiency level in math and reading. The College and Career Ready Performance Index (CCRPI) is a Georgia Department of Education tool to determine a school's proficiency relative to the Georgia standard of excellence. TAG Academy has shown a steady increase in their CCRPI score over recent years with a 2020 goal of 83.2 (72.7 in 2019). Enhancing student performance in science-related topics may contribute to reaching TAG's CCRPI goal and ultimately allow the school to become STEM certified.

Methods:

Compassion used three methods to access TAG's community including a windshield survey, key informant interview, and focus group. The windshield survey consisted of a drive-through by four student teams to survey Neighborhood Planning Units S and T, which were divided into two quadrants. The key informant interviews consisted of 12 interviewees (four men and eight women), of which 92% were African American and 8% were Caucasian. The focus group was conducted with nine parents of children in kindergarten-fifth grade at TAG Academy.

Results:

Based on the WSS, physical environment was a hybrid of well-kept and unkempt areas. It was a food desert with one grocery store, but many corner stores. There were adequate public transportation, religious and educational facilities. Three recurring themes emerged from both the key informant interviews and parent focus group: COVID-19, parental involvement, and gentrification. Due to Covid-19, parents expressed concern with the lack of hands-on learning and social learning. Additionally, the effect of the lack of parental involvement and displacement due to gentrification on student academics were discussed.

Implications:

Implications for COVID-19 is that it has caused a digital divide and disproportionately affected students from low socioeconomic backgrounds and increased the academic achievement gap. Implications for parental involvement is that increased parental involvement correlates to increased student academic success and implications for gentrification can lead to increased student mobility rate. Compassion's intervention involves designing asynchronous science modules to be paired with subjects covered in the current science curriculum.

P-39

Development of Radio-frequency Identification-based Electronic Health Record System for Use in Rural and Inaccessible Communities

Authors: Kwon J, Haygood J, Demian S, Aimua N, Ali J, Geng R, Immergluck LC

Mentor: Lilly Immergluck M.S., M.D., FAAP

Morehouse School of Medicine

Background/Significance:

In 2018 and 2019, a team from Morehouse School of Medicine alongside others collaborated with a local NGO (UboraTZ), and the Siha District Department of Public Health to host mobile health clinics for over 3,000 primary school students. During this time, the team implemented an electronic health record (EHR) system based on REDCap®. Based on the challenges faced with the EHR system, existing technologies were explored as possible solutions.

Methods:

The first challenge was the inability of the electronic system to function properly with an unreliable internet connection which was needed for the REDCap® based EHR to transmit data between stations within the mobile health clinic. The second challenge was the delayed speed at which the data was transferred.

The RFID-based EHR was written in C++ and began development in 2018. This software focused on accurately and securely capturing patient information using a system of RFID cards and readers to seamlessly move between clinic stations. Based on feedback, incremental changes were made to improve user experiences. Most importantly, the RFID-based EHR program was able to edit, save, and transfer data between clinic stations without a reliable global internet connection. In addition, the RFID-based EHR program transfers information between the RFID card and reader almost instantaneously, diminishing concerns for sluggish data transfer.

Results:

The RFID-based EHR has not been deployed in the field at this time due to the pandemic. However, the software has been developed and has the capability to overcome the specific challenges that its predecessor encountered.

Conclusions and Implications:

Although the RFID-based EHR was unable to be deployed this year, plans are ongoing for its implementation. The ability of this system to improve needs assessments and continuity of care and efficiency could be adapted to any resource-challenged community.

Acknowledgement of Funding: Office of Global Health Equity (2019)

THREE MINUTE THESIS COMPETITION® ABSTRACTS

3MT-01

Acid-Sensing Ion Channels in Long-term Stroke Recovery

Authors: Ariel Armstrong 1; Zhigang Xiong MD, PhD 2

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2. Morehouse School of Medicine Department of Neurobiology

Mentor: Zhigang Xiong MD, PhD
Morehouse School of Medicine

Background/Significance:

Stroke is a leading cause of death and long-term disabilities in the United States. Tissue plasminogen activator (tPA) is currently the only FDA approved therapeutic for ischemic stroke but must be administered within 4.5 hours of stroke symptom onset and it can be dangerous for many patients. Searching for new targets and mechanisms involved in stroke recovery may lead to alternative and more effective therapeutic strategies. Acid sensing ion channels (ASICs) are proton-gated cation channels in the central nervous system that have well-established roles in several neurological disorders. Our lab was the first to demonstrate a critical role for ASIC1a (an ASIC subunit) activation in ischemic brain injury. The application of ASIC antagonist reduces neuronal death in stroke conditions and ASIC1a knockout mice have reduced infarct size after middle cerebral artery occlusion (MCAO). However, most studies done to establish ASICs' role in stroke are short-term and only demonstrate its acute impact. Also, it is unknown if this reduction in infarct size translates to improved behavioral recovery. The objective of this study is to determine if ASICs contribute to long-term stroke recovery behaviors in mice.

Methods:

MCAO will be performed in wild-type, ASIC1-/-, and ASIC2-/- mice. 24hrs after MCAO, mice will be assessed for neurological deficits. Mice will undergo behavioral analysis every other day following MCAO for 4 weeks. Neurological deficit and behavioral analysis scores will be analyzed for relative improvement over the 4 weeks and the relative improvement of knockout and wild-type mice will be compared.

Results:

The results will reveal whether ASIC1a and ASIC2a (ASIC subunits commonly expressed in the brain) positively or negatively impact behavioral stroke recovery.

Conclusions and Implications:

Determining how ASICs affect long-term behavioral outcomes will aid in reducing the "translational roadblock" to the development of stroke therapies.

Acknowledgement of Funding: Mechanism of ASIC-mediated Neuronal Injury, NIH R01 Grant, Research Training Initiative for Scientific Enhancement, T32 Grant

3MT-02

Persistent racial/ethnic disparities in draft 2020 USPSTF lung-cancer screening guidelines

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4 International Agency for Research on Cancer, Lyon, France

Mentors: James W. Lillard, Hormuzd Katki

Background:

Lung cancer is the leading cause of cancer death and disproportionately affects underrepresented groups and those with lower socioeconomic status. Current U.S. lung cancer screening guidelines could exacerbate health disparities because they do not account for race/ethnicity, gender, or socioeconomic status. Draft 2020 US Preventive Services Task Force (USPSTF) lung cancer screening guidelines recommend screening those who have ever-smoked, aged 50-80 years with ≥20 pack-years who currently smoke or have quit in the last 15 years. African Americans have a higher risk of developing lung cancer despite smoking less than their white counterparts, suggesting that current guidelines may exclude many African Americans from screening despite having equivalent risk as their white counterparts.

Methods:

We examined whether draft 2020 United States Preventive Services Task Force (USPSTF) lung-cancer screening recommendations "partially ameliorate racial disparities in screening eligibility" compared to 2013 guidelines, as claimed. Using data from the 2015 National Health Interview Survey, we calculated the number who would be eligible, Number Needed to Screen (NNS) to prevent one lung-cancer death, and the number of lung cancer deaths prevented for subpopulations under draft 2020 USPSTF guidelines and 2013 USPSTF guidelines.

Results:

Eligibility increased by similar proportions for minorities (97.1%) and Whites (78.3%) under USPSTF-2020 draft guidelines, though the relative disparity (difference in percentages of lung cancer deaths prevented from National Lung Screening Trial-like screening by eligible Whites vs. minorities) increased slightly from USPSTF-2013 to USPSTF-2020 in Hispanic and Asian American populations and only decreased marginally for African Americans (African Americans: 54.5%-39.8%=14.7% to 67.4%-54.0%=13.4%; Hispanic Americans: 54.5%-30.3%=24.2% to 67.4%-40.6%=26.8%; Asian Americans: 54.5%-39.3%=15.2% to 67.4%-47.9%=19.5%).

Conclusions:

Draft USPSTF-2020 guidelines increased the number of eligible minorities versus USPSTF-2013 but may inadvertently increase racial/ethnic disparities for certain minority populations. Action must be taken to identify ineligible people with high predicted benefit from screening, regardless of race/ethnicity.

3MT-03

In vivo Circadian Rhythmicity and Photic Response in Neuromedin S+ (NMS) Neurons

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Mentor: Alec Davidson, PhD
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Background/Significance:

Circadian rhythms are cycles that adhere to a 24-hour cycle and are generated by an endogenous time-keeping system. The suprachiasmatic nucleus (SCN), located in the hypothalamus above the optic chiasm, is considered the master pacemaker of the mammalian circadian system. In mammals, the SCN's overall structure is composed of a core and a shell. Within those distinct structures are GABA-ergic cells that express and secrete diverse neuropeptides, which serve as markers for subgroups of neurons within the SCN. Neuromedin S (NMS) is a peptide which has been found to be expressed by 40% of the neurons in the SCN. In order to lay the groundwork for the study of the role of specific neuronal populations in the generation of circadian timing and photic responses within the SCN, this work focused on the rhythmic behavior and photic responses of the broader class of NMS-containing oscillator neurons.

Methods:

An NMS: Cre mouse received a GcAMP7 Flox adeno-associated virus (AAV) injection and GRIN lens insertion into the hypothalamus. The mouse was placed in customized imaging coffin for an acclimation period to the imaging coffin and the miniature fluorescent imager for at least 48 hours. Following the acclimation period, in vivo recordings were collected in three different imaging paradigms:

- 5-minute recording every 3 hours in 12:12 Light-Dark (LD) environment for 48-hours
- 5-minute recording every 3 hours in constant darkness (DD) environment for 48-hours
- 10-minute recording at CT6, CT16 and CT20 with a 1-minute light pulse in DD

Results:

Three (3) NMS+ mice in vivo recordings were collected during the LD and DD environments. Initial analysis shows how there likely seems to be a difference in activity in LD phase compared to DD phase. Initial observations showed some cells to be more cellular active (calcium depolarization) in the night (active phase) which was opposite of the expectation for cells to display such cellular activity in the day (rest phase). Light pulse observations showed that within the population some cells were responsive to the photic cue and while others were not at the tested specific circadian times (CT 16 and CT 20).

Conclusions and Implications:

It is expected for there to be a diversity of what SCN neurons do in vivo, and when they do it. The observations will help to establish a novel and unbiased functional classification of SCN neuronal subpopulations.

Acknowledgement of Funding: R35GM136661, Research Initiative for Student Enhancement (RISE) R25GM058268, SC1GM12567, W.M. Keck Foundation.

3MT- 04

"The People v. Obesity"

Authors: Jade Avery1; Wei Zhong2; Sharon C. Francis, Ph.D.1,2

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Mentor: Sharon C. Francis, Ph.D.
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Background/Significance:

This is a case about a complex disease involving excess body fat commonly known as obesity which threatens and assaults the quality of life and health of 40% of American adults. The defendant, obesity is implicated in adverse cardiovascular health complications such as stroke and hypertension. Over time, if the defendant remains at large, 85% of American adults' health will be endangered. Previous investigations report obesity's motive is to promote vascular damage, but the modus operandi remains an unsolved mystery. Nevertheless, we have learned that stopping the culprit, serum and glucocorticoid-inducible kinase 1 (SGK1) offers protection against obesity-related vascular disease by causing a metabolic switch from glycolysis to oxidative phosphorylation (OXPHOS). The cause for the metabolic switch is unknown, but we suspect that the mitochondrial calcium uniporter (MCU) may be an unwitting co-conspirator as it was spotted near the scene of the crime of obesity-related vascular disease. This case will investigate whether SGK1 recruits MCU as an unwitting accomplice to enhance vascular disease caused by obesity.

Methods:

Our investigation will assess MCU's role in the crime by examining MCU's assembly into a functional complex by blue native western blot analysis and its mitochondrial Ca2+ uptake ability through microscopic and biochemical procedures in aortic smooth muscle cells (VSMC) of obese mice before and after SGK1 is apprehended and in human aortic VSMC from normal weight and obese individuals. We will also examine whether SGK1 and MCU conspired to harm components of the electron transport chain (ETC) by conducting a kinetic electron flow assay. Additionally, we will profile multiple metabolites in VSMC of lean and obese mice before and after SGK1 is detained to identify other affected casualties. VSMC from lean and obese subjects will also be metabolically profiled to assess whether there are common casualties. Crime scene investigation of obesity-related oxidative stress and antioxidant capacity will be performed in lean and obese mice VSMC before and after SGK1 is seized and in VSMC samples from lean and obese humans to determine the extent of injury the conspirators' have inflicted upon VSMC.

Expected Results:

The evidence will show that SGK1 intentionally restrains MCU activity by preventing MCU from assembling into a functional complex. Also, the facts will prove that SGK1 and MCU cooperate to increase OXPHOS, in part, by disrupting the activity of specific ETC components. SGK1 recruits MCU as an unwilling accomplice which worsens obesity-related oxidative stress and antioxidant capacity in aortic VSMC.

Conclusions and Implications:

This case provides evidence that SGK1 enlists MCU in the crime of obesity-related vascular disease. Further, our investigation suggests SGK1 is an ideal target to halt the progression of obesity-related vascular disease.

Acknowledgment of Funding: NIGMS/NIH Grant: R25GM058268

3MT-05

Multivariate Transcriptome Analysis of CXCL13-CXCR5 Signaling in Ovarian Cancer

Author: Kaylin Carey1, Tiara Griffen1, Corey Young1, Courtney Dill1, and James W. Lillard Jr1

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Mentor: James W. Lillard. Ph.D.
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Background/Significance:

Ovarian Cancer (OvCa) is a disease that affects postmenopausal women, with high-grade serous ovarian carcinoma being the most common and lethal histopathological type. Many patients are asymptomatic in the early stages of OvCa, thus going undetected, leading to higher patient mortality rates. One of the defining characteristics of terminal OvCa is malignant ascites, or excess tumor and immune cell accumulation fluid within the peritoneal cavity. Although high ascites volume is associated with more metastatic spread, a major limitation in current research is the lack of understanding of the molecular mechanisms responsible for HG-OvCa metastasis to the omentum. These signals initiate activation of the innate and adaptive immune system promoting rapid migration of macrophages to the omentum causing MS expansion and production of factors and chemokines which could promote metastatic spread of HG-OvCa. CXCL13 is involved in MS formation and high expression of this ligand by Follicular Dendritic Cells, FDCM1+CD11b+, has been observed outside the B cell clusters, and are proposed to be macrophages. Thus, these finding suggest a mechanism that involves these macrophages for metastasis. We hypothesize that CXCL13, expressed by FDCM1+CD11b+ macrophages, drives HG-OvCa metastasis to the omentum. Two specific aims will be used to test this hypothesis.

Aim 1 will characterize CXCL13, CXCR5, and associated gene expression and the mechanism of their regulation during HG-OvCa.

Aim 2 will evaluate CXCL13-CXCR5 signaling effects on HG-OvCa cell line transcriptome, migration, invasion, and growth. After completion of these studies, we will have advanced the understanding of chemokine mediated metastasis to the omentum. We will have identified novel fusion genes and mRNA variants that contribute to disease progression. The functional response of CXCR5 activation by CXCL13 and their mechanism of recruitment to the omentum may also be identified. Studies will also reveal subsequent phosphorylation cascades associated with aggressive molecular phenotypes in HG-OvCa immune cell pathobiology.

3MT-06

Circadian Regulation of COMPASS H3K4 Methyltransferases

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2. Morehouse School of Medicine Pharmacology and Toxicology

Mentor: Hao Duong, PhD,
Morehouse School of Medicine

Background/Significance:

Over evolutionary time, organisms have adapted to the Earth's 24-hour light/dark cycle. Those best adapted can anticipate this cycle via a cell-autonomous internal biological rhythm, referred to as a circadian rhythm (Spoelstra K, et al. 2016). In mammals, the circadian clock is regulated by transcriptional feedback loop where three PERIOD (Per) and two CRYPTOCHROME (Cry) proteins form a complex that ultimately repress their own transcription by associating with their dimeric activators Clock/Bmal1 (Takahashi JS et al., 2008 ; GEKAKIS, et al., 1998). Turnover of Pers and Crys allow their transcription factor to be released thereby beginning a new cycle (Siepka SM, et al., 2007). This internal clock system is typically in line with external light-dark cycle (ECA), however, when they are not aligned, we call this environmental-circadian disruption (ECD). For humans, misalignment of activity with the light-dark cycle, such as shift work, leads to greater incidence pathological conditions such as metabolic syndrome related diseases, CVD and cancer (Evans J, Davidson AJ, et al., 2013; Cook KM et al., 2019). Our goal is to elucidate the process of COMPASS recruitment to better our understanding of the role of chromatin modification in ECA. Additionally, we will investigate the circadian regulation of Kmt2c to better understand how COMPASS interacts with the circadian clock.

Methods:

We will investigate how the subcellular location of COMPASS histone 3 lysine 4 methyltransferase (H3K4) complexes perturbate in ECA vs ECD by western blot. Then we will investigate the circadian regulation COMPASS component Lysine Methyltransferase 2c (Kmt2c) by LC/MS analysis of the different forms of Kmt2c expressed over time. Lastly, we will investigate Kmt2c transcriptional regulation via qPCR to determine splice variant expression; followed by luciferase reporter assay to determine the cis-element binder responsible for driving KMT2C gene expression.

Conclusions and Implications:

Elucidating the pathway for COMPASS recruitment will give us a better understanding about the mechanism behind Environmental Circadian Alignment.

Acknowledgment of Funding: NIH R01EY026291 Gianluca Tosini/Hao Duong

3MT-07

Molecular Mechanisms of Macrophage Inflammasome Activation by Chlamydia trachomatis and VCG-MECA

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Mentor: Yusuf Omosun, PhD,
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Background/Significance:

Chlamydial infections are reported worldwide and have shown a steady increase each year. In women, 70-80% of C. trachomatis genital tract infections are asymptomatic. Chlamydia ascends the upper genital tract causing pelvic inflammatory disease, infertility, and ectopic pregnancy. Even when treated with antibiotics, 10-15% of women are rendered infertile. There are several serovars of C. trachomatis; thus, an ideal vaccine should protect against various serovars. Characterization of the immune response induced by recombinant Vibrio cholerae ghosts (VCG) based vaccine candidate is important. This study aims to investigate macrophage inflammasome activation in response to VCG Multi-epitope CT Antigen (rVCG-MECA) and determine if the activation is through canonical or noncanonical pathways.

Methods:

Caspase 1-/- and Caspase 11 -/- knockout (KO) and wild type mice were used in this study. Mice bone marrow-derived macrophages (BMDMs) were obtained from the femur and tibiae. The cells were maintained in DMEM medium containing 10% FBS, 100 u/mL Penicillin, 100ug/mL streptomycin, and five ng/ ml GM-CSF at 5% CO2 atmosphere for seven days. Harvested BMDMs were lysed with M-PER Mammalian Protein Extraction Reagent. Cell lysates and supernatant will be analyzed for mIL-1B, mIL-118 using SDS-PAGE analysis and western blotting. Total RNA from BMDMs will be isolated, and qPCR performed to determine the expression of inflammasome associated genes. Flow Cytometry will be used to determine apoptotic and necrotic changes associated with CT and VCG-MECA.

Results:

Preliminary data shows that macrophages treated with VCG-MECA were more apoptotic compared to those treated with chlamydia. The results from this study will determine how macrophage inflammasome is activated.

Conclusion and Implication:

This national study's findings could suggest the need for continued surveillance of CT vaccine interventions addressing the major significant challenges to women's reproductive health globally, particularly among younger age groups. Further research is needed to elucidate further the route of vaccination and long-term effects of treatment of Chlamydia Trachomatis with VCG-MECA.

Acknowledgment of Funding: R01AI41231 from the National Institutes of Health (NIH), R01AI26897 from the National Institutes of Health (NIH)

3MT-08

SGK-1 Increases Glucose Utilization in Aortic Smooth Muscle Cells for Basal Oxidative Phosphorylation During Obesity

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Mentor: Sharon Francis, PhD
Morehouse School of Medicine

Background/Significance:

Obesity remains a serious problem in the United States with over 40% of the country obese. As obesity rates rise so does the risk of developing cardiovascular disease thus, there is a critical need to understand the underlying mechanisms of obesity related cardiovascular disease. Our lab has identified serum and glucocorticoid inducible kinase 1 (SGK-1) as a mediator of vascular smooth muscle cell (VSMC) dysfunction during obesity. Genetic inhibition of SGK-1 in VSMCs provide protection against obesity-related VSMC dysfunction by metabolically reprogramming VSMCs towards enhanced oxidative phosphorylation (OXPHOS). The metabolic fuel required to drive activation of OXPHOS in VSMC during obesity remains unclear. Glucose metabolism which is central to energy production is crucial for normal VSMC function. Thus, the purpose of this study was to dissect the dependency and capacity of VSMC to metabolize glucose to sustain OXPHOS in wildtype (WT) and knockout (KO) SGK1 VSMC during obesity.

Methods:

Oxygen consumption rate (OCR) was assessed using the Agilent MitoXpress Xtra Oxygen Consumption assay as an indicator of OXPHOS. WT and SGK-1 KO aortic VSMCs isolated from obese mice were seeded in a 96-well plate at a density of 6x104cells per well in cell culture medium ± UK5099 to assess glucose dependency or ± BPTES/Etomoxir to assess glucose capacity. In parallel, VSMC were treated with FCCP to evaluate glucose dependency and capacity upon increased energy demand (i.e., maximal OXPHOS). Sample wells were overlaid with a fluorescent extracellular oxygen consumption reagent and sealed with high sensitivity mineral oil. The fluorescent signals were read at 1.5-minute intervals for 2 hours at Ex/Em=380/650 nm. Two Way Analysis of Variance was used to compare the slopes of the regression lines to determine significance.

Results:

Basal OCR was higher in SGK-1 KO VSMCs compared to WT VSMCs after inhibition of glucose metabolism with UK5099, indicating lower glucose dependency. However, upon enhanced energy demand, UK5099 reduced maximal OCR in SGK-1 KO VSMCs to a level comparable to WT VSMCs. Also, when long chain fatty acids and glutamine oxidation were inhibited with BPTES/Etomoxir, basal OCR was higher in SGK-1 KO VSMCs compared to WT VSMCs indicating higher glucose capacity. When energy demand was stimulated, glucose capacity in SGK-1 KO VSMCs decreased to the level observed in WT VSMCs.

Conclusions and Implications:

This study suggests that SGK-1 increases preferential glucose metabolism to sustain basal OXPHOS in VSMC during obesity. However, when SGK1 is absent VSMC may use alternative metabolic fuels to drive basal, but not maximal respiration. Accordingly, SGK1 may limit the capacity for VSMC to metabolize glucose when other fuels are unavailable. But inhibition of SGK1 may restore glucose capacity to drive basal respiration when it is the only available fuel source. This study broadens our understanding of how SGK-1 regulates VSMC energy metabolism during obesity and suggests that increased glucose utilization for basal OXPHOS may contribute to obesity-related VSMC dysfunction.

Acknowledgement of Funding: NIH Support of Competitive Research (SC1): 5HL107236, NIH Research Endowment Grant: 5S21MD000101, NIH RCMI G12 Grant: 5G12MD007602, NIGMS/NIH Grant: R25GM058268, American Heart Association Grant: 20PRE35211040

3MT-09

Multi-omic analysis of CXCL13-CXCR5 signaling in metastatic castration resistant prostate cancer

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Mentor: James W. Lillard, Jr. PhD, MBA
Morehouse School of Medicine

Background/Significance:

Prostate cancer (PCa) is the second most diagnosed malignancy in men and the second leading cause of cancer-related deaths among men. Advanced PCa is defined as the progression to biological recurrence, which manifests in non-metastatic castration resistant prostate cancer (nmCRPC) and then progresses to metastatic castration resistant prostate cancer (mCRPC). mCRPC is defined as image evidence-based castration-resistant disease, which often metastasizes to lymph node and/or bone. mCRPC represents an important negative prognostic factor for PCa patients. CXCR5 and CXCL13, its sole ligand, have been shown to mediate metastasis and growth of prostate tumors. The goal of this project is to decipher the transcriptome expressed by mCRPC, in the context of CXCL13-CXCR5 signaling.

Method:

RNA-seq gene expression data, from 429 clinically annotated mCRPC samples, were acquired from dbGAP for the purpose of characterizing the co-expression of CXCR5, CXCL13, and associated genes in mCRPC. Weighted gene co-expression network analysis (WGCNA), differential expression, Kaplan-Meier, and canonical pathway analyses of clinical and genomic data to determine the relevance of significantly correlated co-expressed gene clusters associated with mCRPC clinical outcomes. mRNAs, miRNAs, lncRNAs, cRNAs, and mRNA variants were analyzed to identify coding and non-coding RNA expression profiles that are associated with CXCL13/CXCR5 expression and mCRPC outcomes. Bioinformatic tools, including R, Linux scripting, and web-based tools were used for analysis and interpretation.

Expected Results:

We expect to show significantly higher expression of CXCR5, CXCL13 and/or cell survival genes in mCRPC, than compared to normal prostate tissue or primary prostate tumor. WGCNA results will demonstrate modules (or pathways) that are significantly correlated with disease-free survival, overall survival, and other clinical outcomes. The Kaplan-Meier estimator will illustrate a lower survival probability correlating to a high expression of CXCR5 and CXCL13.

Conclusion and Implication:

The findings of this multi-omic approach to studying advanced prostate cancer is the first to examine multiple molecular signaling pathways correlated with or activated by the CXCR5-CXCL13 axis during mCRPC. These studies will enhance our understanding of the coding and non-coding RNA factors mediated by CXCR5 signaling and will elucidate an overall comprehensive molecular map of mCRPC progression.

Acknowledgement of Funding: MSM/Tuskegee U/UAB Comp. Cancer Center Partnership Name & Number of Grant Award, NCI - U54CA118638

3MT-10

CXCL13, CXCR5, and co-expressed gene networks provide insight into the colorectal cancer tumor immune microenvironment and disease progression

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2. The University of Texas M.D. Anderson Cancer Center, Department of Gastrointestinal Medical Oncology, Houston, TX
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Mentor: James Lillard Jr. PhD, MBA
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Background/Significance:

Colorectal cancer (CRC) is a frequently lethal disease with heterogeneous outcomes. Alterations in the WNT signaling pathway have been shown to promote RAS-RAF-MAPK, TGF-β, and the PI3K-AKT pathways. Chemokine receptor stimulation has also been shown to stimulate PI3K-dependent activation of MAPK/ERK1-2 through Ras signaling. Hence, WNT and chemokine co-activation could significantly promote CRC progression. The CXCL13-CXCR5 axis is expressed during CRC and activates PI3K/Akt and other related pathways involved in cell growth, survival, and invasion. The central hypothesis tested in this study is that CXCL13-CXCR5 signaling and co-expression networks mediate CRC progression, cell growth, and survival.

Methods:

We investigated co-expression gene networks in CRC, using clinically annotated RNAseq datasets from The Cancer Genome Atlas (TCGA). Weighted gene network co-expression analysis (WGCNA) elucidated gene networks significantly correlated with factors influencing CRC prognosis. CRC cell lines SW620, HT29, CaCo2, SW48, and prostate cancer cell line PC3, as a control, were treated with CXCL13 to determine its effects on cell growth.

Results:

CXCL13, CXCR5 and associated genes were identified in the WGCNA designated brown module (M3). M3 hub genes were CCL19, PIK3AP1, FLT3, UBASH3B, GPR31, and WNT1. IPA analysis revealed these factors play significant roles in immune cell trafficking, B cell receptor signaling, PI3K-Akt, RAS, MAPK1/ERK2, and MAPK3/ERK1, MEK, and NFκB activation, and the canonical Wnt signaling pathway by promoting beta-catenin dependent transcriptional activation. In confirmation, CXCL13-CXCR5 CRC cell line responsiveness resulted in cell proliferation. However, CXCR5-activation had no direct influence on CRC cell survival. Gene set enrichment analysis (GSEA) determined the CXCL13-CXCR5 axis is significantly associated with immune system and cell cycle processes.

Conclusion and Implications:

To this extent, CXCL13, CXCR5 and M3 co-expressed gene signatures are found in the consensus molecular subtype (CMS1) of CRC. CMS1 has distinguished features of MSI-H, BRAF mutations, immune infiltration and activation, and is suggested to have a worse survival after relapse. Our findings strongly support CXCL13-CXCR5 signaling activates important pathways that are associated with CRC progression and the CMS1 phenotype.

Acknowledgement of Funding: This work was supported by the MSM/TU/UAB CCC Partnership grant U54CA118638, and facilities were supported by MSM (1G12RR026250-03; NIH RR03034 and 1C06 RR18386), the partnership of NIH/NCI R25CA056452, and The MDACC Colorectal Cancer Moonshot.

3MT-11

Lessons from Our Past: Retrospective Analysis of African American Women's Response to rtPA and Stroke Mimic Incidence

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Mentor: Robert Meller, PhD
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Background/Significance:

Health disparities in stroke treatment and patient outcome still exist, despite many technological advances. The association of acute ischemic stroke and stroke mimic with significant morbidity and high mortality (Ingall et. al, 2004) among African Americans has been known, yet poorly understood. The purpose of this study is to conduct a retrospective study on EHR of female patients between the ages of 18 and 90 years old who suffer stroke from 2011-2019. Previous studies have reported significant health disparities between African American women and Caucasian women in terms of acute ischemic stroke and stroke mimic treatment, diagnosis, and prognosis.

The goal for this study is to compare rtPA efficacy in African American women who suffer acute ischemic stroke and stroke mimic incidence to Caucasian women, based on demographic data, stroke type, severity, treatment, discharge location, early mortality rate, clinical and laboratory (brain imaging) data, concomitant therapies, and 90 follow up outcome. The central aim of this study is to investigate the efficacy of rtPA treatment is for acute ischemic stroke and current stroke mimic incidences in African American women. Diagnosis and treatment of acute ischemic stroke and stroke mimic are often misunderstood due to similarities in clinical presentations. Stroke mimics present with symptoms of migraine, seizure, hypoperfusion, metabolic dysfunction, and sepsis. The misdiagnosis of stroke mimic and acute ischemic stroke occur more frequently in African American populations due to a host of factors late hospital arrival and lack of medical history on file.

Methods:

Analyses were conducted using data from patients presenting to Grady memorial hospital emergency department. All collected data were from women 18-90 years old who were diagnosed as stroke or stroke mimic, diagnosed according to NIHss and magnetic resonance imaging, from 2011-2019. Demographic data, stroke type, severity (NIHss), treatment, discharge location, early mortality rate, clinical and laboratory (brain imaging) data, concomitant therapies, and 90 follow up outcome will be extracted from medical charts. The first statistical technique we used was pPREDICTS, (based on the generation of a surrogate control function from the placebo arm of published randomized clinical trials representing roughly 6,000 ischemic stroke patients). The second method we used, pPAIRS to match each patient on an individual basis rather than as grouped data sets (matching will be based on individuals which must have identical distribution characteristics). The pPAIRS method accounted for the assortment among the patients to allow for good matching

Conclusions and Implications:

The findings of this retrospective study suggest the need for supplemental and improved diagnostic tests to differentiate between acute ischemic stroke and stroke mimic for improved prognosis in African American women. The capability to diagnosis accurately in a minimum amount of time is critical for effective and efficient treatment implementation.

Acknowledgment of Funding: Blood transcriptomics as CT adjuvant to exclude hemorrhage in acute stroke & NIH/NINDS: R01 NS112422-01A1 (PI: Meller), • Precision based medicine for stroke in African American Women & U54- MD007602-31A1 RCMI (PI: Bond)

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