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Dr. Michelle Tucci
Mississippi Academy of Sciences
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msacademyofscience@comcast.net
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Mississippi Academy of Sciences
Post Office Box 55907
Jackson, MS 39296-5907

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On the cover: A Mississippi Sunrise. This is a photo was taken by Michelle Tucci at the Ross Barnett Reservoir, Ridgeland, MS March 2022

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WEDNESDAY, MARCH 30, 2022 Registration Opens from 3:00- 5:00 pm Lobby area of convention center

Thursday March 31, 2022

Agriculture and Plant Sciences	Cellular, Molecular, and Developmental Biology	Chemistry and Chemical Engineering	Ecology and Evolutionary Biology	Geology and Geography	Health Sciences	History and Philosophy of Science
Room D1	**Room D3**	**Room D11**	**Room L6**	**Room D5**	**Room D2**	**Room D6**
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Sessions 8:00-12:00	Oral Sessions	Oral Sessions	Workshop Oral Session	Oral Sessions	Oral Session 8:00-10:00 Symposium I Telehealth 10:00-12:00	Oral Sessions
12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
POSTER SESSION 1:00-3:00 Hall C	Oral Sessions **Room D3**	Career Workshop Oral Sessions **Room D11**	POSTER SESSION 1:00-3:00 Hall C	Oral Sessions **Room D5**	Interactive Workshop 1:30-3:00 Room D2	Oral Sessions **Room D6**
EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30	EVENING 3:30-7:30
Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C

Thursday March 31, 2022

Marine and Atmospheric Sciences	Mathematics, Computer Sciences, Statistics	Neuroscience	Physics and Engineering	Psychology and Social Sciences	Science Education	Zoology
	Room D7	Room D8		Room D4	Room D12	Room L5
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
OPEN	Oral Sessions	Oral Sessions	OPEN	Oral Sessions		Oral Sessions
12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B	12:00 - 1:00 General Session Hall B
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
Oral Sessions	Oral Sessions	Oral Sessions	Keynote	Oral Sessions	Symposium	OPEN
Room L6	Room D7	Room D8	RoomL5	Room D4	Room D12	
EVENING	EVENING	EVENING	EVENING	EVENING	EVENING	EVENING
Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/ Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/Reception Hall C	Awards Ceremony/ Dodgen Lecture Hall B Poster Session/Reception Hall C

Friday, April 1, 2022

Agriculture and Plant Sciences Room D1	Cellular, Molecular, and Developmental Biology Room D3	Chemistry and Chemical Engineering Room D11	Ecology and Evolutionary Biology	Geology and Geography Room D5	Health Sciences Rooms D2/D12	History and Philosophy of Science Room D6	Math and Computer Science and Statistics Room D7	Physics Room D8
MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING	MORNING
Oral Sessions 8:00-12:00	Oral Sessions 8:00-12:00	Oral Sessions 8:00-12:00	Field Trip Aquarium 10:12:00	Oral Sessions	Oral Session I (D2) Oral Session II (D12) 8:00-10:00 Symposium II 10:05-12:00 High School Poster Session	Oral Sessions	Oral Sessions 8:20-11:30	Oral Sessions 8:20-12:00
AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON	AFTERNOON
Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Oral Sessions 1:00-3:00	L.C. Dorsey Society Symposium 1:00-3:00	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B	Scholars Symposium Awards Hall B
ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN	ADJOURN

Mississippi Gulf Coast Convention Center
Biloxi, MS 39531

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If Coming from Jackson, MS –Go South on I-49:

Take the MS-67 S ramp to Biloxi
Continue onto MS-67 S (9.1 miles)
Exit onto MS-605 S (11.7 miles)

Turn left onto US-90E/E Beach BLvd (3.2 miles)

Turn left when you see the Mississippi Gulf Coast and Convention Center

If Coming from Starkville, MS Take US-45, I-59, and US49
Take US 45 (70 miles)
Then take the Exit onto I-20-W/I-59 South Toward Meridian
Continue on I-59 South (Look for signs Laurel/ New Orelans

Take exit 59 for US 98 E towards Lucedale/Mobile

Continue onto US 98 E/US98 BYP E and use the right lane to take the ramp to Gulfport

Merge onto I-49 South

Take the MS-67 S ramp to Biloxi
Continue onto MS-67 S (9.1 miles)
Exit onto MS-605 S (11.7 miles)

Turn left onto US-90E/E Beach BLvd (3.2 miles)

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If Coming from the Lorman MS on Highway 61 S:
Take US 61 S to US 98

Merge onto I-55 South/ US-98 E toward McComb

Take exit 29 A Onto I-12 East toward Slidell

Take Exit 38 toward MS 605

Turn left onto US-90E/E Beach BLvd (3.2 miles)

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If Coming from Mississippi Valley State University on US-82 W:
Follow MS-7 South to US 49 W in Belzoni

Continue on US 49 South toward Jackson, Hattiesburg, Gulfport

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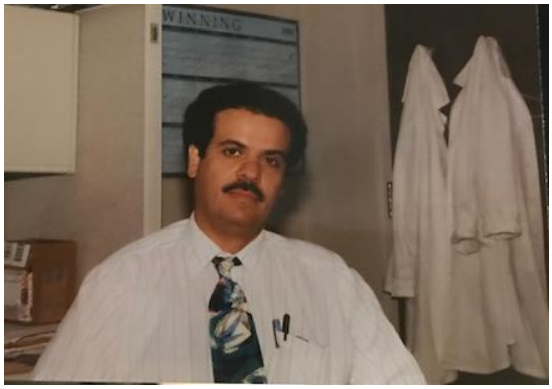

I hope all of you are staying safe. The trees are budding, the birds chirping, and sun is rising a bit earlier each day and setting a bit a later. I truly enjoy this time of year because it symbolizes new beginnings and new hope. As we get ready for this meeting in Biloxi, I am anticipating the weather to cooperate with us and be glorious so you have the opportunity to take advantage on our magnificent Gulf Coast.

This year marks our 86th Annual Meeting for the Mississippi Academy of Sciences (MAS). So much has changed during the past two years. The Zoom meetings, the virtual teaching, the social distancing, the feeling of never getting back to what was "normal" has been overwhelming. Now, as this new Omicron COVID-19 wave is passing, I am able to look back and marvel over how the leadership of this academy stepped up to preserve and fight to keep us strong during these times of uncertainty. It truly is my honor to stand next to these dedicated ladies and gentlemen that work tirelessly for our academy. The creativity, perseverance, and solidarity they displayed has been unquantifiable. I am deeply indebted to our MAS President, K. Raja Reddy. There are no words to accurately describe his leadership and efforts that he initiated to withstand the chaos of this pandemic. I would say those efforts were more than heroic. Dr. Reddy thank you seems so simple, so multiply those work by million and it still would not be enough to express my gratitude. You undoubtedly have left a significant mark on our academy.

This year we are planning a meet and greet on Thursday, March, 31st at lunch in order to express our appreciation for every member of the board along with our division chairs and co-chairs. Please come and meet your leaders and fellowship with them. Your input and communication with leadership is critical to the success of our organization. Every voice needs to be heard, remember we are stronger when we are all working as one! Come find out what is new in your division, and what the MAS has done to make itself more visible and viable. This is the time to provide your input, or better yet step up to volunteer to help there is always room at the table. Over the years we have grown in size, but in order to get to the next level we need more foot soldiers and people with new ideas and a passion for Science and STEM in our state. When everyone works together the job will not be so burdensome.

In preparation for the upcoming meeting, we have been watching the COVID-19 spread in our area on a daily basis, and we are doing our best to make the meeting safe for all our attendees. To be respectful to all member of our academy, we will not require proof of vaccination. However, at this time, we will require that masks be worn by all registrants, staff, exhibitors, etc during the meeting in order to keep **each other** safe. We will provide hand sanitizer and will work with our safety committee to ensure that all areas stay as clean as possible. Keep vigilant and wash your hands frequently to keep safe. This virus is invisible, but it does not mean we can't contain its spread by practicing safe distancing and respect for each other. (**NOTE:** If the safety committee, along with our state health department, feels the virus in our area is contained the rules may change and we will send a mass email with those changes).

On behalf of the Academy, I want to extend our gratitude for the continued support that we receive from our sponsors most notably, USDA-ARS, Cotton Inc, Mississippi Research Consortium, Various Collages and Schools

and Departments at Mississippi State University, Coastal Mississippi, LSMAMP, our Sustaining Members, our symposia speakers, and our exhibitors. Special thanks to our major sponsor, Mississippi-INBRE and its directors Dr. Moe Elasri and Dr. Alex Flynt. I would like to congratulate Dr. Elasri on accepting a leadership position at the University of Arkansas, School of Medicine. Moe thank you for all the years you put into the academy and implementing the numerous program in STEM around our state. We are grateful that you have selected Dr. Alex Flynt to succeed you and we promise to keep the Mississippi IDeA Network of Biomedical Research Excellence (**INBRE**) strong.

As we come out of this pandemic facing new challenges and often feeling underappreciated, I want to share with you one of my favorite poems that keeps me grounded.

"Do It Anyway"

People are often unreasonable, irrational, and self-centered.
Forgive them anyway.
If you are kind, people may accuse you of selfish, ulterior motives.
Be kind anyway.
If you are successful, you will win some unfaithful, friends and some genuine enemies.
Succeed anyway.
If you are honest and sincere people may deceive you.
Be honest and sincere anyway.
What you spend years creating, others could destroy overnight.
Create anyway.
If you find serenity and happiness, some may be jealous.
Be happy anyway.
The good you do today, will often be forgotten.
Do good anyway.
Give the best you have, and it will never be enough.
Give your best anyway.

In the final analysis, it is between you and God.
It was never between you and them anyway.
~Mother Teresa

MISSISSIPPI ACADEMY OF SCIENCES AWARD WINNERS 2022

Contribution to Science

Larry S. McDaniel, PhD

Dr. Larry S. McDaniel is a Professor in the School of Medicine, Department of Microbiology and Immunology at the University of Mississippi Medical Center. He is an accomplished researcher in microbiology, a respected teacher and a leader in our academy of science.

Dr. McDaniel started his career in Microbiology at Southeastern Louisiana where he earned a BS degree. He earned a Master's Degree in Microbiology from University of Southwestern Louisiana, followed by the PhD in Microbiology from the University of Oklahoma. He completed an NIH Fellowship at the University of Alabama at Birmingham in Microbial Pathogenesis and Immunology.

Dr. McDaniel's research interests include four specific areas: (1) the role of pneumococcal proteins in the ability of *Streptococcus pneumoniae* to cause disease. (2) Host immune response against bacterial antigens. (3) Pathogenesis and treatment of *Pseudomonas aeruginosa* in acute otis externa. (4) Serum survival and pathogenesis of *Acinetobacter baumannii*.

Dr. McDaniel is the author of over 150 journal peer reviewed publications with an i10 Index of 87 and an h index of 44. .He was awarded 5 US Patents related to Pneumococcal surface proteins, genes, and oral antigens. He has received numerous honors and recognitions during his career including being elected as Fellow in the American Academy of Microbiology, a Fellow of the Infectious Disease Society of America, and Fellow of the Mississippi Academy of Sciences. He has also received an Excellence in Research Award from the University of Mississippi Medical Center. He has served as president of the Mississippi Academy of Sciences and as President of the Lancefield Society. He is a member of American Society for Microbiology, The American Association of Immunologist, Phi Sigma Society, and the Mississippi Academy of Sciences to name just a few.

In addition to his research obligations, he is actively engaging graduate students. He is the course director for bacterial structure and function as well as advanced bacteriology for graduate students. He has served on numerous Thesis and Dissertation Committees as either a member or chair. Dr. McDaniel is passionate about helping the graduate students be competitive. He has performed workshops and symposia on grant writing and scientific writing and publishing that are directed toward graduate students and young faculty.

Dr. McDaniel played a very unique and instrumental role during COVID-19. He led efforts within his department to provide and promote solid scientific based information. He was on the front-lines and developed testing platforms for UMMC and was instrumental in providing testing materials throughout the state during a time when supplies were often not available almost anywhere. In addition, he has been a strong community leader for vaccine awareness and vaccine distribution efforts.

Dr. McDaniel has shown exceptional service to community outreach and engagement of under-represented groups throughout our state. He has opened up his lab and provided guidance and challenges to any student interested in learning. His students have presented numerous poster and oral presentations at the MAS in either the Health Sciences Division or Cellular and Molecular Divisions. He is active in our Health Sciences Division and is always asked when called upon to serve.

Dudley Peeler Award

Contribution to the Mississippi Academy of Sciences

Felicia Tardy, Ph.D.

Professor (retired)

Dr. Felicia Tardy is a scientist and educator who is dedicated to teaching students to soar in the clinical health sciences. Dr. Tardy has recently retired from the University of Mississippi Medical Center where she was a Professor of Medical Laboratory Sciences.

Dr. Tardy started her career earning a B.S. in biology from Alcorn State University, followed by a second BS degree in Clinical Laboratory Sciences (CLS) from the University of Mississippi Medical Center. Following graduation, she worked as a registered medical technologist where she did specialty testing in hematology and coagulation. Within two years she was promoted in her specialty area to Supervisor. Working as a supervisor she was responsible for proficiency testing, monitoring patient test results, performing quality control analysis, instrument maintenance and calibration, and provide training to undergraduate CLS students. All of this while continuing her education and earning a Master's Degree and a PhD in Clinical Health Sciences from the University of Mississippi Medical Center. Dr. Tardy has taught students in many formats. Her workload in teaching was significant and she served as course director of upper level courses in her specialty area. In addition to teaching at the medical center, she also provided lectures for students at Jackson State University in the College of Life Long Learning. Dr. Tardy began teaching an advanced standing class to help students with Medical Laboratory Science degrees and extensive work history earn their BS degree. Dr. Tardy is resilient and dynamic and was teaching on-line back in 2007 when it was in its infancy.

In addition to teaching, she has been active publishing her research and clinical case studies. Her research activities focused mainly on the interrelationship between sex steroid hormones and cardiovascular disease using MRC-5 cell line as a model. She has been coming and presenting at the Mississippi Academy of Sciences since 2002. Her service to our academy has been **exemplary**. She has served in various roles over the years. She served in the Division of Health Sciences as a **Co-Chair, Chair, and student judge** numerous times since 2007. She has served on the MAS **board of Directors from 2011-2017**. Felicia is an excellent communicator and has really helped our academy connect with the public and the many universities and colleges in our state. She is the **Publicity Committee Chair** and has served in this role since 2010. She has used her on-line skills to bring us into several social media platforms such as Facebook, Instagram and Twitter. She makes sure that our academy is visible in the media by engaging with Mississippi Public Broadcasting and various news outlets where we host our meeting.

2022 Dodgen Lecture

Thursday, March 31, 2021

(Immediately following the 3:30 awards ceremony)

The Wicked Nature of Global Food Security and Sustainability Challenges

Given By

David Shaw, PhD

Provost and Executive Vice President
Mississippi State University
Mississippi State, MS

David Shaw is the provost and executive vice president at Mississippi State University. As chief academic officer, he oversees all academic policies, the integrity of the academic mission, and academic operations of Mississippi's leading university and land-grant institution. He provides direct oversight for eight academic colleges and two campuses, as well as many academic and non-academic support units. A longtime faculty member and former vice president for research and economic development at MSU, he works with senior administrators to develop budgetary recommendations that affect the teaching, research and service mission of the 141-year-old institution.

During his tenure as the university's chief research officer, Mississippi State attained Carnegie Foundation R1-Very High Research Activity Doctoral University status and consistently ranked among the National Science Foundation's top 100 research institutions, including a national ranking of 9th in agriculture research and 17th in social sciences. The university's research expenditures totaled nearly $241 million in FY 2017, accounting for more than half of the total in research and development expenditures reported by all Mississippi institutions. He also worked closely with local, state, and regional economic development officials to recruit new companies to the state.

Dr. Shaw joined the Mississippi State faculty as an assistant professor in 1985, with a joint teaching and research appointment. In 1999, he was recognized as a William L. Giles Distinguished Professor, the university's highest honorary distinction.

Mississippi Academy of Sciences Fellows -2022

Dr. Alex D. W. Acholonu is an emeritus professor of biology at Alcorn State University. He has a Ph.D. degree with specialties in parasitology, microbiology, and developed expertise in environmental biology. He has a certificate in public health and tropical medicine from Tulane University, New Orleans, Louisiana. He was an academic administrator who held all positions in academia and pro-chancellor (higher than a president). He is a nationally and internationally recognized educator who has published two books one of which is his autobiography, "My Journey Through Life", two booklets, four book chapters, and 111 publications in reputable journals and numerous abstracts. He has excelled in his field of expertise and has won many national and international recognitions and accolades. He is cited as one of two thousand outstanding intellectuals of the 21st century among others by the International Biographical Center, Cambridge, England. He received a universal award of accomplishments in microbiology and parasitology from the American Biographical Institute, one of the top hundred educators of the year 2005 and Who's Who among America's teachers (2004-2005). He is a recipient of the Nigerian National Honors Awards Medal of Officer of the Order of Niger (OON) in 2003 given by the President of Nigeria. He has several fellowships which include Fellow of the Nigerian Society for Parasitology (FNSP), Fellow of the Renewable and Alternative Energy Society of Nigeria (FREAS), and Fellow of the Nigerian Academy Science (FAS), the highest honor given to a scientist in Nigeria. He was an executive board member of the World Federation for Parasitologists. He was the MAS chair of the Division of Zoology and Entomology several times and vice-chair several times. He was chair of the Healthcare Disparity Committee. He served as president of the faculty senate of Alcorn State University. Dr. Acholonu has been very active in research which has taken him to many parts of the US and the world. He has supervised the research of many undergraduate and graduate students. One of his most outstanding research accomplishments is his discovery, naming, and description of 14 new species of parasites. He is currently the Editor-in-chief of Advances in Science and Technologies Journal and Community Voice Action Magazine. He is also currently the vice-chair of the Zoology and Entomology Division. He has supervised the research of many undergraduate and graduate students. Dr. Acholonu is a recipient of the MAS award of Distinguished Contribution to Science and Diversity and Healthcare Disparity Award.

Dr. Renee Clary, Professor of Geology in the Department of Geosciences at Mississippi State University, also serves as the Director of the University's Dunn-Seiler Museum. She received her undergraduate degree in Chemistry and two Master's degrees (Geology, Curriculum and Instruction – Science Education) at the University of Louisiana at Lafayette before completing her Ph.D. in Curriculum and Instruction (Geoscience Education) at Louisiana State University. Dr. Clary is an elected Fellow of the Geological Society of London, the Geological Society of America, and the American Association for the Advancement of Science. In 2021, she received the National Association of Geoscience Teachers (NAGT) Transformation Award for outstanding research. She is also a recipient of an SEC Faculty Achievement Award and the Geological Society of America Gerald M. and Sue T. Friedman Award. Dr. Clary's research specializes in optimizing science learning in traditional, online, and informal settings. In addition, she conducts and supervises research in paleontology, environmental geochemistry, and the history and philosophy of science. Dr. Clary currently serves as the President of the History of Earth Sciences Society and is a past chair of the Geological Society of America History and Philosophy of Geology Division; she also has served on numerous editorial boards. Dr. Clary authored more than 80 peer-reviewed journal articles, 30 peer-reviewed book chapters, and has presented more than 300 peer-reviewed research presentations on five continents. She is a past recipient of the MAS Outstanding Contributions to Science Award

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Dr. Elasri is an active researcher in infectious diseases and has developed a research program in antibiotic resistance and biofilm development. Dr. Elasri earned his doctorate in Microbiology and Molecular Genetics from Oklahoma State University. He was a postdoctoral fellow at the National Institutes of Health and the University of Arkansas for Medical Sciences. In 2013, he was named the T.W. Bennett Professor of Infectious Diseases at The University of Southern Mississippi. Dr. Elasri served as Principal Investigator and Director of the Mississippi INBRE and founded and directed the Center for Molecular and Cellular Biosciences at The University of Southern Mississippi. He has been awarded over $65 million in extramural funding as a Principal Investigator or Co-Principal Investigator.

Dr. Elasri is also passionate about addressing health disparities for underserved communities. He has directed several interdisciplinary research projects in this field and co-founded a community health clinic for underserved residents of south Mississippi. In his continuing effort to bring researchers together and foster interdisciplinary collaborations, Dr. Elasri founded the first statewide biomedical research conference in Mississippi, as well as the Annual Mississippi Health Disparities Conference, which brings together stakeholders to address health equity issues.

At the onset of the COVID-19 pandemic, Dr. Elasri developed an emergency COVID-19 PCR testing facility for south Mississippi. The testing facility allowed regional health care providers to carry on essential surgeries and care; it was also essential for reopening The University of Southern Mississippi campus.

Dr. Elasri has received numerous honors, including the Multidisciplinary Research Innovation Award from The University of Southern Mississippi (2020), the Outstanding Contribution to Health Disparity and Diversity Research Award from the Mississippi Academy of Sciences (2020), and the Diversity Award for Excellence from the Mississippi Board of Trustees of State Institutions of Higher Learning (2017).

Recently, Dr. Elasri has joined the University of Arkansas for Medical Sciences in the role of Associate Vice Chancellor for Research. In addition to his admirative role, Dr. Elasri intends to continue his work on developing new therapeutics for antibiotic resistant microbes.

Larry S. McDaniel is Professor and Chair of the Department of Microbiology and Immunology at the University of Mississippi Medical Center. He is a past President of the Mississippi Academy of Sciences. He is a Fellow of the Infectious Diseases Society of America and The American Academy of Microbiology. McDaniel's lab works on host-pathogen interactions using model systems of *Streptococcus pneumoniae*, *Acinetobacter baumannii*, and *Pseudomonas aeruginosa*. His lab also investigates the host immune response against bacterial antigens with an emphasis on vaccine development. As Chair of the Department, he played an integral role in the Medical Center's response to SARS-CoV-2 in Mississippi. The Department in conjunction with the Department of Pathology developed an in-house test for the Coronavirus. This allowed the Medical Center to handle the high volume of testing in response to the pandemic. Currently the Department is conducting studies of immune responses of vaccinated individuals. The Department is also collaborating with the Molecular Biology Core and the Mississippi State Department of Health to sequence SARS-CoV-2 to identify variants in the state.

Thursday, March 31st, MAS Symposia

Plenary Speaker

Thursday, March 31, 2022
Hall B

Louis Stokes Mississippi Alliance for Minority Participation (LSMAMP) Symposia Symposium

Chair(s): Dr. Victor Ogungbe and Dr. Martha Tchounwou, Jackson State University

12:00pm-12:45 pm

Motivational Speaker: Dr. Kendrick Savage (Former LSMAMP Student)

Moderator: Mrs. Jacqueline Vinson (University of Mississippi)

Dr. Kendrick Savage is a native of Oxford, MS. He is a first-generation college student. He earned his B.S. in mathematics from the University of Mississippi, an M.S. in mathematics from Mississippi State University, an M.A. in teaching from Mississippi State University, and a Ph.D. in mathematics education from Mississippi State University. Dr. Savage is currently an Assistant Professor of mathematics and mathematics education at Georgia Gwinnett College where in his short time there he has been nominated for Georgia Gwinnett College's Outstanding Teacher Award twice (most recently in 2021) and for the Student Engagement Award. Dr. Savage is a passionate motivator. Being a first-generation college graduate, he has achieved many academic firsts. However, his focus is not on being first, it is to make sure he is not the last one to overcome difficulty and reach their dreams. His journey to attaining his Ph.D. was anything but smooth. Therefore, he is devoted to using life lessons, the difficulties he overcame, and his desire to help others keep their dreams alive. On another note, Dr. Savage enjoys running, strength training, spoken word poetry, working with his church, and spending time with his family. His most precious gifts in life are his wife and his two beautiful young daughters.

Thursday, March 31st, MAS Symposia
Plenary Speaker

Thursday, March 31, 2022

Moderator: Dr. Felix Okojie

1:00-1:45 pm
Hall B

Speaker: Dr. Stella Anyangwe

World Health Organization representative retiree, and Department Of Health, South Africa, National Advisory Group on Immunization (NAGI)

Theme: Diversity and Impact of COVID-19 on Under-Represented Minority Communities

Dr. Stella Anyangwe is a physician and an experienced, results-driven epidemiologist and global health practitioner, manager and team player, with a long history of successful work in the public health care system of developing countries. Successfully served the United Nations (World Health Organization) in multiple capacities, over a period of 17 years, and retired in April 2013. Accomplished academic, having taught Epidemiology, Social Determinants of Health and Disaster Risk Management in various universities and institutions across Africa (including University of Yaoundé Medical School, Monash University South Africa, University of Pretoria, and the South African National Defence Force [SANDF] Health Training School). With the deep belief that knowledge transfer is key for health systems strengthening, my driving passion is to train and mentor all levels of health care professional, in the public and non-governmental sectors, in Global Health disciplines, with a view to contributing towards Universal Health Coverage in Sub-Saharan Africa.

1:30-2:00 (Closed Session- Room B2/B3)

LSMAMP Executive Committee Meeting (Program Administrators, Site coordinators, and NSF Program Director).

Organizers: Dr. Hattie Spencer: Mississippi Valley State University and Ms. Sonia Eley Alcorn State University (Organizers)

Friday, April 1st, MAS Symposia

MAS Scholar Symposium

Sponsored by Millsaps College and Mississippi INBRE

Friday, April 1, 2022
12:00 P.M. (Hall B Room 5-6)

86th Annual Mississippi Academy of Sciences Meeting
March 31-April 1, 2022

Biloxi Convention Center
Biloxi, MS

The MAS, in its commitment to recognize and promote novel student research, would like to announce the following prestigious awards:

1. Millsaps Undergraduate Scholars Symposium

Honoring Excellence in Science in Mississippi
Symposium Chairman: Timothy J. Ward | Associate Dean of Research, Millsaps College
Event Coordinator: Mariam Ageli| MAS Executive Assistant
Millsaps College, Jackson, MS

This symposium is intended to expand the scope and depth of opportunities for undergraduate student researchers to meet other student researchers and their mentors as well as to provide a dedicated venue to disseminate and present their research activities. Participation in undergraduate research increases self-confidence, independence, and critical thinking skills. Disseminating one's results by participating in conference symposia develops communication and presentation skills. These experiences create and foster a life-long quest for research and discovery. The sponsor of the symposium Millsaps College. Candidates in science and engineering research may be selected by their division chairs and approved MAS to compete for these outstanding awards.

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) of the 14 divisions will score the **top 10% of undergraduate student abstracts** to represent their division and present in the Millsaps sponsored lunch award symposium, "Honoring Excellence in Science

in Mississippi," on Friday April 1st from 12:00 am – 2:00 pm. **Student's name must appear as first author in both abstract and poster.**

2. After presenting in their division, the candidate students will agree to present their **posters** in the poster symposium following the Dodgen event on Thursday March 31st around 4-7 PM (see program for more detatils). Failure to physically present their poster and be present on Thursday 3/31/2022 disqualify the selected candidates from competing in the symposium. First author must be present to compete and presentation by a co-author will not be accepted.
3. Candidates presenting on Thursday and fail to attend the awards event on Friday will be disqualified and the awards will be moved to next score in line (must attend both events: Thursday evening and Friday event).
4. Power point poster must be uploaded in MAS website no later the 3/25/2022 at 5 PM to be included in the competition and sent to Judges for initial screening.
5. On Friday 4/1/2022 all candidate will receive scholar recognition certificates and will be invited to the podium to say few words (one minute). Top ten candidates will receive awards as follows: 1st Place: Certificate plus $250; 2nd Place: Certificate plus $200; 3rd Place: Certificate plus $150; 4th Place: Certificate plus $100; and honorable mention for 5th – 10th winners. Each selected candidate will receive a complementary one-year membership to MAS in addition of certificate of achievement. (Must be present at the awards ceremony to qualify for awards or certificates)

2. Mississippi INBRE Graduate/Post Graduate Scholars Symposium

Honoring Excellence in Science in Mississippi
Symposium Chairman: Dr. Alex Flynt | Program Coordinator, Mississippi INBRE
Event Coordinator: Mr. Danny Holland | Mississippi INBRE
The University of Southern Mississippi, Hattiesburg, MS

Sponsored by Mississippi IDeA Network of Biomedical Research Excellence (INBRE), this symposium is intended to promote and recognize meritorious research conducted by graduate students. Mississippi INBRE is a network of colleges and universities throughout Mississippi with the goal of enhancing biomedical research infrastructure, funding, and training opportunities to better the development of the next generation of researchers in Mississippi. Funded by the National Institutes of Health and housed at The University of Southern Mississippi, the mission of Mississippi INBRE is to reach out to Mississippians in order to improve health throughout the state and to engage talented researchers and students in biomedical research projects that will increase the state's research competitiveness as well as impact the health of citizens of Mississippi.

Criteria for Selection of recipients:

1. Each division chair(s) and vice chair(s) of the 14 divisions will score the **top 10% of graduate/post graduate student abstracts** to represent their division and present in the sponsored lunch award symposium, on Friday April 1st from 12:00 am – 2:00 pm. **Student's name must appear as first author in both abstract and poster.**
2. After presenting in their division, the candidate students will agree to present their **posters** in the poster symposium following the Dodgen event on Thursday March 31st around 4-7 PM (see program for more detatils). Failure to physically present their poster and be present on Thursday 3/31/2022 disqualify the selected candidates from competing in the symposium. First author must be present to compete and presentation by a co-author will not be accepted.
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Friday, April 1, 2022

11:00-12:00 (Hall B Room2/3)

LSMAMP Advisory Board Meeting

(Presidents/Provosts of Alliance Institutions and Program Administrators)

Moderator: **Dr. Glake Hill and** and **Dr. Victor Ogungbe**

LSMAMP Symposium

(LSMAMP participants only)

12:00 PM-1:00

Mrs. Natalla Boulton (Merrill Lynch)

The Role of Financial Wellness and Trajectories for Under-Represented Minorities

Moderators: **Michael Lowe**

Mrs. Natella Boulton is a Vice President and a Senior Financial Advisor with Merrill Lynch in Ridgeland, MS. She graduated from Mississippi University for Women in 2003 with a Bachelor's degree in Business Administration and Marketing. After spending several years in a corporate setting, followed by an Executive Director position with a nonprofit, Natella joined Merrill Lynch in 2012 relocating from Meridian to Ridgeland. As a Financial Advisor, Natella works with families and institutional clients to provide financial planning and investment management services. A native of Russia, Natella is active with the local international community, and has been instrumental in developing the first Russian-speaking community in MS. She is involved in a number of civic and philanthropic activities, and served on the board of directors of the MS Center for Nonprofits. She is currently a board member of the Mississippi Council on Economic Education. Natella was named as one of 50 Leading Business Women by the MS Business Journal in 2017, and was chosen as a recipient of the 2017 Global Diversity & Inclusion Award by Bank of America Corporation. Natella and her husband Charles have two daughters, and enjoy traveling, supporting the arts and spending time outdoors.

1:00pm-2:00pm

"Introduction to Computational Chemistry and Data Science using nanoHUB"

Moderator: Dr. Sarah Lee (University of Southern Mississippi)

Tomekia Simeon is a passionate Assistant Professor of Chemistry at Dillard University and a K-12 and higher education STEM advocate. Tomekia received her Ph.D. from Jackson State University in Physical Chemistry under the supervision of Prof. Jerzy Leszczynski. Afterward, she joined the groups of Profs. Mark Ratner and George Schatz at Northwestern University as a postdoctoral fellow. Her research involves using computational chemistry and theoretical methods to study the chemical and electronic properties of rare earth metals and ionic polyamide materials.

2:00pm-2:30pm **LSMAMP Students Awards**

Closing Remarks: **Dr. Sarah Lee and Mr. Jonathan Townes**
(University of Southern Mississippi and Hinds Community College)

Group Photographs
Adjourn

LSMAMP Conference Room Managers: Mrs. Jacqueline Vinson and Ms. Amber Lampkin

DIVISIONAL SYMPOSIA AND WORKSHOPS
Thursday, March 31, 2022

ECOLOGY AND EVOLUTIONARY BIOLOGY
SYMPOSIA
8:15-9:15
Room L6

SYMPOSIA ON CONSERVATION THROUGH SCIENCE AND EDUCITON
***Organizers*: Dr. AHM Ali Reza and Dr. Nina Baghai-Riding**
Delta State University

James R. Lee, Biologist with the Mississippi Chapter of The Nature Conservancy, Camp Shelby, MS.

Title: **'*Gopher Tortoises (*Gopherus polyphemus*) Head-starting and Recovery Efforts in Mississippi*'**.

Jim will discuss the concept of re-establishing populations of the federally threatened, state endangered Gopher Tortoise (*Gopherus polyphemus*), via head-starting efforts, in southern Mississippi. By giving them a head start, the project gives them a much greater chance of surviving to sexual maturity and growing a healthy population.

Jim is a native of Upstate New York and graduated with a bachelor's degree in Wildlife Management from S.U.N.Y Cobleskill. While attending Towson University for his master's in biology, his thesis work focused upon the hibernation ecology of a small rattlesnake species in Missouri. For the past 17 years Jim's work has focused on reptile and amphibian conservation in general, and specifically upon the recovery of the Dusky Gopher Frog (*Lithobates sevosus*), Gopher Tortoise, and Black Pinesnake (*Pituophis melanoleucus lodingi*).

Alyson A. Brink, Ph.D., Assistant Professor of Geology, University of Southern Mississippi, Hattiesburg, MS; Research Associate at the Sam Noble Museum, University of Oklahoma, Norman, OK.

Title: **'*On the Shores of the Western Interior Seaway: The Late Cretaceous mammals of Texas and Mississippi*'**.

Dr. Brink will discuss ~80-million-year-old mammal teeth from the Aguja Formation near the Big Bend area of Texas and the slightly older Tombigbee Sand of the Eutaw Formation in Mississippi. She will discuss how these specimens might illuminate potential differences in southern latitude paleoecology of Laurasia during the Late Cretaceous.

Dr. Brink is a native of San Antonio, Texas. She graduated from Texas A&M with a bachelor's degree in English and returned to school fifteen years later to pursue her Ph.D. in Geosciences (it's a journey she's happy to share, so just ask her!). Dr. Brink graduated from Texas Tech University in 2016 and began work at USM as an adjunct instructor and Visiting Assistant Professor for three years before accepting a position as Assistant Professor. The focus of her research is primarily Late Cretaceous mammals, but she has also published on dinosaurs, lizards, turtles, fish, and other vertebrate fauna.

AHM Ali Reza, Ph.D., Associate Professor of Biology and Environmental Sciences, Division of Math and Sciences, Delta State University, Cleveland, MS.

Title: **'*Turtles of Bangladesh: Population and Conservation Challenges in an Over-populated Landscape*'.**

Out of the 30 freshwater Testudine species of Bangladesh, IUCN reports 22 species (over 73%) are facing some kind of conservation threats. That means wild turtles of Bangladesh are in great danger; several species are distributed in very isolated locations. Unless some aggressive measures are taken to save them, there is likely a high chance that we might have to lose these amazing creatures in the near future. Dr. Reza will share some of his personal experiences with these turtles as well as the associated challenges for their conservation in Bangladesh. The presentation will also provide the latest update on the population status and major initiatives pertaining to the conservation of wild turtles of Bangladesh. He will also discuss some ways how you can get involved in some conservation initiatives on a personal level.

Dr. Reza is a trained wildlife professional and serving as an Associate Professor of Biology and Environmental Sciences at Delta State University where he coordinates 'widllife management' concentration under environmental science degree program. He received his Ph.D. from Texas Tech University studying amphibians and reptiles and their impacts of climate change. Before moving to Texas, Dr. Reza studied man-eating tiger from Bangladesh Sundarbans for his Masters thesis. Dr. Reza is well-published on vertebrate wildlife and travels across the globe in conducting research projects and study abroad programs. He currently serves as the Chair of the Ecology and Evolutionary Biology Discipline of the Mississippi Academy of Sciences.

HEALTH SCIENCES
Symposium I
TELEHEALTH
10:10 AM-12:00 PM
Room D2

Moderators: Drs. D. Olga McDaniel and Candace M. Howard-Claudio

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10:15-10:40 AM

Dr. Saurabh Chandra, Chief Telehealth Officer at University of Mississippi Medical Center

Title of Talk: " Telehealth in the post-pandemic era"

Dr. Chandra is a critical care physician with a passion for promoting Telehealth as a modality for healthcare delivery. He will discuss the impact of telehealth in the post pandemic era, the contribution to science and research, and how the population may benefit from such system.

Dr. Chandra received his medical degree from MLN Medical College in Allahabad, India, and his Ph.D. from the Department of Life Sciences at Indiana State University. He completed an internal medicine residency at The Christ Hospital in Cincinnati and a fellowship in critical care medicine at the University of Pittsburgh Medical Center. He also was a research fellow at Cincinnati Children's Hospital.

Dr. Chandra is a very collaborative person and has a dedicated focus on telehealth on a daily bases and that will help bring to Medical Center the next generation level of telehealth for delivering high quality patient care across the state of Mississippi.

10:45-11:10 AM

Elizabeth Heitman, Ph.D., Professor in the Department of Psychiatry, Division of Ethics in Science and Medicine, at University of Texas Southwestern

Title of Talk: " Ethical Issues in Telehealth"

Dr. Heiman's presentation on "Ethical Issues in Telehealth" will look at the longstanding promises of telehealth, and how COVID-19 both realized many of its long-awaited benefits and highlighted important ethical challenges for patient care and privacy.

Dr. Heitman is a biomedical ethicist whose work focuses on cultural aspects of ethics in public health, biomedical science, and clinical medicine. She teaches particularly international standards of research ethics and education in the responsible conduct of research (RCR).

She received her Ph.D. in Religious Studies in 1988 from Rice University's joint program in biomedical ethics with the University of Texas Houston Health Science Center. Her undergraduate studies were in Romance Languages and she has a long record of teaching research ethics and RCR in Latin America.

Dr. Heitman a Co-Investigator and Mentor in the Jackson Heart Study Graduate Training and Education Center at University of Mississippi Medical Center (UMMC GTEC) and for the past 20 years has been an instructor and consultant for the ethics course at the Undergraduate Training and Education Center (UTEC) at Tougaloo College.

Dr. Heitman is a National Associate of the US National Research Council and has been chair or member of eight US National Academy of Sciences programs in research integrity education in the Middle East, North Africa, and Southeast Asia. In 2015-16, she co-chaired the National Academies' Committee on Gene Drive Research with Non-Human Organisms, and later served on NIH's Working Group on Gene Drive Research for the Novel and Exceptional Technology and Research Advisory Committee.

Dr. Heitman is a member of the American Association for the Advancement of Science, Association for Clinical and Translational Science, as well as the Association for Practical and Professional Ethics and the American Society for Bioethics and the Humanities.

11:15-11:40 AM

Dr. Jennifer Lemacks, PhD, RD, Associate Professor, School of Health Professions, University of Southern Mississippi

Title of Talk: "Telenutrition"

Dr. Lemacks will discuss application of telenurition through behavioral therapy targeting nutrition and physical activity behaviors.

Dr. Jennifer Lemacks is an Associate Professor and Associate Dean for Research at the University of Southern Mississippi College of Nursing and Health Professions. https://www.usm.edu/nursing-health-professions/index.php

Dr. Lemacks is a Registered Dietitian in Hattiesburg, MS with special training and skill in assessing, diagnosing, and treating dietary and nutritional problems.

She has received ample training in community-based participatory research methods and health interventions. Her research is driven by a passion to reduce preventable chronic disease disparities in underserved populations through behavioral therapy targeting nutrition and physical activity behaviors.

She has directed a project funded by the National Institutes of Health to explore how to utilize churches to deliver obesity management interventions to young and to middle-aged African Americans in South Mississippi. She has also directed a youth mentorship and nutrition program focused on improving diet and social behaviors of 5th graders in the Mississippi Delta. She serves as Co-Director of the Mississippi INBRE Community Engagement and Training Core, https://msinbre.org, Director of the Mississippi INBRE Telenutrition Center (https://telenutitioncenter.com), and manages three projects that address COVID-19, obesity and diabetes health disparities among African American, Native American and other underserved Mississippians.

Dr. Lemacks is originator of the Mississippi INBRE Outreach Scholars Program that engages students in community outreach and research activities over a 10-week intensive summer period. She is also one of the founding organizers of the Mississippi Health Disparities Conference (https://www.mississippihealthdisparities.org).

11:40-12:00 Discussion

CELLULAR AND MOLECULAR
Mississippi INBRE Microbiome Symposium
1:00 PM -3:00 PM
Room: D1

Microbiome Resilience- A New Frontier

Organizers: Dr. Shahid Karim,
Shahid.Karim@usm.edu)
Latoya Downs
Shahid.Karim@usm.edu
Center for Molecular and Cellular Biosciences, School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

1:00-1:05:
Welcome remarks

1:05-1:25 PM
An insight into the microRNA profile of an ectoparasite mite *Varroa destructor* (Acari: Varroidae)
Dr. Deepak Kumar
School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

1:25-1:45 PM:
piRNA in *Crassostrea virginica* a non-model organism
Dr. Yulica Santos Ortega
School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

1:45-2:05 PM:
Analysis of tick hemocytes in response to rickettsial infection based on RNA Sequencing
Abdulsalam Adegoke
School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

2:05-2:25 PM:
Investigating piRNA expression and function in regenerating tissue of Lophotrochozoans
Beatriz Schueng Zancanela
School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

2:25-2:45 PM:
Mysterious connection of tick bite and Alpha-Gal Syndrome
Surendra Sharma
School of Biological, Environmental, and Earth Sciences,
The University of Southern Mississippi, Hattiesburg, MS-39406

2:45-3:00 PM:
Open discussion and concluding remarks

Chemistry and Chemical Engineering
1:00 PM-2:00 PM
Room: D11

Career Workshop

Dr. Ruhul Amin is a scientist at Oak Ridge National Laboratory. He will discuss the opportunities of the STEM students and postdocs at the US National laboratories.

Dr. Wayne Huberty; Technical Director of Research at the Advanced Composites Institute, Mississippi State University. He will discuss the opportunities for the STEM students in aerospace science and engineering.

Dr. Julie Pigza is an Associate Professor, University of Southern Mississippi. She will cover careers in chemistry in academia that can range from a two-year community college to a primarily undergraduate institution (PUI) up through a research-intensive university.

Dr. Dale Rosado is the Manager - Analytical Chemistry for the Technical Services Lab at CF Industries. He will discuss the Chemistry, and Chemical engineering students' opportunities at CF Industries and at other industrial and government chemical laboratories and manufacturing sites. He will also discuss the preparation of industrial jobs. Including strategies for networking and finding jobs in the South.

HEALTH SCIENCES
1:00 PM -3:00 PM
Interactive Workshop
Room: D2

Open Arms Health Center

Jennifer Lemacks, PhD, RD, Professor, University of Southern Mississippi, Associate Director, University of Southern Mississippi School of Kinesiology and Nutrition, Co-Director, Open Arms Healthcare Center.

Title: "An Academic Primary Prevention Center Model for Community Health Solutions "

Open Arms Healthcare Center is the State of Art health facility creating a healthier Mississippi. In conjunction with Mississippi INBRE at The University of Southern Mississippi (USM) and My Brother's Keeper, Inc., a new Open Arms Healthcare Center/ Clinic was opened in downtown Hattiesburg Oct. 1. Practitioners, educators, and researchers will work together on-site to provide Hattiesburg with community health solutions, representing a unique opportunity for both residents and healthcare professionals.

Dr. Jennifer Lemacks, director of the Mississippi INBRE Telenutrition Center, and Co-Director of the Mississippi INBRE Community Engagement and Training Core, https://msinbre.org, describes:

This is probably the first site of its kind in Mississippi, which provides integration of co-learning from the community, practitioners, researchers, and everybody that's involved in the care of patients.

Additional speakers at the event: Alicia Barnes, MBA and Mauda Monger, PhD, MPH

MATHEMATICS, COMPUTER SCIENCE, STATISTICS
SCIENCE EDUCATION
WORKSHOP
1:00 PM -2:30 PM
Room: D7

ILLUSTRATING SPECIFIC STATISTICAL TOOLS REQUIRED FOR DESIGNING RESEARCH STUDIES –POWER ANALYSIS

Jamil Ibrahim
University of Mississippi Medical Center, Jackson, MS

Statistics is useful in almost all fields especially in research studies. Statisticians should be involved from the beginning of these studies. In research practice, the most common requests to statisticians from investigators are sample size calculations or sample size justifications. The techniques of statistical power, sample size estimations and confidence intervals are the most important aspects of a research study. Determining sample size is one of the most important steps in designing a study. In order to have reliable and valid results, it is important to determine the right sample in combination with high quality data collection efforts. Sometimes, researchers have different opinions as to how sample size should be calculated. Statisticians usually choose from many available formulas that can be applied for different types of data and study designs. The aim of this presentation is to clarify this issue and to provide examples on how to calculate sample size. The components of sample size calculations will be discussed and what factors to consider in choosing the sample size. Other concepts related to this issue such as power analysis, confidence intervals, variability, type I error, type II error, and minimum effect size of interest will also be discussed.

SCIENCE EDUCATION
Mini-Symposium
1:00 PM -3:30 PM
Room: D12

"RESEARCH MENTORSHIP AND UNIVERSITY OUTREACH: THE MISSISSIPPI BASE PAIR CONSORTIUM"

Organizer: Rob Rockhold, PhD., Deputy Chief, University of Mississippi Medical Center

Faculty at Mississippi Institutions of Higher Learning have a proud tradition of mentoring young students in the basics of scientific research. This outreach has demonstrable positive outcomes in improving science identity in precollege students, particularly of non-traditional and underserved populations. Further, it provides significant advantages for recruitment into higher education as well as enhancing diversity within the STEMM (Science, Technology, Engineering, Mathematics, and Medicine) workforce. This presentation illustrates the nature and degree of research mentorship opportunities across six research-intensive Mississippi universities (Delta State University, Jackson State University, Mississippi State University, University of Mississippi, University of Mississippi Medical Center (UMMC), and University of Southern Mississippi), and highlights the nature of campus-specific mentorship activities, along with outcomes for student recruitment and career advancement. It also serves to introduce a new cross-campus research mentorship initiative aimed specifically at high school students, the Mississippi Base Pair Consortium (MBPC). A keynote address from a national outreach expert will highlight important principles in mentoring high school students in STEMM. Following the presentations, a round table discussion will initiate conversations for best practices for implementation of the MBPC moving forward. The MBPC is an evolution of a biomedical research mentorship program, called Base Pair, that originated between UMMC and Murrah High school in the Jackson Public School District. Funded by an award from the Phil Hardin Foundation, the MBPC will replicate key elements of the Base Pair model while introducing unique, campus-specific collaborations with local secondary schools. The MBPC is envisioned as the core of a potentially state-wide effort to enhance STEMM education and establish best practices for mentorship of high school students in a research-intensive university environment.

1:00 Welcome and Introduction
Rob Rockhold, PhD, University of Mississippi Medical Center

1:10 Base Pair: Program Structure and Key Outcomes
Rob Rockhold, PhD, University of Mississippi Medical Center

1:20 Keynote Speaker: "Achieving Health Care and STEM Workforce Diversity"
Catherine Morton, EdD, University of West Virginia

1:45 BREAK

1:55 OKRADiscovery: Delta State University K-12 STEM Outreach
Tanya McKinney,Delta State University

2:05 Challenging Minds, Changing Lives: STEM Outreach, Mississippi Schools
Mehri Fadavi, PhD, Cary Smith, Jackson State University

2:15 MSU Partnership School and Outreach Initiatives
Amanda Tullus, Med, Mississippi State Univeristy

2:25 University of Mississippi Outreach
Ellen Shelton,EdD, Univeristy of Mississippi

2:35 Discovery U
Sydney Murphy, PhD., University of Mississippi Medical Center

2:45 University of Southern Mississippi Health Sciences and Wellness Academy
Janet Donaldson, PhD, Univeristy of Southern Mississippi

2:55 BREAK

3:05 Panel Discussion-University Outreach and Mentorship

3:30 Concluding Remarks
Rob Rockhold, PhD, University of Mississippi Medical Center

DIVISIONAL SYMPOSIA AND WORKSHOPS
Friday, April 1, 2022

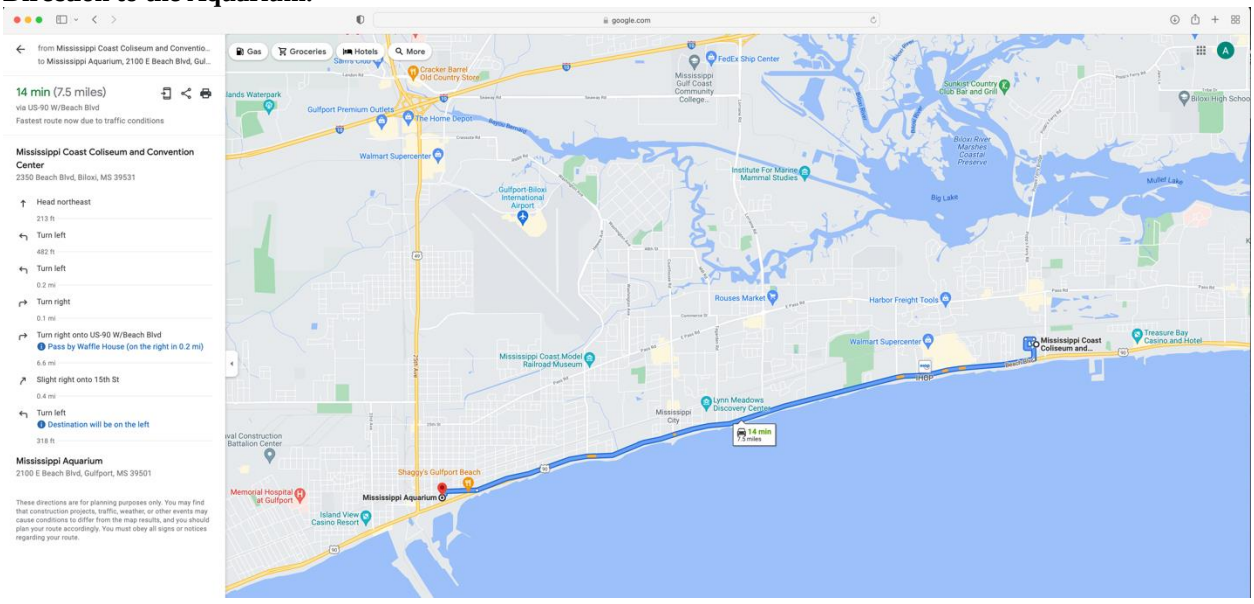
ECOLOGY AND EVOLUTIONARY BIOLOGY
FRIDAY 10:00-12:00

FIELD TRIP TO THE MISSISSIPPI AQUARIUM

***Organizers*: Dr. AHM Ali Reza and Dr. Nina Baghai-Riding, Delta State University**
[*RSVP email:* areza@deltastate.edu | *RSVP phone: 806-438-5622*]

Opened in August 2020, **Mississippi Aquarium** is a premier institution delivering an awe-inspiring entertainment experience which supports animal research and conservation, inspires learning and instills a passion for the aquatic world. The Aquarium tells the incredible story of all of Mississippi's aquatic resources from the Delta to the coastline and the remarkable connection that ties all of the state's natural resources uniquely together. Featuring the warm waters of the Gulf of Mexico and beyond, the roaring waters of the mighty Mississippi River and the wetlands and marshes of the tranquil bayous, the story of Mississippi's natural resources had never been told in this extraordinary way. The Aquarium understands that living in Mississippi is about the outdoor experience and the relationships of its people. Mississippi Aquarium represents education, conservation and community. The Aquarium provides visitors many opportunities to be entertained and fully immersed in the aquatic wonder that Mississippi has to offer.

Direction to the Aquarium:



Regular Adult Admission to the Aquarium: $29.95

Discounted MAS Deligates Admission: $25.45

[Due to COVID-19 restrictions, we are not providing transportation to the Aquarium]

Room: D2

OMICs APPLIED IN THE DISEASE DIAGNOSTICS

Moderators: Drs. D. Olga McDaniel, Edward Florez and Maricica Pacurari
University of Mississippi Medical Center and Jackson State University
Speakers and Topics

10:15-10:40 AM

Errol D. Crook, M.D. Professor and Chair
The Department of Internal Medicine at University of South Alabama College of Medicine, Director of the Center for Healthy Communities and Abraham A. Mitchell Professor

Title of Talk: " Kidney disease and Therapeutics"

Dr. Crook will discuss cause of diabetic kidney disease and prevalence in population diversity.
A native of Monroeville, Alabama, Dr. Crook received his undergraduate degree from Yale College and his Doctorate of Medicine from the Vagelos College of Physician and Surgeons of Columbia University in New York. He trained in internal medicine and nephrology at the University of Alabama - Birmingham Hospitals.
Prior to moving to Mobile Dr. Crook was on faculty at Wayne State University School of Medicine in Detroit, MI, where he served as interim chairman of the Department of Internal Medicine, and the University of Mississippi Medical Center in Jackson.
He serves as Director of the University of South Alabama Center for Healthy Communities and PI of their National Center of Excellence Grant from the NIH's National Center for Minority Health and Health Disparities.
Dr. Crook's research focus has been in health disparities and has evolved from bench research on diabetes and its complications to translational research in diabetic and hypertension related kidney and cardiovascular disease to the community engaged research he and his colleagues perform today.
Dr. Crook is Past-President of the American Federation for Medical Research and a past member of the SSCI Council. He has authored or co-authored over 100 manuscripts and book chapters and has been an invited speaker at several institutions.

10:45-11:10 AM

Dr. Michael Hall, Associate Professor of Medicine, and Interim Chair
University of Mississippi Medical Center

Title of Talk: " Hypertension and Transition to Heart Failure"

Dr. Michael Hall will discuss potential mechanisms in the transition from hypertension to heart failure, including studies of cardiac imaging, circulating biomarkers, inflammation and kidney dysfunction.
Dr. Michael Hall received his medical degree from the School of Medicine in 2005 at UMMC, where he completed residency training in internal medicine. After his residency, Dr. Hall participated in the physician-scientist pathway in cardiovascular research in the UMMC Department of Physiology and Biophysics.
He had Fellowship training in cardiology at UMMC, and Fellowship in cardiovascular imaging at Wake Forest University Health Sciences in Winston-Salem, North Carolina, where he also earned a Master's Degree in clinical and population translational sciences.

Dr. Michael Hall also holds faculty appointments in the Department of Physiology and Biophysics, and in the Department of Radiology. He has assumed many leadership roles, including director of clinical and population science in the Mississippi Center for Clinical and Translational Research; associate director of the Cardiology Fellowship Program; and cardiac imaging director for the Cardiovascular Service Line.

Dr. Hall is an investigator on numerous active NIH research grants. Among awards he received the 2019 Gold Award for Research, Office of Sponsored Programs; and the 2018 Department of Medicine Exemplary Research Award. He has authored or co-authored many manuscripts and book chapters and has been an invited speaker at several institutions.

11:15-11:40 AM

Paul Byers, MD, State Epidemiologist, Mississippi Department of Health

Title of Talk: "COVID-19 Pandemic Update - Mississippi, 2022"

Dr. Byers will provide review of current epidemiology of COVID-19 in Mississippi, the disproportionate racial impacts of cases/deaths, and current vaccination data for Mississippi and how vaccinations have impacted transmission and deaths, especially among the most vulnerable populations.

Dr. Paul Byers received his Bachelor of Science degree from Millsaps College in Biology. He earned his Medical Degree from the University of Mississippi, with training in internal medicine in 1992. He began his career at the Mississippi State Department of Health in 1993, providing direct patient care at the County Health Department level and serving as the medical director for the dedicated STD clinic for several years.

In 2005, Dr. Byers moved to the Office of Communicable Diseases, serving in multiple positions including Medical Director, Deputy State Epidemiologist and Acting State Epidemiologist.

In 2016, Dr. Byers was appointed State Epidemiologist. He provides medical direction for the Office of Communicable Diseases which includes the Offices of Immunization, STD/HIV and Tuberculosis.

Dr. Byers has led the responses and investigations around multiple emerging diseases and conditions including Ebola, Zika, vaping related lung injuries and most recently, COVID pandemic. He has participated or led the response of many other situations of public health significance like Hurricane Katrina and subsequent hurricanes and has been involved in the investigations of many diseases and conditions such as Mumps, hepatitis A and other vaccine preventable diseases, foodborne outbreaks and outbreaks of Legionnaires' disease.

Dr. Byers is a key figure in the public-health response to COVID-19, including an expansive testing and tracing regime intended to prevent community transmission of virus and identify clusters where it spread. He has authored multiple publications and given numerous presentations about Epidemiology and Public Health.

GEOLOGY
1:00 PM
Room: D5

Division Keynote

Sedimentary History of Gale Crater and Its Implication for the Geological Evolution of the Planet Mars

Ezat Heydari

Dept. of Physics, Atmospheric Science, and Geoscience, Jackson State University, Jackson, MS 39217

E-mail: ezat.heydari@jsums.edu

The Curiosity Rover landed in Gale Crater, Mars, in August of 2012. The primary goal of the mission is to examine modern and ancient rock record in search of habitable environments using diverse payload on board the rover. Two Mast-mounted cameras take colored images of rock outcrops. A high resolution camera (MAHLI) on the Rover's robotic arm can resolve grains as small as fine sand. Bulk elemental analyses are determined by APXS and spot analysis by laser ablation of ChemCam instrument. SAM is a gas chromatograph – mass spectrometer and a gas analyzer to examine composition of gases released by heating of samples. CheMin instrument is an x-ray diffractometer that determines mineralogy of powdered samples. DAN instrument analyzes rocks and soils for sings of water. REMS instrument is a weather station reporting temperature, wind, and humidity. RAD instrument continuously measures solar and cosmic radiation.

The rover has so far traveled over 20 km and investigated lithology, mineralogy, elemental composition, and isotoptic signatures of rocks and sediments along its path. This presentation concentrates on sedimentological characteristics of selected strata examined by the Curiosity rover. The study demonstrates that initial sedimentological interpretation based on Earth-based uniformitarian principles does not explain unique characteristics of sedimentary rocks of Gale crater. Detailed observations of strata in Gale crater suggests that sedimentation was dominated by catastrophic giant floods that was triggered by heat generated by asteroid impact. In contrast to the present-day cold and dry conditions, Mars appears to have had periods of active geological system with abundant water in its past.

HEALTH SCIENCES
1:30 PM-4:00 PM
Room: D2

The L.C. Dorsey Research Honor Society

1:30-4:00 PM **Symposium III**

Tribute to Dr. Lula C. Dorsey, (Dec. 17, 1938 – Aug. 21, 2013)

"The L.C. Dorsey Research Honor Society"

Dr. Dorsey was born in Tribbett, a small town in the Mississippi Delta. She was Civil rights and social justice activist.

The society is named after her. She was known for her commitment to improving the health and well-being of Mississippi's disadvantaged and disenfranchised populations. Being raised in the turbulent civil rights era, she dropped out of school in the 11th grade to keep her family safe, and with the help of Fannie Lou Hamer, she became an advocate for black delta residents and community involvement.

She returned to school when she was 31 years old and obtained her GED, a doctorate degree in social work from Howard University, a master's degree in social work from State University of New York, and a Certificate in Health Systems Management from John Hopkins University. She was one of the first Mississippians to obtain a master's degree in her field.

The L.C. Dorsey Research Honor Society is a regional, multidisciplinary network of social, behavioral, health, and citizen scientists created to recognize excellence in research contributing to the effort to improve health among vulnerable populations.

The society have contributed to the production of exceptional minority health disparities and education research. This honor society is comprised of graduate students, faculty and citizen scientist, who honor the life and legacy of Dr. L.C. Dorsey through a pursuit of research excellent, a focus on marginalized population and a willingness to invest in the next generation.

Time	Activity	Speaker(s)
1:30 – 1:40 PM	Introduction of Jackson Heart Study Graduate Training and Education Center at the University of Mississippi Medical Center (UMMC-GTEC) and Keynote Speaker	Dr. Jennifer Reneker Principal Investigator UMMC-GTEC
1:40 – 2:00 PM	Keynote Speaker	Dr. April Carson Director/Principal Investigator Jackson Heart Study
2:00 – 2:10 PM	The Association between Social Support and Medication Adherence among African Americans in the Jackson Heart Study	Alexcia Carr Robert Smith, MD Scholar
2:10 – 2:20 PM	Association of High Sensitivity C-reactive Protein with Stroke Incidence in African Americans: The Jackson Heart Study	Cellas Hayes Robert Smith, MD Scholar
2:20 – 2:30 PM	Investigating the Association of Parity on the Prevalence of Left Ventricular Hypertrophy within Jackson Heart Study	Maria Jones-Muhammad Robert Smith, MD Scholar
2:30 – 2:40 PM	Adherence to the Healthy Eating Index-2015 Versus Alternative Healthy Eating Index-2010 in Relation to Metabolic Syndrome among African Americans in the Jackson Heart Study	Nicole Reeder Robert Smith, MD Scholar
2:40 – 2:50 PM	Vitamin D Sufficiency and Type II Diabetes among African Americans: The Jackson Heart Study	Jamarius Waller Robert Smith, MD Scholar
2:50 – 3:00 PM	Social Support and Smoking among African Americans in the Jackson Heart Study	Roxanne Watts Robert Smith, MD Scholar
3:00 – 3:15 PM	Graduation Ceremony Robert Smith, MD Scholars Cohort 2 UMMC-GTEC	Dr. Jennifer Reneker Principal Investigator UMMC-GTEC
3:15 – 4:00 PM	Induction Ceremony L.C. Dorsey Research Honor Society	Dr. Elizabeth Heitman UMMC-GTEC Mentor and L.C. Dorsey Research Honor Society Inaugural Member

The GTEC Sponsored by the National Heart, Lung, and Blood Institute, National Institutes of Health, Department of Health and Human Services

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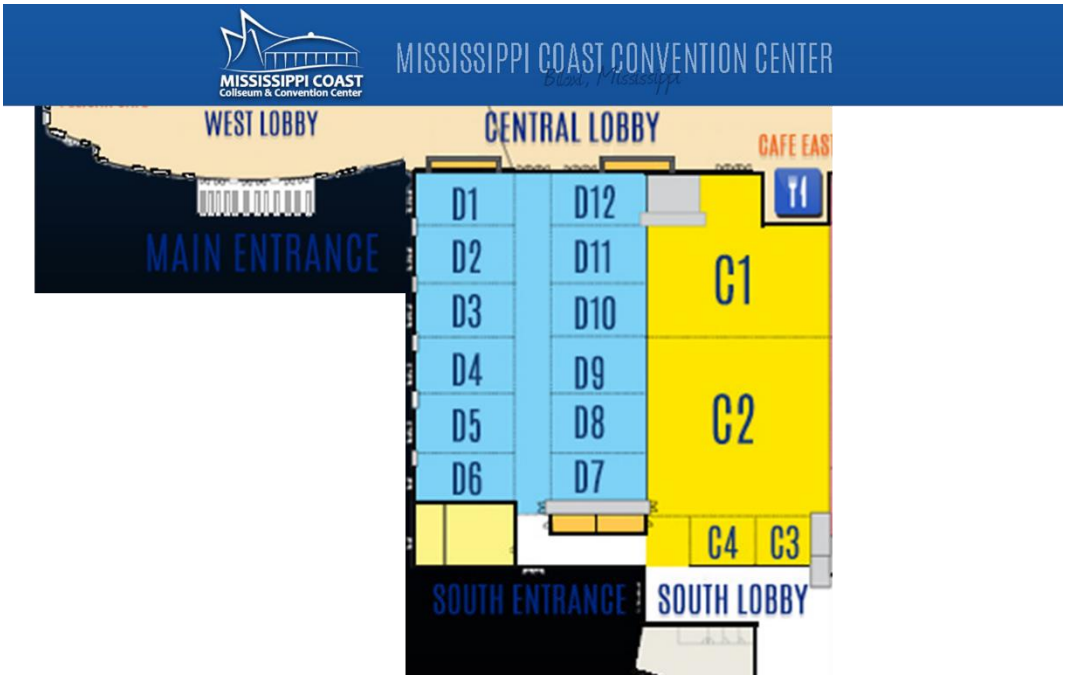
Mississippi Coast Coliseum and Convention Center Floor Plan



NOTES

Key to Abbreviations

O = Oral Presentation
P = Poster Presentation
1st number is Division

1	**Agriculture and Plant Science**
2	**Cellular, Molecular, and Developmental Biology**
3	**Chemistry and Chemical Engineering**
4	**Ecology and Evolutionary Biology**
5	**Geology and Geography**
6	**Health Sciences**
7	**History and Philosophy of Science**
8	**Marine and Atmospheric Sciences**
9	**Mathematics, Computer Science, and Statistics**
10	**Physics and Engineering**
11	**Psychology and Social Sciences**
12	**Science Education**
13	**Zoology and Entomology**

2nd number is Abstract Number within oral presentations or poster session
Eg., O3.04 = oral presentation (O) number 4 in the division of Chemistry and Chemical Engineering (3)

AGRICULTURE AND PLANT SCIENCES

Chair: Gurpreet Kaur

Mississippi State University

Vice-Chair: Raju Bheemanahalli Rangappa

Mississippi State University

Thursday, March 31, 2022

8:00 AM Opening remarks

Room D1

Moderator: Bhupinder Singh, Mississippi State University

O1.01

8:15 POTENTIAL BENEFITS OF ORGANIC AND MICROBIAL SOIL AMNEDMENTS IN SHORTLEAF PINE (*Pinus echinata*) RESTORATION IN NORTHCENTRAL ALABAMA

Casey Iwamoto, Courtney Siegert, Krishna Poudel, Adam Polinko, Joshua Granger

Mississippi State University, Mississippi State, MS, USA

Coal strip mining has left degraded soils throughout the southeastern United States. These soils tend to have low pH, high bulk density, impacted hydrologic processes, and an accumulation of heavy metals that limit revegetation and reforestation efforts. Shortleaf pine (*Pinus echinata*) has the adaptability to grow on post-mined sites due to being tolerant of soils with low pH. It also has the largest native range of pines in the southeastern United States, making it an ideal species for widespread restoration efforts. Currently, there are substantial efforts to restore shortleaf pine to the landscape, which includes this study. To restore post-mined soils to conditions where shortleaf pine can grow, a combination of organic a However, the current extent of shortleaf pine is threatened by climate change, disease, pests, and the commercial preference for loblolly pine (Pinus taeda). nd mycorrhizal amendments will be used. These amendments have been shown to increase carbon sequestration, reduce erosion, promote plant growth, and immobilize heavy metals. However, limited empirical field trials have been conducted on the success of these soil amendments on both soil health and tree productivity. To provide restoration recommendations to land managers and landowners, we established a field trial in Winston County, Alabama on a reclaimed mining site. We measured soil bulk density, pH, heavy metal content, electrical conductivity, carbon content, and nitrogen content both before and after planting every three months. We will also monitor shortleaf pine survival and growth. Our pr In Spring 2021 we planted shortleaf pine in a complete randomized block design with 30.5 x 30.5 m spacing with two treatments: organic and mycorrhizal fungi amendments in four replicates.eliminary results for pH, bulk density, and electrical conductivity are within the expected range for shortleaf pine to do well on this post-mined site. Prior to soil treatments and planting, soil pH was 5.55 ± 0.54 pH, dry bulk density was 1.51 ± 0.14 g/cm3, wet bulk density was 1.81 ± 0.13 g/cm3, and electrical conductivity was 248.68 ± 179.66 µS. Soil carbon content was 2.31 ± 0.76% and soil nitrogen content was 0.15 ± 0.04%. The average C:N ratio was 15.8:1. Survival of planted seedlings after six months was 80%. Changes in soil physical and chemical conditions relative to restoration treatments are pending. This study will help support our understanding of organic soil amendment's interaction with mycorrhizal fungi inoculation, role in shortleaf pine restoration, and use in southeastern United States soils.

O1.02

8:30 ADVANCED COMPOSTING TECHNOLOGY TO PRECIPITATE STRUVITE FOR SOIL HEALTH AND SUSTAINABLE CROP PRODUCTION

Aubreney Jackson, Girish Panicker, Leonard Kibet, Charles Weiss

Alcorn State University, Larman, MS, USA

Groundwater and surface water supplies are threatened with contamination from numerous sources. One of the most serious sources of non-point pollution is animal waste. Nitrogen contamination of groundwater in the forms of nitrate (NO3-N) or nitrite (NO2-N) is a major health concern. Runoff from field crops receiving raw animal manures contributes both nitrogen and phosphorus in surface waters. An aerobic composting technique with a soluble magnesium source was applied on the farm for over 30 days to the poultry manure of layers to convert the organic nitrogen and phosphorus to an inorganic compound (ammonium magnesium phosphate hydrate) that is similar to the mineral form of nitrate (struvite) produced naturally in guano deposits. This technique succeeded to produce composted wastes that are three to five times richer in nutrients than conventional compost, and the nitrogen and phosphorus are released slowly from this organically produced nutrient source. The production of struvite was confirmed through the use of X-ray diffraction analysis using an XPert Pro (Panlytical Co., Almelo, The Netherlands) of the materials after reaction. This high-quality compost, produced from poultry manure, will have great importance in maintaining soil health and sustainable agriculture. The aim of this study is to monitor the levels of contamination in both soil and leachate. Tomato **(***Solanum lycopersicum***)** was raised under controlled conditions on Memphis silt loam to evaluate the leachate for N and P. The presentation will cover step by step production practices of the compost on the field and the leachate analysis in the lab.

O1.03

8:45 SCREENING OF SWEET POTATO VARIETIES FOR THEIR ALLELOPATHIC EFFECTS ON GROWTH OF DIFFERENT WEED SPECIES UNDER FILED CONDITIONS

Varsha Singh[1], Isabel Werle[2], Mark W. Shankle[3], Stephen L. Mayer[4], Te-Ming Tseng[1]

[1]Mississippi State University, Starkville, MS, USA. [2]University of Arkansas, Fayetteville, AR, USA. [3]Mississippi State University, Pontotoc, MS, USA. [4]Purdue University, West Lafayette, IN, USA

The excessive use of herbicides has resulted in the development of resistance in weeds, and mechanical methods are laborious, time-consuming, and cause soil erosion. A more sustainable and effective approach for weed management is critical in agriculture to meet the growing need to feed the global population. Keeping that in view, the current study was conducted at two locations; Ridge-Flatwoods Branch Experiment Station in Pontotoc, MS, and R.R. Foil Plant Science Research Center in Starkville, MS, under the field conditions to determine the allelopathic (natural weed-suppressive) effect of selected sweet potato varieties on weed density. Six sweet potato varieties that showed significant allopathic suppression of weeds in the greenhouse experiment (Heart-O-Gold, Beauregard, Centennial, Hatteras, 529, and Morado) were planted in two-row plots along with a commercial variety B14. After three weeks of sweet potato transplanting, seeds of three weed species (yellow nutsedge, goosegrass, and

Palmer amaranth) were sown in between the rows of all the plots. Weed cover by weed species was recorded at 14, 21, and 28 days after sowing (DAS) of the weed seeds. Weed cover for the natural weed species present in the field was also recorded. At 14 DAS, only native weeds were able to grow in the plots. Even at 21 and 28 DAS, the growth of other native weeds was 20-90% higher than the three studied weeds in plots at both places. Analysis of variance showed that after 21 and 28 DAS, only broadleaf signalgrass cover was significantly variable in the periphery of different sweet potato varieties at the experiment station in Pontotoc. In the perimeter of the five varieties, the overall weed density at both locations was lower than the commercial variety B14. Among all the varieties, the weed density was highest in the presence of variety Heart-O-Gold, followed by B14. The findings of this study will help in identifying sweet potato varieties able to suppress the growth of different weeds in the field and reduce the dependency on herbicides in sweet potato fields. It will help improve the well-being of organic sweet potato growers and ultimately strengthen rural communities in sweet potato-producing regions of the country.

O1.04

9:00 GENOME-WIDE ASSOCIATION STUDY FOR MORPHOLOGICAL TRAITS IN BERMUDAGRASS (Cynodon spp.)

Lovepreet Singh[1], Yanqui Wu[2], Jay McCurdy[1], Barry Stewart[1], Crian Baldwin[1], Hongxu Dong[1]

[1]*Mississippi State University, Mississippi State, MS, USA.*
[2]*Oklahoma State University, Stillwater, OK, USA*

Limited knowledge of genetic and phenotypic diversity in bermudagrass (***Cynodon*** spp.) is hindrance for the development of new varieties and progress of bermudagrass breeding. A diversity panel of 206 bermudagrass accessions was assembled from USDA-NPGS, Oklahoma State University, and Mississippi State University, consisting of genotypes of worldwide origin. Germplasm panel contains accessions from two species that are predominantly used in turfgrass breeding: common bermudagrass (*C. dactylon* var. *dactylon*) and African bermudagrass (*C. transvaalensis*). Phenotypic data were collected on leaf length (LL), leaf width (LW), internode length (IL), stem/stolon diameter (SD) using electronic digital calipers in a greenhouse. A randomized complete block design was arranged for this study. Broad-sense heritability estimates from the first-year data are generally high for the traits studied: LL (0.96), LW (0.97), IL (0.94), SD (0.91). High heritabilities indicate that these traits can be genetically improved in breeding programs to develop new varieties. Field trials of this germplasm panel will generate phenotypic data that validate high heritabilities of these traits. Hundreds of thousands of single nucleotide polymorphisms (SNPs) are generated using genotyping-by-sequencing on an Illumina platform. Based on the first-year greenhouse data, genetic architectures of these traits are dissected by genome wide association studies (GWAS).

O1.05

9:15 WEED SUPPRESSION BY COTTON CHROMOSOME SUBSTITUTION LINES WITH WITHIN DIFFERENT COVER CROP SYSTEMS

Alyssa Miller, Paul Tseng

Mississippi State University, Mississippi State, MS, USA

Alternative weed control methods are needed in the production of cotton. Palmer amaranth is a problematic weed and most abundant in cotton in Mississippi and eight other states. This unwanted weed has shown ample ability to derive resistance to many herbicides- including glyphosate. It is extremely likely that Palmer amaranth will also evolve widespread resistance to glufosinate, 2,4-D, and dicamba if these chemicals are relied on too much. Cover crops have been used in agriculture to increase productivity while having little to no adverse effects on the environment. Cover crops help to control weeds as well as provide moisture in the soil. Alluding to the fact that cover crops can reduce the usage of herbicides, and in turn slow or even prevent the further evolution of herbicide resistant weeds, combining the two methods of utilizing cover crops as well as CS cotton lines weed pressure will hopefully be reduced and the need for chemical herbicides will be greatly reduced. Results from a stair-step screening conducted in our lab for allelopathy against Palmer amaranth using 43 separate cotton chromosome substitution lines showed that the top five lines were CS-10, CS-34, CS-1, and CS- 6. CS-10 was most suppressive and reduced Palmer amaranth density by 65%. Among the cover crop mixtures tested (fallow, rye+clover, rye+vetch, and rye+vetch+radish), the rye+vetch cover crop combination reduced Palmer amaranth density by 75% compared to plots without any cover crop (fallow).

O1.06

9:30 O1.06

9:30 FUNCTIONAL RELATIONSHIPS BETWEEN SOIL SALINITY AND CORN GROWTH AND DEVELOPMENT DURING EARLY SEASON

Ranadheer Reddy Vennam[1], Purushothaman Ramamoorthy[1], Sadikshya Poudel[1], Raju Bheemanahalli[1], K. Raja Reddy[1]

[1]*Mississippi State University, Mississippi State, MS, USA.*

Soil salinity is one of the most important global concerns that negatively affect crop growth, development, and productivity. Salt stress tolerance is a complex trait controlled by several morpho-physiological and biochemical processes. Improving salinity stress tolerance in corn **(**Zea mays L.) can be achieved by understanding how salinity affects corn's physiology, pigments, shoot, and root parameters during the early vegetative stage. Two independent experiments were conducted using the pot-culture facility to develop functional relationships between salinity and early-season vigor traits. Two commercial hybrids, Agrigold A6659VT2RIB and Pioneer P1316YHR were exposed to five salt concentrations (0, 3, 6, 9, 12 dSm^{-1}) at the V2 growth stage for 28 days. The potential of all morpho-physiological traits, measured 28 days after stress (DAS), significantly decreased in response to salt stress. Among studies on traits, salt stress (12 dSm^{-1}) had a higher inhibitory effect on stomatal conductance as it caused 69% and 58% reductions for A6659VT2RIB P1316YHR compared to the control, respectively. On the contrary, the root to shoot ratio increased by 25% (P1316YHR) and 7% (A6659VT2RIB) under severe salt stress than the control. Chlorophyll content ($r^2 = 0.85$) increased linearly with an increase in salt treatments. An increase in salinity treatments recorded a linear decrease in leaf area ($r^2 = 0.92$) and shoot biomass ($r^2 = 0.93$). While the canopy temperature showed a positive correlation with salt concentration. The functional algorithms developed in this study could help identify salt stress-tolerant or sensitive traits. In addition, the phenotypic data generated from our research helps to understand and initiate trait-based early-season salinity tolerance in corn.

O1.07

9:45 INDEPENDENT AND COMBINED EFFECTS OF HEAT AND DROUGHT STRESS DURING POD FILLING ON SOYBEAN

Sadikshya Poudel, Ranadheer Reddy Vennam, Raju Bheemanahalli, K. Raja Reddy

Mississippi State University, Mississippi State, MS, USA.

Impacts of individual stress (heat or drought) on soybean (*Glycine max*) physiological and morphological traits have been studied investigated. However, information related to interactive stress effects on the genetic potential of reproductive success is limited. In this study, ten soybean lines grown under non-stress conditions were subjected to four different treatments (32°C daytime with soil moisture content, 100% replacement of evapotranspiration (ET), characterized as an optimum growing condition), heat (38°C daytime+100% ET), drought (50% ET+32°C daytime) and heat and drought (38ºC+50% ET) during reproductive and pod filling stage. Individual and combined stress treatment-induced changes in (i) pollen germination, (ii) pigments, (iii) stomatal conductance and canopy/leaf temperature, and (iv) yield components were quantified. The average of all measured parameters was lower in the combined stress treatment relative to the control treatment. Maximum reduction in pollen germination was observed under interactive stress (25%) followed by drought (17%) compared with optimum conditions. At 15 days after stress treatments, the chlorophyll content of soybean lines decreased (24%) under combined stress conditions compared with the control. Drought stress alone or in combination with heat stress decreased stomatal conductance (95% or 98%), transpiration (82% or 91%), and leaf area (18% or 26%) compared plants grown at the control conditions. The pod weight was reduced by 48%, pod number was reduced by 35%, the number of seeds by 42%, and pod weight by 43% under combined heat and drought stress compared to that under control. Both heat and drought stress resulted in a marked reduction in pollen germination and yield components, drought resulted in more damage than heat stress.

O1.08

10:00 CHEMICAL CONTROL OF *Erigeron sumatrensis* WITH CROSS-RESISTANCE TO ACETOLACTATE SYNTHASE INHIBITORS

Vanessa Vital Silva[1], *Andreia Kazumi Suzukawa*[2], *Rubem Silverio Oliveira Jr*[1], *Te-Ming Tseng*[3]

[1]*State University of Maringa, Maringa, Parana, Brazil.* [2]*Oregon State University, Corvallis, OR, USA.* [3]*Mississippi State University, Starkville, MS, USA*

The selection of fleabane populations resistant to the herbicide chlorimuron-ethyl is an emerging phenomenon in most soybean and corn producing regions of Brazil. Studying herbicides with different modes of action in weed management systems is an important tactic to combat acetolactate synthase (ALS) inhibitor resistance. Currently, most herbicides used as an alternative or complement to chlorimuron-ethyl are also ALS inhibitors, such as diclosulam and cloransulam-methyl. Since the repeated use of herbicides with similar modes of action has resulted in the development of herbicide-resistant weed biotypes, there is a critical need to rotate herbicide modes of action. In our previous study, a resistant population showed cross-resistance to chlorimuron-ethyl and cloransulam-methyl applied post-emergence, and cross-resistance to chlorimuron-ethyl and diclosulam applied pre-emergence. Chlorimuron-ethyl resistance was, therefore, observed in two different modes of application (pre-and post-emergence). The objective of this work was to evaluate alternative herbicides for the control of a Sumatran fleabane population with cross-resistance to ALS inhibitor herbicides. Two greenhouse experiments were conducted, one with pre-emergence applications and another in post-emergence. The control percentage at 28 days after the application was evaluated. The use of residual herbicides for fleabane control is an essential tool for its management since the success of the herbicides applied post-emergence is linked to the stage of the plants and the environmental conditions at the time of application. Alternative herbicides to ALS inhibitors effective in fleabane control may be recommended in rotation with different modes of action to curtail resistance. The herbicides tembotrione, mesotrione, clomazone, amicarbazone, metribuzin, atrazine, flumioxazin, fomesafen, trifluralin, s-metolachlor, pyroxasulfone, and indaziflam evaluated pre-emergence in this work were efficient to control the resistant population (100% control). In post-emergence, saflufenacil and ammonium glufosinate isolated or associated with glyphosate, glyphosate+2,4-D, and glyphosate+dicamba are practical tools for management (more than 98% control). The contact herbicides paraquat, diquat, and [paraquat+diuron] also provided effective control (100% control). The results obtained in this study presents options for pre and post-emergence control of the resistant population with cross-resistance to ALS inhibitors.

O1.09

10:15 MECHANISM OF ACTION OF BENOXACOR SAFENER IN PROTECTING TOMATO AGAINST HERBICIDE DAMAGE

Tabata Oliveira, Stepfano Duarte, Edicarlos Castro, Bruna Martins, Carolina Moraes, Brooklyn Schumaker, Te Ming Tseng

Mississippi State University, Mississippi State, MS, USA

Safeners are substances used to protect crops. The mechanism involves the ability to metabolize different compounds, including herbicides. The primary action of safeners includes raising the crop´s endurance to herbicide damage by inducing the protein(s) involved in herbicide metabolism, catalyzing their detoxification in the crop´s system. This study aimed to understand the biochemical effect of benoxacor safener for use in tomato culture, including the activation of the detoxifying enzyme glutathione S-transferase (GST). The experiment was conducted in a randomized factorial design 4 x 2, with four replications which were separated into two treatments, A: four herbicides (Flumioxazin, Femosafen, Linuron, and Control), and B: two safener treatments (benoxacor and control). Both treatments were applied to the aerial part of the tomato seedlings. Visual injury at 3, 7, 14, and 21 days after application (DAA) and biomass at 21 DAA were evaluated. To determine GST activity, leaf tissues were collected 24 and 48 hours after herbicide application. A lower crop injury was observed with fomesafen, and linuron at 7 DAA with tomato was pre-treated with benoxacor. Biomass was higher in benoxacor pre-treated plants than benoxacor non-treated plants in fomesafen and linuron treatments. A close perusal of data indicates that seeds pre-treatment with benoxacor raised the GST activity of tomato plants, and the absence of the herbicide improved the GST activity. Benoxacor safener reduced crop injury and increased the GST enzyme activity in the presence of fomesafen. The use of benoxacor safener showed high potential in increasing GST enzymatic activity, assisting the detoxification of plants caused by herbicides. Knowledge of the defense mechanism(s) in plants will help improve our understanding of how safeners can offer protection against herbicides, thus leading to improved weed management strategies.

O1.10

10:30 MELATONIN AS A SAFENER IN COTTON AGAINST SUBLETHAL DOSES OF 2,4-D

Josiane Argenta[1], *Alyssa Miller*[1], *Te Ming Tseng*[1]

[1]*Mississippi State University, Starkville, MS, USA.*

Melatonin (N-acetyl-5-methoxytryptamine) is a well-known molecule for regulating sleep, mood, immune system and others, in humans and animals. Melatonin is an essential molecule in physiological processes such as germination, photosynthesis, flowering, senescence, and others in plants. In the recent years, melatonin has been shown to protect against biotic and abiotic stressors. It also has been suggested that melatonin can act as an essential reactive oxygen species (ROS) scavenger, protecting plants against herbicide damage. Therefore, the objective of this study was to evaluate the effect of melatonin in cotton sprayed with sublethal doses of 2,4-D. Plants were grown in the greenhouse at an average temperature of 35°C/25°C (day/night). When plants were at the two expanded leaf stages, melatonin at 100µM was added by drenching the soil for 3 consecutive days. In non-melatonin treatment, the soil was drenched with distilled water. Following melatonin treatment, all plants were sprayed with 0, 5, 25, 50, and 75% of 2,4-D field rate (0.8 kg/ha^{-1}). Herbicide injury was evaluated at 7, 14, 21, and 28 days after application (DAA). At 28 DAA, shoot and root biomass were collected. The data were subjected to analysis of variance (ANOVA) at $\alpha = 0.05$ using the software R. At 5% of 2,4-D, plants treated with melatonin showed significantly lower herbicide injury when compared to no-melatonin treatment ($p=<0.001$). Although melatonin-treated plants had a higher shoot and root biomass, the difference was not significant when comparing plants sprayed with 5% of 2,4-D. When 25, 50, and 75% of the field rate were applied, no significant injury between melatonin treated and untreated plants were found. Further research needs to be conducted to confirm our findings. Melatonin may act as a ROS scavenger, but only at the lower rate of 2,4-D. At higher herbicide rates, plants may require more prolonged melatonin treatment to induce their defense mechanisms.

O1.11

10:45 USING COTTON CHROMOSOME SUBSTITUTION LINES TO MANAGE WEEDS

Worlanyo Segbefia, Grace Fuller, Te-Ming Tseng

Mississippi State University, Mississippi State, MS, USA

Palmer amaranth (Amaranthus palmeri) is a common cotton weed that causes problems for cotton growers (Gossypium hirsutum). Palmer amaranth populations have evolved resistance to routinely used herbicides since the introduction of chemical management. Therefore, it is necessary to find alternative weed control mechanisms to reduce herbicide-resistant populations. Cotton lines were tested three times using the stair-step construction approach. Each plant in the system was monitored for height (cm) and chlorophyll concentration (cci). Statistical analysis revealed a difference in Palmer amaranth height decrease and chlorophyll concentration among the CS lines evaluated for 7, 14, and 21 DAE. Among the CS lines, the 14th DAE had the most significant variation in Palmer amaranth height decrease. Based on substantial differences, mean susceptibility was computed. K-clustering techniques led to hierarchical clustering, and a principal component analysis was used to determine allelochemicals. Finally, the CS lines were tested on the field. Farmers combating herbicide-resistant weed species or trying to limit the spread of herbicide-resistant populations might benefit from creating allelopathic cotton varieties. On the other hand, Allelopathy is a complicated phenomenon that will require further research to contribute significantly to Agriculture. Besides, it could increase the genetic diversity of cotton. Most importantly, allelopathy could be a natural replacement for synthetic herbicides.

O1.12

11:00 AN EVALUATION ON THE EFFECTS OF ADDITIONS AND DELETIONS OF SPECIFIC NUTRIENT MANAGEMENT STRATEGIES ON CORN YIELD AT DIFFERENT PLANT DENSITIES

James Dew[1], *Jagmandeep Dhillon*[1], *Amelia Fox*[1], *Gurbir Singh*[2], *Justin McCoy*[3], *Camden Oglesby*[1], *Ramandeep Sharma*[1]

[1]*Mississippi State University, Starkville, MS, USA.* [2]*Mississippi State University, Stoneville, MS, USA.* [3]*Mississippi State University, Verona, MS, USA*

Improved nutrient management strategies are needed to increase yield production and quality while maintaining soil health. The present study aimed to determine the suitable cultural practices for improved corn production in Mississippi. Two experiments were set up at Verona and Stoneville, MS, in a randomized complete block design with four replications. Treatments included row configurations (single and twin-row), plant populations (79074 and 98842 seeds ha^{-1}), and one included stepwise additions and other stepwise deletions of different nutrients. The nutrients tested were two nitrogen rates (235and 314 kg N ha^{-1}), phosphorus (45 kg P ha^{-1}), potassium (112 kg K ha^{-1}), sulfur (22 kg S ha^{-1}), and zinc (11 kg Zn ha^{-1}). An additional fungicide application was applied to the last treatment for the additions and five out of six treatments for the deletions. At Verona, all three main effects of population, rows, and fertilizer significantly affected corn yield in the addition study. Similarly, in the deletion study, we found a three-way interaction among the main effects. In 2020 at Stoneville, fertilizer was the only factor that affected corn yield in both studies. In 2021 at Stoneville, population and fertilizer significantly affected corn yield in the addition study. Population and rows significantly affected the corn yield in the deletion study, while fertilizer treatments showed no effect. Overall, most of the factors that produced higher yields were site-specific and based on soil characteristics and health. Producers should determine soil deficiencies before deciding the appropriate nutrient management strategy. Further research would also be necessary to disseminate if the fungicide application was economical or not.

O1.13

11:15 WATERCRESS EXTRACT TARGETING ONCOGENIC SIGNALING PATHWAYS IN OVARIAN CANCER

Kaelin Travis[1], *Kalendra Self*[1], *Brenita Jenkins*[1], *Bidisha Sengupta*[2], *Debarshi Roy*[1]

[1]*Alcorn State University, Larman, MS, USA* [2]*stephen f. austin state university, nacogdoches, tx, USA*

Nationally, ovarian cancer (OVCA) is the 10th most commonly diagnosed cancer in women and the fifth-leading cause of cancer death. OVCA is difficult to detect in preliminary stages due to lack of symptoms and limited screening techniques, contributing to poor prognosis of patients. OVCA patients often develop drug resistance and almost 70% of the patients have a risk of tumor recurrence as well. Therefore, identification and validation of newer therapeutics are critical for the treatment of OVCA. For years, natural occurring products are in prominence as anti-cancer therapeutics. The current study is carried out on one

gm of coarsely crushed watercress leaves which were extracted in methanol and further filtered through a 0.22-µm filter. HPLC analysis evidenced that watercress extract has significant amount of kaempferol in it. Kaempferol is known to produce anti-cancerous effects in various types of cancer cells. Cellular studies revealed that methanolic extract of watercress (WCM) treatment inhibited the cell viability of HeyA8 (OVCA) cells by 50%. The WCM extract mediated oxidative stress in HeyA8 cells were further determined by detecting the elevated level of reactive oxygen species (ROS) through DCFDA flouroscence. We have further shown that WCM treatment is inducing formation of autophagic vesicles in HeyA8 cells. Our preliminary studies indicated potential anti-cancerous effects triggered by watercress extract in OVCA cells through inducing reactive oxyen species (ROS). This novel approach is likely to create a better understanding between the oncogenic signaling pathway and the influence of plant products in the chemoresistance and proliferation of ovarian cancer. Further studies are underway.

O1.14

11:30 "IT JUST ROUGH ON BLACK FARMER" CONTEMPORARY CHALLENGES OF THE MISSISSIPPI BLACK FARMER

Destiny Crockett

Mississippi State University, Mississippi State, MS, USA.

Black farmers have contributed much to American agriculture, but they have received little in return. In the early 1900s, Black farmers owned a large portion of farmland. As time progressed, sovereignty of the wealthy, discriminatory practices and policies in federal farm programs, and a transitioning economy from a labor to capital system hurt Black farmers' success. In effect, Black farmers received socioeconomic inequality which caused a great decline in Black farmers and their land. Today, Black farmers are still suffering from effects of unequal treatment in the agriculture system. While there is much information upon the historical treatment of Black farmers, there is not much information about present-day Black farmers' experiences in farming. Here, I examine the challenges that Black farmers face in the rural counties of the Mississippi Delta region and their strategies to survive in the farming business. A total of nine Black farmers were interviewed by phone and were asked about their knowledge and experiences in farming, challenges, and resilience strategies. I observed that the main barriers for small-scale Black farmers in Mississippi are low profits, lack of resources, somewhat complicated relationship with local farm agents, increasing farm expenses, weather and climatic conditions. Farmers explained how the desire to continue a family legacy, emotional attachment with the land, and community togetherness are helping them persevere through disadvantages and help maintain a sustainable enterprise. Although these farmers are faced with many obstacles, their resiliency and desire to continue the legacy of farming help these farmers face the uncertainty.

11:45 AM -1:00 PM: Lunch Break

Thursday, March 31, 2022

DIVISIONAL POSTER SESSION

1:00-3:00 PM

Posters will be judged in the division and will also be presented in the General Poster Session

P1.01

CHANGS IN BARK HYDROLOGIC PROPERTIES ALONG THE STEM OF FOUR COMMON SOUTHEASTERN TREE SPECIES

MaKeriah Hampton, Amie Triplett, Courtney Siegert

Mississippi State University, Mississippi State, MS, USA

Tree bark plays an important role in the forest hydrologic cycle as it can absorb substantial quantities of water during rainfall events. Water is diverted into bark storage instead of being delivered to the forest floor where it would be available to plant roots. The quantity of water that can be stored in tree bark varies across species and is a function of bark surface properties and internal structural characteristics such as thickness, density, and hygroscopicity. These properties also vary along the length of the stem, but our understanding of this variability is limited, especially with respect to other components of the forest hydrologic cycle. To address this knowledge gap, we extracted bark along the stem of four common southeastern species including loblolly pine, sweetgum, shagbark hickory, and cherrybark oak. Then in the laboratory we conducted a series of experiments to measure bark volume, density, and hygroscopicity (i.e., the passive absorption of water vapor from the atmosphere). Bark bulk density was lowest in loblolly pine (0.33 ± 0.01 g/cm^3) followed by sweetgum (0.39 ± 0.01 g/cm^3), hickory (0.54 ± 0.01 g/cm^3), and cherrybark oak (0.59 ± 0.01 g/cm^3). In cherrybark oak, sweetgum, and loblolly pine, bark bulk density was greater in the middle of the tree and lower at the base and higher up the tree stem while hickory displayed the opposite trend. The opposite trend was observed for hygroscopicity with shagbark hickory and cherrybark oak having higher hygroscopicity (0.91 ± 0.06 and 0.81 ± 0.6 mm H_2O per cm bark thickness, respectively) and loblolly pine and sweetgum with lower hygroscopicity (0.73 ± 0.06 and 0.66 ± 0.06 mm H_2O per cm bark thickness, respectively). Shagbark hickory had the most pronounced trend in hygroscopicity along the tree stem, with higher hygroscopicity closer to the base of the tree and lower hygroscopicity at higher stem heights. Results demonstrate that structural characteristics of bark are variable both across species and along tree stems. Hydrologic models that rely on bark water storage parameters could be improved by taking into account this variability.

P1.02

AN INVESTIGATION OF THE GROWTH OF *Escherichia coli* AND *Bacillus subtilis* IN THE PRESENCE OF *Ganoderma lucidum*

Precious Orji, Andrela Adebayo, Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS, USA

Ganoderma lucidum (Reishi) is a mushroom that can be used for health benefit. The study hypothesized that the extracts from either water, ethanol, or methanol can be used to inhibit the growth of bacteria. In the present study, *G. lucidum* spawn plugs were purchased and grown on Petri dishes containing potato dextrose agar. Ten µg of the mycelium was mixed in 1 ml of either water, ethanol, or methanol. The mycelium was mixed in either water, ethanol, or methanol for few minutes. After few minutes, the crude extracts were screened for antibacterial activities using a modified Kirby-Bauer disc method on *Escherichia coli* and

Bacillus subtilis. The screening of the extracts was repeated using the same extracts after 10 days. Eight antibiotic sensitivity discs of erythromycin, chloramphenicol, kanamycin, oxytetracycline, ampicillin, penicillin, streptomycin, and tetracycline were also used. The results revealed that the growth of *E. coli* and *B. subtilis* was not inhibited by the extracts using either water, ethanol, or methanol. The antibiotic sensitivity discs inhibited the growth of *E. coli* and *B. subtilis*. In conclusion *G. lucidum* extracted using either water, ethanol, or methanol was not effective in inhibiting the growth of *E. coli* and *B. subtilis*.

P1.03

INTENSIFICATION OF AGRICULTURAL PRACTICES AND ITS IMPACT ON SOIL HEALTH

C Shaffer, L Kibet, S Mwangi, G Panicker, F Mrema

Alcorn State University, Lorman, Mississippi, USA

Overall decline in soil health has led to increased cost of agricultural production. Hence, the objectives of this experiment were: 1) To assess the impact of poultry litter, compost manure and urea fertilizer on crop yields under alley cropping system; 2) To assess the effect of poultry litter, compost cow manures and urea fertilizer on soil health. The study area is in Alcorn State University, Lorman, MS and the soil is classified as Memphis silt loam. The plots measure 10 x15ft. and are separated by alleys of 10 ft. in length. The experiment had three treatments (compost manure, poultry litter, urea fertilizer) and controlunder randomized complete blocks design. Treatments were surface applied and incorporated at a rate of 140 lbs. N/acre. Early round Dutch cabbage (Brassica oleracea) seedlings were raised in the green house and transplanted at a spacing of 2 ft. between plants and 3 ft. between the rows. Preliminary results showed no significant differences in soil health properties in the first season. However, cabbage yield was significantly higher under the urea treatment than the poultry litter treatment but not different when compared to compost cow manure and control. After 3- yrs., there were significant differences between poultry litter, composted cow manure, and urea fertilizer regarding phosphorus, potassium, organic matter, and total carbon. However, there was no significant differences in nitrogen, water-stable aggregates, and active carbon among the treatments. It is hypothesized that differences will be observed among the treatments after 5-yrs of consistent experimentation.

P1.04

TAUNGYA SYSTEM OF AGROFORESTRY FOR CLIMATE CHANGE ADAPTATION AND MITIGATION

W. Mims , L.Kibet, G. Panicker, G. Boyd, A. Joseph, G. Young, S. Cain

Alcorn State University, Lorman, MS, USA

Soil erosion and climate change adaptation and mitigation are major conservation issues around the globe. Taungya system of agroforestry is a collective word of land-use systems and practices where herbs, shrubs, and trees are grown for food on the same land management unit. Pecan tree-based agroforestry is a scientifically designed mixed cropping system with annuals, biennials, and perennials for economic and environmental benefits. Five acres of land on Memphis Silt Loam was divided into four blocks. Each block has four treatments replicated four times under randomized complete block design. The block for biennials (vegetables) have been evaluated for soil health since 2019, while perennial blocks were only assessed at the project initiation stage. Biennial block has three treatments (compost manure, poultry litter, urea fertilizer) and control under randomized complete blocks design. Treatments were surface applied and incorporated at a rate of 140 lbs. N/acre. Crop rotation of Early round Dutch Cabbage (Brassica oleracea), purple hull peas (Vigna unguiculate) and sweet corn (Zea mays) have been planted in the plots over the years. Preliminary results showed no significant differences in soil health properties in the first season. However, after 3- yrs., there were significant differences between poultry litter, composted cow manure, and urea fertilizer regarding phosphorus , potassium , organic matter, and total Carbon. However, there was no significant differences in nitrogen, water-stable aggregates, and active carbon among the treatments. It is hypothesized that differences will be observed among the treatments after 5-yrs of consistent experimentation.

P1.05

AN INVESTIGATION OF THE GERMINATION OF Echinochloa crus-galli (BARNYARD GRASS), AND *Lolium multiflorum* (ITALIAN RYEGRASS) IN THE PRESENCE OF *Nicandra physalodes*

Jordan Johnson, Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS, USA

Echinochloa crus-galli is an important weed of rice and has developed resistance to multiple herbicides in many countries including United States. It was found to have an inhibitory effect on the seed germination and seedling growth of sunflower, wheat, barley, rice, and maize. *Lolium perenne* **ssp.** multiflorum, affects the growth of maize, wheat, and soybean, but can be used as a cover crop for soil sustainability preventing soil erosion. Most of the time physical mechanisms of managing the weeds such as mowing, and handpicking can be tedious and time-consuming. Farmers resort to using herbicides which can be applied fast, but the chemicals tend to cause pollution to waters. The cost-effective and environmentally friendly methods such as the use of allelopathic chemicals can be used as an integrated approach for the management of *E crus-galli***,** and *L. multiflorum***.** The hypothesis of the study was that the seeds of *N. physalodes* would inhibit the growth of the *E. crus-galli***,** and *L. multiflorum* seeds. Seeds of *N. physalodes* were purchased from the seed company. Seeds of *E. crus-galli***,** and *L. multiflorum* were obtained from USDA Research Station in Stoneville. The seeds of *E. crus-galli*, *L. multiflorum*, and *N. physalodes* were grown in Petri dishes. The results indicated that after three days the germination of *E. crus-galli***,** and *L. multiflorum* seeds was not inhibited in the presence of *N. physalodes* seeds.

P1.06

CHARACTERIZATION OF ENDOPHYTE BACTERIA ISOLATED FROM SOYBEAN ROOTS TO IDENTIFY ANTI-XYLARIA ACTIVITIES AND DISEASE-PROTECTIVE ISOLATES

Slade Smith

Mississippi State University, Starkville, MS, USA

Root microbiota can act as a barrier to prevent invasive pathogens of plants and protect against diseases caused by those pathogens. Biological methods of pathogen control that use beneficial microbes are an alternative to traditional chemical-based control methods, which have strong negative impacts on the environment and human health. Many challenges remain before biological control methods can be reliably used in the field, including identification of microbes with beneficial and disease suppressive activities for specific pathogen-crop systems.

Invasive pathogenic soil borne fungi colonize many plant hosts to cause severe root rot disease. Xylaria sp. was identified as the long-sought case of soybean crop failure. In a 2017 study, Soil

borne fungal pathogens, such as Xylaria sp., are a significant threat to global food supply. This fungus would kill or affect up to 25% of the crop, losing up to 1.58 billion dollars a season (Allen et al 2017). Xylaria sp. was identified attacking through the root systems, causing a darkening of the taproot while stunting the growth. Another symptom is chlorosis. Current chemical methods of control are not effective against Xylaria sp. infection of soybean.

The purpose of this project is to test a set of bacterial strains isolated from healthy soybean roots for the potential to inhibit Xylaria sp. growth and to suppress the disease caused by Xylaria in soybeans (taproot decline). The importance for the protection to be a living biocontrol as opposed to chemicals is to avoid the negative environmental factors of herbicides. My objectives are: (1) using a set of in vitro and in vivo methods to identify bacterial endophytes with beneficial activities, and (2) Taxonomic identification of bacterial taxa with proven beneficial activities.

P1.07

IMPACT OF DIFFERENTIALLY EXPRESSED GENES IN MONOCLONAL AND POLYCLONAL PLANTINGS OF *Populus deltoides* FOR AGRICULTURAL NITROGEN MITIGATION

Macy Gosselaar, Austin Himes, Daniel Peterson, Heidi Renninger, Courtney Siegert

Mississippi State University, Starkville, MS, USA

Excess nitrogen runoff from agricultural fields can cause eutrophication of water bodies. The establishment of riparian crops, such as, *Populus spp.* can reduce nitrogen runoff. Polyculture plantings of *Populus* spp. are expected to increase site resource utilization through niche differentiation (e.g., different varieties may have root structures occupy different parts of the soil), which in turn would increase efficacy of *Populus spp.* ability to intercept nitrogen from agricultural fields before it reaches streams. Different *Populus spp.* varieties may use the environment's resources in divergent ways to help them coexist. However, underlying molecular mechanisms of niche differentiation are poorly understood. A better understanding of these mechanisms can aid in the development of tools to predict what mixture of varieties will provide the greatest growth and nitrogen mitigation potential. RNA sequencing is a high through-put tool that can determine the condition of the genetic transcriptome and provide accurate information on transcription response to the environment. I propose using RNA-Seq to determine if differentially expressed genes (DEGs) are an underlying molecular mechanism of niche differentiation. I expect that my two varieties of *Populus deltoides* in polyculture plantings will show greater nitrogen utilization, greater growth and show greater expression of genes than monoculture plantings**.** Following RNA-Seq, I will conduct a gene ontology analysis (GO) to identify biological processes, and molecular functions associated with my DEGs. I will utilize the KEGG PATHWAY database to link DEGs in pathways related to nitrogen utilization and tree biomass growth to determine if DEGs may be an underlying molecular mechanism linked to changes in growth and/or nitrogen use. My determination of DEGs and their relationships in biological pathways may help us better understand morphological variability in *Populus deltoides* varieties and could inform future genetic studies aimed at further improving nitrogen mitigation potential and growth of this crop.

P1.08

ISOLATION AND DETERMINATION OF ALLELOCHEMICALS FROM ROOT EXUDATES OF COTTON CHROMOSOME SUBSTITUTION LINES PROVEN TO SUPPRESS PALMER AMARANTH

Alyssa Miller, Paul Tseng

Mississippi State University, Mississippi State, MS, USA

Weedy plant species have been and continue to be an extreme issue affecting crops, including cotton. A specific weed type that is of major nascence to cotton (Gossypium hirsutum), in particular, is known as Palmer amaranth (Amaranthus palmeri). Plamer amaranth's ability to form herbicide resistance has created a dire need for substitute methods in controlling weed populations, besides the most common form- chemical control by way of herbicides. It is imperative to develop alternative weed control methods to slow the evolution of herbicide- resistant weed populations. The goal of this study was to identify specific allelochemicals associated with allelopathy in cotton CS lines. Eleven chromosome substitution (CS) cotton lines (B26lo, T17, BNTN 16-15, BNTN 17-11, B12, T05sh, T26lo, T11sh, M11sh, B22, and B22lo) previously screened for weed-suppressing abilities were utilized in this study. The cotton lines were tested using a stair-step structure and replicated three times. Height (cm) and chlorophyll concentration were measured for each plant in the system. Statistical analysis indicated a difference in Palmer amaranth height reduction and chlorophyll concentration between the CS lines test. The most competitive CS lines were determined to be: BNTN 16-15, B10, T26lo, T11sh, M11sh, and B22. Using HPLC, we discovered two commonly known allelocompounds (chlorogenic acid and coumarin) produced by the root of the allelopathic cotton lines compared with the other non-allelopathic cotton lines and TM-1 (parent of the cotton CS lines). This breakthrough discovery motivated us to initiate a more in-depth investigation to characterize the novel allelopathic cotton CS lines at the genetic and molecular level with respect to its weed suppressive ability and fiber qualities (on-going study).

P1.09

IMPACT OF NITROGEN AND SULFUR APPLICATION ON YIELD AND QUALITY OF MISSISSIPPI CORN

Ramandeep Kumar Sharma[1], *Camden Oglesby*[1], *James Dew*[1], *Krishna Reddy*[2], *Xiaofei Li*[1], *Gurpreet Kaur*[3], *Jagmandeep Dhillon*[1]

[1]*Mississippi State University, Starkville, MS, USA.* [2]*USDA, Stoneville, Mississippi, USA.* [3]*Mississippi State University, Stoneville, MS, USA*

There has been a drastic decline in atmospheric industrial ejections due to an improvement in the SO2 pollution management strategies in the last two decades, reducing sulfur (S) deposition to soils. However, the soil S withdrawal is steadily increasing due to high yielding cultivars, low tillage intensity, diminished usage of S-containing fungicides and insecticides, increased use of fertilizer with minimal to no S. Consequently, the gap between the S requirement of crops and S availability (either natural or artificial) has widened which necessitates rethinking S stature along with nitrogen (N) in corn (*Zea mays*) nutrient plan. Therefore, to determine the yield and quality responses of corn to S and N and S-N interactions in rainfed corn in Mississippi, studies were conducted at three different locations (Starkville, Brooksville, and Stoneville). Experiments were set up in a randomized complete block design with four replications with a total of 13 treatments each including a control. The treatments included multiple N and S rates. The optical sensors (SPAD, Crop circle, and Mica Sense) were used at each location to sense corn's in-season N and S status at different growth stages.

The results were variable across different locations where Stoneville showed significant yield response to N and S, Brooksville responded only to N, and Starkville corn yield was not affected by any fertilizer. The highest recorded yield was at rates (336 kg. N ha-1 & 67 kg. S ha^{-1}) and (336 kg. N ha^{-1} & 45 kg. S ha^{-1}) corresponding to yield of 17.83 Mg ha^{-1} and 13.94 Mg ha^{-1} at Brooksville and Stoneville respectively. Within each N rate, non-significant incremental S trends were noted at Brooksville and Stoneville. Conclusively, it was found that the yield responses are location-specific and based on the local soil characteristics and health. Therefore, soil testing is suggested to make nutrient management decisions.

P1.10

IMPACT OF POST-FLOWERING HEAT AND DROUGHT EFFECTS ON PHYSIOLOGY, YIELD AND QUALITY IN CORN

Ranadheer Reddy Vennam, Raju Bheemanahalli, Sadikshya Poudel, David Brand, K Raja Reddy

Mississippi State University, Mississippi State, Mississippi, USA

Corn **(***Zea mays* L.) is the most widely grown cereal crop globally and in the USA. Exposure of corn to heat and drought stress during grain filling can induce grain yield and quality losses. These stresses are increasingly becoming a serious threat to corn production in major corn-growing regions. In this research, two corn genotypes (B73 and Mo17) were exposed to three treatments such as optimum (31ºC daytime, control), heat stress (36ºC, daytime), and drought stress (45% evapotranspiration, ET) during grain filling. We measured physiological (chlorophyll content and stomatal conductance), (ii) biomass components (leaf area and biomass), (iii) yield (seed number and seed weight), and quality (starch, oil, and protein) parameters in all treatments. At 14 days after stress, drought and heat stress decreased stomatal conductance (70% and 38%) and chlorophyll content (47% and 22%) compared to the control. Ear weight decreased by 52% under drought (78% in B73 and 30% in Mo17), followed by heat 27% (35% in B73 and 20% in Mo17) in both the corn genotypes. The genotype, 'B73', recorded a significantly higher reduction in grain number (42% in drought and 20% in heat) than Mo17 (5% in drought and 4% in heat) across treatments. Compared to the control, heat, and drought stress reduced grain yield by 95, and 51% in 'B73' and 31, and 28% in 'Mo17', respectively. An increase in seed protein (5%) under drought stress was associated with a decline in oil (7%) in both genotypes compared to the control. Under heat stress, genotype 'Mo17' recorded lower protein (5%) and higher oil (10%) contents than the control. The genotype 'B73' recorded a 5% reduction in starch under heat stress compared to the control. The genotype 'Mo17' maintained greater yield and quality traits under heat and drought than B73. Rising heat stress coupled with low rainfall episodes is unfavorable to corn's yield components and quality compositions. Our finding emphasizes the need for developing corn varieties/hybrids with improved tolerance to combined stresses to sustain production and quality for the future climate.

P1.11

QUANTIFYING THE IMPACT OF HEAT STRESS ON POLLEN GERMINNATION, PHYSIOLOGY, AND YIELD IN SOYBEAN

Sadikshya Poudel, Ranadheer Reddy Vennam, Raju Rangappa, K Raja Reddy

Mississippi State University, Mississippi State, MS, USA

Heat stress is increasingly becoming a serious threat to soybean production in major soybean growing regions, particularly in the US Midsouth. The predicted increase in frequency and magnitude of heat stress above the critical threshold during soybean flowering and pod-filling can induce reproductive failure and grain yield reduction. In this study, ten soybean lines were exposed to two treatments: control (32°C daytime) and heat (38oC daytime temperature) stress during the reproductive and pod filling stage to quantify heat stress impact on pollen germination, physiological and yield-related parameters. Significant inhibitory effects of heat stress on all studied traits. Under heat stress, chlorophyll content was decreased by 3%, stomatal conductance was reduced by 11%, transpiration increased by 5%, and canopy temperature was increased by 14% compared to the control. Five soybean lines had a value less than the average value of pollen germination under heat stress. Four out of ten lines exhibited increased transpiration rates than the mean value under heat stress, while 'S48XT90' had a 45% lower transpiration rate than the control. Heat stress-induced significant reduction in seed number (17%) and seed weight (23%) compared with control. Under heat stress, the canopy temperature difference was negatively correlated with stomatal conductance (-0.75) and transpiration (-0.83), as the same parameters were positively correlated (0.77). Under control, chlorophyll content positively correlated with stomatal conductance (r = 0.66), while under heat stress, the same pair of parameters showed a negative correlation (r = -0.28). A significant difference was found between the genotypes and treatment for seed weight and pod number. Our research quantified soybean physiology, yield, and seed quality compositional changes in response to heat stress, providing a route to increase soybean production and quality.

P1.12

ASSESSMENT OF BIOAVAILABILITY OF HEAVY METALS IN CENTRAL MISSISSIPPI PLAYGROUND SOIL AND CHILDREN HEALTH

Thomasina Horton and Fengxiang Han

Jackson State University, Jackson, MS, USA.

Children play in urban children playground. Soils may be eaten by children through hand touch. This bioavailability of Heavy metals in playground soil were assessed in playground soils for children safety in the central Mississippi area. Heavy metals are ubiquitous but can be potentially hazardous. Majority of parks in Mississippi are located in rural areas only few are located in urban areas with a high amount of traffic. Soil contamination levels are determined by location and its exposure level to certain contaminants. Children are a vulnerable population, and it is important to know of any potential hazards when at local playgrounds. Soil was taken from several playgrounds using spatial distribution in the Jackson, MS area and a total of 100 samples were collected from 6 different parks. Pb, As, Cd, Zn, Hg, Cu, Cr, Ni levels were evaluated using ICP-MS using acid digestion. Results show bioavailability of heavy metals in children playground may be controlled by biogeochemical conditions and traffic conditions. This study will provide the data on assessment of children heath as affected by these playgrounds.

P1.13

SOLUBILITY AND EXTRACTIBILITY OF URANIUM IN US ARMY SHOOTING SOIL

Richterica Ford

Jackson State University, Jackson, MS, USA

Yuma Proving Ground (YPG) is one of the largest military bases in the world. It is a subsidiary command of the Army test. Depleted Uranium (DU) is used to make weapon penetrators. The

presence of DU in YPG soil varies among fields and ditches. DU can be extracted from the contaminated soil using water, Humic Acid (0ppm, 0.5ppm, 5ppm, 20ppm, and 100ppm) , acidic water with pH levels (2, 4, 6, 8, 10), and salt solutions containing various anions (NaCl, $NaNO_3$, Na_2CO_3, $NaSO_4$, NaH_2PO_4, Na Acetate) and EDTA (sodium). Twenty original samples were taken from YPG sites. The results from the Humic experiment show humic solution increased U solubility and extractability with increasing in humic concentration and u extraction increased with increasing water acidity. The results on the effects of anions in salt on U solubility will be presented as well. This study provide a scientific base for evaluation of U solubility in the US Army weapon sites as well as possible battle fields as affected by biogeochemical conditions.

P1.14

HOW SAFE ARE ORGANIC FERTILIZERS-A RADIOACTIVITY BASED STUDY

Breanna Lynch, Jermiah Billa, Michael Atkins, Steve Adzanu, John Adjaye

Alcorn State University, Lorman, MS, USA

Naturally Occurring Radioactive Materials (NORMs) are part of our lives as they naturally exist in the geological environment. Living organisms directly or indirectly rely on soil-based resources and therefore there is a possibility of uptake of these NORMs through food, air, and water. Enhanced NORM concentrations result from activities such as burning coal, production and usage of fertilizers, oil and gas industries. Lately, there is a great interest in usage of organic fertilizers in farming industry. Typically, organic fertilizers are derived from animal matter, excretes and vegetable matter, and thus they are widely used to feed both soils and plants. Depending on the geological location and presence of human activities near the repository (pit), there is a possibility of presences of NORM and/or man-made radioisotopes even in organic fertilizers. In this approach, a study was performed on locally produced (Mississippi based) organic fertilizers. A set of 20 organic fertilizer samples were analyzed for presence and quantification of NORM and man-made radioscopic concentrations via the gamma spectrometry. Based on the obtained radioactivity values and considering the fertilization information based on type of crop, the amount of radiation introduced per acre and per crop type is estimated. Results include radioactivity concentration values and amount of radioisotopes introduced into farmland as a result of fertilization.

P1.15

IMPACT OF COVER CROP OVERSEEDING ON SOYBEAN PRODUCTION IN THE MISSISSIPPI DELTA

Michael Pruden, Gurbir Singh, Gurpreet Kaur, Trent Irby, Taghi Bararpour

Mississippi State University, Mississippi State, MS, USA

Fallow soil following crop harvest leads to nutrient leaching, soil erosion and runoff losses, which increases input costs such fertilizer and fuel. The potential solution can be incorporating cover crops in the current crop production systems in the Mississippi. However, wet soil conditions due to rainfall in the fall after cash crop harvest hinders cover crop planting. Therefore, the timing of establishment for cover crops is crucial to reduce the risk of rain delays and low germination rates. The objective of our study was to identify optimal cover crop species and timing for overseeding of cover crops in the dryland soybean production system. An experiment was conducted at the National Center for Alluvial Aquifer Research, Delta Research and Extension Center, Mississippi State University, Stoneville, MS from 2019 to 2021. Cover crops were broadcast seeded to simulate aerial application onto the soybean crop at R6 growth stage, and after soybean harvest. The cover crop treatments included cereal rye (*Secale cereale* L.), hairy vetch (*Vicia villosa* L.), wheat (*Triticum aestivum* L.), radish (Raphanus sativus L.), crimson clover (*Trifolium incarnatum* L.), hairy vetch + radish, cereal rye + crimson clover, wheat + crimson clover, wheat + radish + turnip (*Brassica rapa* L.), and a no cover crop control. Cover crop species impacted their aboveground biomass production, CN ratio, N uptake, and soybean grain protein content. Overseeding timing of cover crops cover crops biomass N content, CN ratio, N uptake, and soybean yield. Overseeding cover crops at R6 resulted in lower yield for succeeding soybean crop than the overseeding after harvest. Soybean yield was not affected by the cover crop species.

P1.16

FUNCTIONAL DIVERSITY AND MULTIPLE ECOSYSTEM BENEFITS OF CONSERVATION RESERVE PROGRAM (CRP) PLANTATIONS

Htet Lin Naing

Mississippi State University, Starkville, MS, USA

The Conservation Reserve Program (CRP) is a federally sponsored program administered by the Farm Service Agency which pays farmers annually if they agree to remove sensitive land from agricultural production for approximately 10 or 15 years and instead plant species that will improve environmental health and quality. The primary objectives of the CRP program are to improve water quality, reduce soil erosion, and provide wildlife habitat. In addition to these primary goals, CRP also promotes other ecosystem services such as mitigation of landscape and habitat fragmentation, maintenance of regional biodiversity, and changes in regional carbon flux. However, trade-offs and synergies among these multiple ecosystem services have not been fully assessed on CRP forest plantations. This research will be part of a larger project investigating greenhouse gas benefits of CRP practices on plantations in six Major Land Resource Areas (MLRAs). These pilot sites are located in the southeastern US, where 86% of the entire region is encompassed by CRP tree planting contracts. Vegetation information, soil data, and above-ground tree measurements will be collected in the study sites. From these data, we will calculate the trade-offs and synergies between ecosystem services. We will use tree height and diameter measurements in conjunction with allometric equations to calculate above-ground biomass. Using the calculated above-ground biomass accumulated in these sites, we will create models to determine patterns of carbon allocation. These models will provide technical information on the carbon sequestration potential of CRP plantations, which is of paramount importance in CO2 reduction in the face of climate change.

P1.17

COMPARITIVE ANALYSIS OF RHIZOSPHERE AND ENDOPHYTIC MICROBIOME OF DIFFERENT SPECIES AND CULTIVARS OF BLUEBERRIES (Vaccinium sp.)

Niladri Bhowmik[1], Svetlana Yurgel[2], Ankita Bhattacharya[1], Olga Mavrodi[1], Ebrahiem Babiker[3], Dmitri Mavrodi[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, USA. [2]USDA-ARS Grain Legume Genetics Physiology Research, Prosser, WA, USA. [3]USDA-ARS Southern Horticultural Research Laboratory, Poplarville, MS, USA.

Introduction: Plants are inhabited by millions of parasitic, commensal, and mutualistic microorganisms that coexist in complex ecological communities (1). Most plant-associated

microbes are found in the rhizosphere (i.e., in contact with plant roots), where they form part of a food web driven by the release of plant rhizodeposits, or exudates. The microbiome profoundly affects the plant's productivity, health, and capacity to cope with environmental stress (2). Blueberries encompass several wild and cultivated species of shrubs of the genus *Vaccinium* that are native to North America (3). They are grown commercially for the production of fruits, which are considered a health food due to the rich content of minerals, trace elements, and phenolic compounds with antioxidant, antitumor, and anti-inflammatory properties. Despite a long history of breeding and extensive commercial use, remarkably little is known about the composition and function of the blueberry root microbiome and its impact on the plant's ability to tolerate abiotic and biotic stress (4).

Methods: To address this gap, we performed a comparative composition and metagenome analysis of microbial communities inhabiting the different varieties of *V. corymbosum, V. virgatum, V. arboreum, V. darrowi* , and one pentaploid hybrid cultivar. For each cultivar twelve different plants (n = 12) were sampled, and their roots were used for extracting rhizosphere soil DNA with the DNeasy PowerSoil Pro kit (Qiagen). For endophyte analysis roots were surface sterilized and processed using the TissueLyser and DNeasy Plant Mini kit (Qiagen). The comparative analysis of bacterial and fungal communities involved 16S rRNA-based (V6-V8 region) and ITS-based profiling. Using the Microbiome Helper standard operating procedure, the sequenced data was analyzed (5). The microbial cellular pathways were predicted analyzed by metagenome analysis and using Picrust (Phylogenetic Investigation of Communities by Reconstruction of Unobserved States) software (6). In addition, the root washes were analyzed using Biolog EcoPlates containing 31 different carbon sources.

Results: Our results indicate significant species- and cultivar-specific differences in the diversity and abundance of bacteria and fungi, including multiple groups of microorganisms with known plant growth-promoting activity. This work will help to understand the effects of domestication on the association of blueberries with beneficial mycorrhizal fungi. The expected results will also help to characterize the contribution of root-associated microorganisms to the adaptation of blueberries to local conditions (i.e., temperature, precipitation, and soil pH) encountered by growers and breeders in the Southeastern US.

P1.18

OPTIMAL PLANTING DENSITY AND THINNING REGIMES FOR SHORTLEAF PINE PLANTATIONS IN THE WESTERN GULF

Curtis VanderSchaaf

Mississippi State, Raymond, MS, USA

Shortleaf pine (*Pinus echinata* Mill.) has been planted in the Western Gulf region. The USDA Forest Vegetation Simulator (FVS) is the only currently widely available comprehensive yield prediction system for these plantations. As an initial attempt to determine optimal thinning regimes, predictions from the time-of-planting were obtained for densities of 400, 600, and 800 seedlings per acre for site indexes of 45, 60, and 75 ft (base age 25). Common stand density thinning targets, Current, Reasonable, and Optimal stumpage prices, and common reforestation and management costs and revenues were used along with the growth and yield projections to determine financially optimal thinning and final harvest ages.

P1.19

ENVIRONMENT REGULATES COVER CROP BENEFITS ON FOLLOWING CORN GROWTH AND YEILD

Bhupinder Singh[1], *Gurbir Singh*[1], *Gurpreet Kaur*[1], *Jagmandeep Dhillon*[2]

[1]*National Center for Alluvial Aquifer Research, Mississippi State University, Leland, MS, USA.* [2]*Mississippi State University, Mississippi State, MS, USA*

Cover crops grown during winters after corn harvest can provide rotational benefits along with N credit to the following corn crop. However, cover crops' ability to provide biomass N and benefit the following corn growth and yield is highly regulated by genetic, environmental, and management factors. Therefore, a field study was conducted in three environments, a combination of three locations and two years, i.e., Stoneville in fall 2019 (Environment 1), Stoneville in fall 2020 (Environment 2), Starkville in fall 2020 (Environment 3), to determine the potential of single or mixed cover crops, including broadleafs, cereal grasses, and legumes, on following corn growth and yield compared to check (no cover crop). The cover crops significantly differed for carbon/nitrogen ratio (C/N) in all three environments but only one of three environments affected corn growth and yield. The C/N ratio was higher in cereal grasses (wheat and cereal rye), followed by legumes (crimson clover, hairy vetch), and lowest in broadleaf (radish) cover crops. The combination of different types of cover crops had higher C/N ratio than cover crops of same type but not different from single planted cereal grasses. The similar trends were observed for percent carbon. In contrast, percent N was consistently highest in radish and variable across three environments in other crops. The higher percent N by radish could be credited for higher plant height (PH) and yield observed in the following corn, unlike cereal rye that had lower percent N but similar percent carbon. While the future work is needed to discover factors differing growth and yield in the corn following cover crops that exhibited similar C and N content. The information on the high regulation of the environment on the plasticity of cover crops to accumulate N in the biomass supports the significance of long-term trials on determining the efficiency and selection of cover crops benefiting region-specific continuous corn production practices.

P1.20

HYPERSPECTRAL REFLECTANCE AND PHYSIOLOGICAL TECHNIQUES FOR DIAGNOSING PLANT HEALTH STATUS OF COTTON UNDER DROUGHT AND ROOT-KNOT NEMATODE

Purushothaman Ramamoorthy[1], *Raju Bheemanahalli*[2], *Sathishkumar Samiappan*[1], *Martin Wubben*[3], *Amrit Shrestha*[2], *John Brooks*[3], *Raja Reddy*[2]

[1]*Geosystems Research Institute, Mississippi State University, Mississippi State, MS, USA.* [2]*Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, USA.* [3]*USDA-ARS, Mississippi State, MS, USA*

Cotton encounters biotic and abiotic stresses during the growing season, which significantly affects the genetic potential of stress tolerance and productivity. The occurrence of abiotic stress (drought stress, DS) can alter the plant-disease (root-knot nematode, RKN) interactions by enhancing host plant sensitivity. An experiment was conducted under greenhouse conditions to investigate the interaction between RKN and DS using nematode-resistant (Rk-Rn-1) and nematode susceptible (M8) genotypes. These genotypes were subjected to four treatments: control (100% irrigation and nematode free), RKN (with nematodes and

100% irrigation), DS (50% irrigation with no nematodes), and DS+RKN, from 15 days after sowing (DAS) until biomass harvesting, 92 DAS. We measured treatments-induced changes in cotton (i) leaf reflectance between 350 and 2500 nm, (ii) pigments (chlorophyll index, anthocyanin, and flavonoids), (iii) physiological (stomatal conductance and quantum yield), and (iv) biomass-related traits for diagnosing cotton plant health under combined biotic and abiotic stresses. Individual treatment had a substantial impact on the measured parameters. The effect of treatments differed among the cultivars. The genotype and DS or RKN treatment showed significant differences in stomatal conductance, transpiration, and biomass-related traits. Substantial reductions in physiological, plant height, and biomass-related traits were recorded under combined DS and RKN treatments. Under combined RKN and DS, the Rk-Rn-1 maintained better physiological traits than M8, whereas the cultivar M8 accumulated higher anthocyanin (13%). Compared to the control treatment, the RKN alone or combined with DS decreased boll weight by 9% or 49% in resistant genotype and 19% or 77% in susceptible genotype, respectively. Further, we applied statistical supervised learning algorithms to classify RKN infested, DS, and both from the control group using leaf hyperspectral signatures. Our study revealed that temporal hyperspectral and physiological changes in response to RKN and DS could help diagnose plant health of cotton before the plant's visual symptoms appear.

P1.21

EMPLOYING SECONDARY METABOLITES TO REDUCE BIOTIC STRESSES IN SWEET POTATO PRODUCTION AND POSTHARVEST STORAGE IN MISSISSIPPI

Ziming Yue, Varsha Varsha, Lilian Trippe, Augusto Augusto, Alyssa Miller, Josiane Argenta, Worlanyo Segbefia, Mark Shankle, Te-Ming Tseng

Mississippi State University, Mississippi State, MS, USA

Mississippi is the third-largest sweet potato producing state in the United States. Sweet potato suffers significant stresses from weeds, insects, fungi, bacteria, and transplantation to postharvest storage issues. Numerous strategies (herbicides, insecticides, fungicides, etc.) have been developed to help sweet potato defend against weeds, herbivores, and pathogens. All these strategies have merits and shortcomings and do not offer a complete solution. Plants have a defense system similar to humans' immune systems, and chlorogenic acid plays a central role in the sweet potato self-defense system. It is the dominant allelopathic compound, an insect repellent, and a fungicide that defends black rot. An analysis of the sweet potato leaf and root periderm chlorogenic acid concentrations revealed that the leaves contained higher than the roots. This explains why the deer would prefer digging the roots than browsing the leaf during the later growth stages. In addition, chlorogenic acid concentrations from different plants of the same cultivar varied by three times. Screening of chlorogenic acid in sweet potato germplasm showed that the purple-red periderm contained more chlorogenic acid. Chemical and physical methods to induce secondary metabolite biosynthesis in sweet potato are to be tried before transplanting. Methyl jasmonate and salicylic acid are also critical compounds in inducing secondary metabolite biosynthesis in various plants. This is the first time they are to be studied on sweet potato. Ultrasonic induction is also to be tried. Besides screening the sweet potato cultivar with high secondary metabolites, breeding for high secondary metabolites is another way to reduce biotic stresses in sweet potato production and postharvest storage.

P1.22

GENETIC AND ENVIRONMENTAL CONTRIBUTORS TO COTTON YIELD AND QUALITY IN THE MID-SOUTH UNITED STATES

Akanksha Sehgal[1], Gurpreet Kaur[2], Daryl Chastain[3], John Snider[4], Haydee Laza[5], Wenxuan Guo[5], Gurbir Singh[1]

[1]Delta Research and Extension Center, Mississippi State University, Stoneville, MS, USA. [2]Delta Research and Extension Center, Mississippi State University, Stoneville, MS, USA. [3]USDA, ARS, Stoneville, MS, USA. [4]Department of Plant and Soil Sciences, University of Georgia, Tifton, GA, USA. [5]Department of Plant and Soil Sciences, Texas Tech University, Lubbock, TX, USA

Cotton (*Gossypium hirsutum* L.) cultivar selection is becoming more challenging. Producers need to know the contributions of genotype, environment, and their interaction (G×E) in determining cotton lint yield, lint percentage, and fiber quality. The potential and stability of lint yield and fiber quality parameters remain the most important factors in maximizing returns and minimizing risks. Seed cotton yield, the percentage of seed cotton that is lint (referred to as lint percentage), and the quality of the fiber determine the monetary value of the crop. The objectives of this research were to define the genotype, environment, and G×E contributions to lint yield, and fiber quality from six modern and obsolete cotton cultivars evaluated across the southern cotton belt. The cultivars selected represent the modern cultivars and cultivars released over a nearly four-decade period by public breeding programs. This experiment was set up at three locations throughout the cotton belt that is in Tifton, GA, Stoneville, MS, and Lubbock, TX in 2021. The study was designed as a randomized complete block with four replications per treatment. Cotton Bolls from each treatment were hand-picked and samples were ginned to obtain lint weight, seed weight, and the mass of 100 fuzzy seeds. The fiber samples were analyzed for fiber quality parameters including micronaire, uniformity, strength, HIV fiber length at fiber testing lab in Texas Tech University Fiber and Biopolymer Research Institute. The lack of information available on the impacts of cultivars, environment and G x E for modern, commercial cotton cultivars commonly planted throughout the Mid-South, points towards the significance of this study.

P1.23

LONG TERM COTTON BASED CROP ROTATIONS EFFECTS ON SOIL QUALITY IN MISSISSIPPI DELTA

Akanksha Sehgal[1], Gurpreet Kaur[1], Gurbir Singh[1], Jagmandeep Singh Dhillon[2], Wayne Ebelhar[1]

[1]Delta Research and Extension Center, Mississippi State University, Stoneville, MS, USA. [2]Department of Plant and Soil Sciences, Mississippi State University, Mississippi State, MS, USA

Cotton production in the southern United States was generally characterized by intensive tillage operations which promotes a rapid oxidation of existing soil carbon and reduces soil quality and productivity. The soils in the mid-southern US are also low in organic matter, have compaction and crusting issues, and prone to erosion and runoff losses. Crop rotations can increase crop yields, reduce pest pressure by breaking pest biological cycles, increase system profitability by spreading risks and maximizing returns, improve nutrient cycling and soil organic matter content (SOM) and consequently, improves soil health over time by impacting the chemical, physical and biological properties of the soil. The purpose of this study was to evaluate the effects of long-

term crop rotations involving cotton, corn, and soybean with respect to soil quality. A long-term cropping systems site was established in 2004 at the Delta Research and Extension Center, Mississippi State University, Stoneville, Mississippi, USA. The study was designed as a randomized complete block with four replications. There were six rotations included in this study over a period of 16 years. The rotations were continuous cotton, corn/cotton, corn/cotton/cotton, corn/soybean, soybean/corn/cotton, soybean/corn/cotton/cotton. Soil samples were collected in fall after harvest of crop from 0-15 cm depths from every plot for 17 years of this study. The collected samples were analyzed for soil pH, cation exchange capacity, organic matter and available nutrients by the Mississippi State Soil Testing lab. The soil sample were extracted using the Lancaster soil test method. Preliminary results indicate that the average cation exchange capacity was 11.69 meq/100 g, soil pH was 6.26, organic matter was recorded 1.08%, and available nutrients phosphorus, potassium, calcium, magnesium, sodium, sulphur and zinc was recorded 90.85 lb/ac, 323.84 lb/ac, 2916.90 lb/ac, 495.56 lb/ac, 76.78 lb/ac, 32.02 lb/ac and 6.44 lb/ac, respectively for the 17-year long study.

P1.24

SURVIVAL, PERSISTENCE, AND ISOLATION OF DIFFERENT COLONY MORPHOTYPES OF *LISTERIA MONOCYTOGENES* AFTER EXPOSURE TO LOW AND HIGH CONCENTRATIONS OF FIRST-GENERATION QUATERNARY AMMONIUM COMPOUND (BAC) IN WATER

Emily Tucker, Stephen Schade, and Ramakrishna Nannapaneni

Department of Food Science, Nutrition, and Health Promotion, Mississippi State University, Mississippi State, MS, USA

Listeria monocytogenes occurrence in food products have changed over the past twenty years. This dangerous foodborne pathogen has been historically associated with the consumption of soft cheeses (queso, camembert, etc.) as well as ready-to-eat processed meats and seafood. Within the past two decades, there has been a notable increase in L. monocytogenes outbreaks in produce. Quaternary ammonium compounds (QACs) are the most common broad-spectrum sanitizing agents used in the food processing environment and in hospitals. Of the seven generations of QACs, the first generation QAC, benzalkonium chloride (BAC) is most widely used in various formulations to kill bacteria, fungi, as well as viruses. Even though, QAC are used at 50-100 times the minimum bactericidal concentration (MBC), sublethal concentrations were found in some environments. Therefore, the objective of this study to determine the survival of two strains of L. monocytogenes, Bug600 (serotype ½ a) and ScottA (serotype 4b) in various concentrations of benzalkonium chloride (BAC) in water, followed by persistence in high or low nutrient conditions. Using a concentration gradient of BAC in 96 well plates, we observed the real-time growth rate of L. monocytogenes strains by mimicking the conditions that it may encounter in some environments. The MIC of BAC of L. monocytogenes was 2 µg/ml for Bug600 or 4 µg/ml for ScottA. About 2 log CFU/ml of these two strains of L. monocytogenes survived from the initial 7 log CFU/ml when exposed to a lethal concentration of BAC of 10-14 µg/ml in water after 1 h. With 24 h incubation in BAC of 3.5-7 µg/ml, such aliquots still yielded 1-2 log CFU/ml of L. monocytogenes in the presence of high or low nutrient conditions and, also yielded two distinct morphotypes of L. monocytogenes (small and large colonies) on agar plates. Such colony variants of L. monocytogenes are undergoing further investigation for QAC tolerance. These findings are useful in understanding the potential link between extensive QAC usage and occurrence of biocide-tolerant strains of L. monocytogenes which may lead to food safety risk.

P1.25

HYPERACCUMULATING THE POTENTIAL OF *ERUCA SATIVA, BRASSICA OLERACEA, AND SPINACIA OLERACEA* UNDER HYDROPONIC CONDITIONS

Tanea Fisher[1], Paul Tchnouwou[2], Gloria Miller[2], Barbara Graham and LaShunda Anderson Hodges[3]

[1]CSET/Environmental Science PhD Program, Jackson State University, Jackson, MS, USA [2]Department of Biological Sciences, Jackson State University, Jackson, MS, USA, [3]Department of Agriculture, Alcorn State University, Lorman, MS, USA

Heavy metal contamination has affected the soil and air due to anthropogenic activity. This contamination poses a serious threat to the environment as well as to the water and food supply. Recent studies have shown that phytoremediation technologies may play a pivotal role in mitigating heavy metal contamination while being a cost effective alternative to traditional technologies such as soil washing and/or removal. Hyperaccumulators are plants capable of absorbing high concentrations of heavy metals, such as cadmium (Cd) and zinc (Zn) through the roots and ideally, translocating the metals to the above ground shoots to facilitate removal of the metal without disturbing the soil. The purpose of this study is to determine the hyperaccumulating potential of three plant species, *Eruca sativa, Brassica oleracea*, and *Spinacia oleracea*. A small-scale hydroponic study will be conducted to evaluate phytoextraction potential of the three plants. The plants will be monitored for morphological characteristics and roots and shoots will be separated, and analyzed for fresh biomass. The roots and shoots will undergo Nitric Digestion and Inductively-Coupled Plasma-Mass Spectrometry (ICP-MS) will be utilized to quantify metal and concentration in the roots and shoot tissues. The assessment of the roots and shoots will be performed by using the Scanning Electron Microscopy technology (SEM) to evaluate the effects of Cd and Zn on the vascular system of exposed plants. X-ray Absorption Near Edge Structure (XANES) will produce a beam line to determine the state of oxidation of the essential micronutrient (Zn) and a toxic non-essential element (Cd) extracted *by Eruca sativa, Brassica oleracea*, and *Spinacia oleracea*.

Acknowledgments: This research work was financially supported by a grant from the Department of Education (Grant N0. 631612/19-20), through the HBGI-Activity 6 Strengthening the Environmental Science PhD Program at Jackson State University (JSU).

P1.26

SURVIVAL, PERSISTENCE, AND ISOLATION OF DIFFERENT COLONY MORPHOTYPES OF *LISTERIA MONOCYTOGENES* AFTER EXPOSURE TO LOW AND HIGH CONCENTRATIONS OF SECOND-GENERATION QUATERNARY AMMONIUM COMPOUND (STERBAC QUAT) IN WATER

Stephen Schade, Emily Tucker, and Ramakrishna Nannapaneni

Department of Food Science, Nutrition, and Health Promotion, Mississippi State University, Mississippi State, MS, USA

With the increasing frequency of recalls due to Listeria monocytogenes, and its frequent association with foods that are

not normally considered a high risk for this pathogen, there is a need for understanding the factors that contribute to its survival and persistence in the food processing environments. While quaternary ammonium compounds (QAC) are typically applied at very high concentrations to kill L. monocytogenes and other foodborne bacterial pathogens, there are some factors can cause its reduced efficacy in the food processing environment. Unequal spreading over a rough surface, over dilution, or the slow breakdown of the compound by light or oxygen can significantly reduce its concentration. Sublethal concentrations of stagnated QAC have been found both in processing plants and in wastewaters released to the environment. Therefore, the purpose of this study was to investigate the ability of two L. monocytogenes strains, Bug600 (serotype 1/2a) and ScottA (serotype 4b) to persist in lethal and sublethal concentrations of second generation QAC, SterBac QUAT, and if these strains would regrow when conditions had improved. Using a concentration gradient of SterBac QUAT in microwells or Eppendorf tubes that mimic varying concentrations of this compound occurring in some processing environments, we determined L. monocytogenes survival, persistence, and recovery in high and low nutrient conditions. The MIC of SterBac QUAT was 1 µg/ml for Bug600 and 2 µg/ml for ScottA. One of the two strains (ScottA) survived bactericidal concentration of 6 µg/ml of SterBac QUAT in water for 1 h with a rapid reduction of 5-6 logs CFU/ml from the initial 7 log CFU/ml, however, there were still 1-2 CFU/ml of L. monocytogenes recovered for both strains after 24 h incubation in twice as high as their MIC concentrations in high or low nutrition conditions. Some survivors of both strains displayed a unique phenotype in which colony size varied widely. Samples of large and small colonies isolated at multiple SterBAC QUAT concentrations are waiting for the complete characterization.

P1.27

DIFFERENCES IN SURVIVAL AND PERSISTENCE OF EIGHT *SALMONELLA* STRAINS AFTER EXPOSURE TO LOW AND HIGH CONCENTRATIONS OF FIRST-GENERATION QUATERNARY AMMONIUM COMPOUND (BAC) IN WATER

Grace Umutesi and Ramakrishna Nannapaneni

Department of Food Science, Nutrition, and Health Promotion, Mississippi State University, Mississippi State, MS, USA

Biocides or disinfectants play an important role in eliminating and/or controlling the pathogen spread in food processing environment and in health care industries. Quaternary ammonium compounds (QACs) are used in over 200 disinfectants as active ingredients because of their wide antimicrobial spectrum. Even though QACs are used at high concentrations in the food processing industries, various factors such as presence of organic matter can reduce their efficacy and *Salmonella* can remain on the processing equipment following biocides application despite thorough cleaning and sanitation. In this study, we determined the strain variation in survival, persistence, and regrowth of eight *Salmonella* strains after exposure to a lethal concentration followed by sublethal concentration of first generation QAC, benzalkonium chloride (BAC) in water. Our results show a significant strain variation in survival and persistence of *Salmonella* in BAC. At a lethal concentration of BAC of 24 µg/ml in 1 h in water, *Salmonella* Typhimurium ATCC 14028 and *Salmonella* Heidelberg ATCC 8326 cells were non-detectable from the initial 7 log CFU/ml, however, after 24 h incubation in 12 µg/ml BAC in high or low nutrient conditions, about 1.5 log CFU/ml of both *Salmonella* strains were recovered. Under the same conditions, four other strains, *Salmonella* Blockley and *Salmonella* Virchow, *Salmonella* Poona 01A4242 and Salmonella Poona 00A3208, which were non-detectable after 1 h BAC exposure at lethal 24 µg/ml, also continued to be non-detectable in 12 µg/ml BAC in nutrient conditions after 24 h. However, two other strains, *Salmonella* Poona 01A4754 and *Salmonella* Poona 00A3279 survived by 1 log CFU/ml in lethal 24 µg/ml BAC in 1 h which grew back to 1.5 to 2.6 log CFU/ml in 24 h in high or nutrient conditions. This work may lead to understanding of the role of lethal and sublethal sequence of QAC exposures that may occur in the processing environment in the induction of tolerant subpopulation of *Salmonella* that may persist in some conditions.

P1.28

CORN AGRONOMICS RESEARCH TO IMPROVE MISSISSIPPI CORN PRODUCTION

Jagman Dhillon, Camden Oglesby, Ramandeep Sharma, James Dew

Mississippi State Uninersity, Starkville, MS

Achieving higher corn yield requires several agronomic decision-making. These choices include but are not limited to hybrid selection, crop rotation, proper fertility, soil drainage, weed control, planting dates, insect control, planting geometry, seeding rates, diseases control, irrigation, tillage, etc. These decisions directly affect different yield components of corn. Successful corn production hinges on timely and updated corn agronomics research. Our corn agronomics lab at Mississippi State University investigates numerous corn agronomic issues. Currently, our lab is investigating different methods to improve the nitrogen fertilizer use efficiency using remote sensing, effects of additions and deletions of macronutrients on corn yield and quality, sulfur fertilizer management using optical sensors, etc. Since the inception of the Corn agronomics lab at MSU in 2020, we have found that current yield goal-based methods of N fertilizer recommendations are inadequate; sulfur nutrient recommendation should be based on site-specific characteristics; agronomic optimum plant populations are site-year specific; corn N status could be accurately predicted using remote sensing with higher accuracy at later growth stages.

Our future projects aim to investigate different cultural practices to mitigate corn diseases, track N uptake at different growth stages, develop a soil-specific corn seeding rate algorithm, evaluate the efficacy of different biological N sources, evaluate biochar as a potential soil amendment, etc.

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

Friday, April 1, 2022

MORNING

8:00 Opening remarks

Moderator: Bhupinder Singh, Mississippi State University

O1.15

8:15 NON-CHEMICAL MANAGEMENT OF WEEDS IN ORGANIC TOMATO USING SOIL STEAMING AND COVER CROPS

Augusto Dubou Serafim[1], *Isabel Werle*[1,2], *Sydney Stockwell*[1], *Alyssa Miller*[1], *Josiane Argenta*[1], *Clay Cheroni*[1], *Shaun Brodrick*[1], *Te Ming Tseng*[1]

[1]*Mississippi State University, Starkville, MS, USA.* [2]*University of Arkansas, Fayetteville, AR, USA*

Weed interference in tomato production has resulted in significant reductions in crop yields. These losses have been mainly associated with the infestation of yellow and purple nutsedge (*Cyperus rotundus*), large crabgrass (*Digitaria sanguinalis*), and Palmer amaranth (*Amaranthus palmeri*). Furthermore, these invader plants have shown to be resistant to the numerous herbicide modes of action used for their control. Thus, alternative control methods such as cover crops and soil steaming have tremendous importance in keeping the tomato production system viable. This study aimed to evaluate the effects of different cover crops and durations of soil steaming on weed management in organic tomato production. The experiment was conducted at the MSU Truck Crops Branch in Crystal Springs, MS. A mixture of yellow nutsedge, large crabgrass, and Palmer amaranth was sown into each plot, and after two days, the plots were steamed to 82^{o}C for 0, 5, or 20 minutes. Mixtures of cover crops analyzed were fallow; rye+clover; rye+vetch; rye+vetch+radish, and the combined effect of mulching (with and without plastic mulch) on weed control was also evaluated. The 0-minute soil steaming treatment promoted an increase in weed coverage, where 55% of the weeds consisted of yellow nutsedge. Mulched treatments had higher plant height when compared with non-mulched treatments, with 8 cm in soil steamed treatments (5 and 20 minutes) and 5 cm in non-steamed treatments. Cover crop mixtures resulted in different weed densities, with Palmer amaranth the most affected, showing a decrease of 75% in rye+vetch plots than fallow. In contrast, plots with rye+vetch+radish cover had an increase in Palmer amaranth weed density. The cover crops treatments were not very efficient in controlling large crabgrass, which showed an average cover of 50% across cover crop treatments. Overall fruit yield was enhanced by 46 and 57% due to mulching and soil steaming, respectively. The study shows that soil steaming, even in short periods, is an effective method in suppressing weeds in commercial tomato production, helping to keep the system more sustainable and environmentally safe.

O1.16

8:30 ALLELOPATHIC POTENTIA OF SWEET POTATO VARIETIES ON THE GRWOTH OF PALMER AMARANTH

Karina Beneton, Varsha Singh, Ziming Yue, Mark Shankle, Te Ming Tseng

Mississippi State University, Starkville, MS, USA

There is tremendous interest in developing effective and sustainable methods to suppress the spread of Palmer amaranth (*Amaranthus palmeri*) in agriculture. This weed is problematic because it is easy to spread, resistant to numerous herbicides, and causes crop yield loss. Numerous studies on the chemical control of Palmer amaranth have been conducted, but the interaction of this weed with other crop plants that have allelopathic effects is still unclear. This study aimed to evaluate the allelopathic effects of 17 sweet potato varieties on the growth of Palmer amaranth (*Amaranthus palmeri*). This study was conducted under controlled conditions in the greenhouse in a stair-step set up in the Department of Plant and Soil Sciences at Mississippi State. Plant height was collected weekly. Four sweet potato varieties were most effective in suppressing Palmer amaranth. The variety that reduced (up to 85%) Palmer amaranth height the most was Hatteras. The variety Centennial presented the most expressive initial height reduction, up to 32%. In the presence of the variety Morado, the germination of the weed was delayed until four weeks after emergence, followed by growth inhibition. The variety Evangeline showed an up to 36% height reduction of Palmer amaranth. Among the sweet potato varieties studied, these three varieties performed the best and can be considered growth suppressors of Palmer amaranth.

O1.17

8:45 LONG-TERM STUDY ON SWITCHGRASS (Panicum virgatum L.) FOR EROSION PREDICTION AND SOIL CARBON BUILDUP

Dana Gaines[1], *G.K. Panicker*[1], *L. Kibet*[1], *Keerthi Mandyam*[1], *W. Mims*[1], *Grant Young*[1], *S.S. Cain*[1], *Timothy Carry*[2]

[1]*Alcorn State University, Lorman, MS, USA.* [2]*US Army, Hanover, NH, USA*

Soil erosion and climate change are some of the major problems the world faces today. Intensively managed agricultural soils have lost 50% to 70% of their pre-cultivation carbon. The chief method of carbon transfer to the soil is via photosynthesis and subsequent storage in plant tissues. Crop residue management has been established as a valuable technology for reducing erosion and climate change. There is general agreement that cover crops can sequester carbon, but the magnitude of their potential impact is debated. As a part of the C-factor (cover and management) research being carried out at Alcorn, different varieties of Switchgrass are thoroughly studied to prevent erosion on U.S. Army's training lands. The main objective of this research is to study the plant density effects of four varieties of Switchgrass, Kanlow, Colony, Alamo, and BoMaster on biomass development. Leaf area Index (LAI), dry biomass, carbon buildup, and C: N ratio were evaluated on a heavy soil, Memphis Silt Loam, at two plant densities; high density planting (HDP) and low density planting (LDP). Our data indicate that Switchgrass is an excellent perennial cover to transfer carbon from the atmosphere to the soil. HDP yields high biomass than LDP. Results indicate that LAI measurements were as effective at predicting Switchgrass dry biomass yield. In addition, LAI and dry biomass measurements were strongly related to one another. The presentation will cover the agronomic methods applied to raise this C_4 crop on a heavy soil and residue management techniques to enhance soil carbon buildup.

9:00-9:15 **BREAK**

O1.18

9:15 DEVELOPING Agrobacterium-MEDIATED TRANSFORMATION APPROACH TO IMPROVE THE VIRAL RESISTANCE AND PROTEIN LEVELS IN SWEETPOTATO (Ipomoea batatas L.)

Yan Meng, Tymesha Nabors, Favour Afolabi, Chunquan Zhang

Alcorn State University, Lorman, MS, USA

Food security and nutrition security exist as the major concerns in many countries of the world. The sweetpotato (*Ipomoea batatas* L.), a member of the Convolvulaceae family, is the world's seventh most important food crop. However, as a crop produced by vegetative propagation, cultivar decline due to viral infections significantly reduces sweetpotato yield and storage root quality. Sweetpotato leaf curl virus (SPLCV) and Sweetpotato virus C (SPVC) are two of the main viruses that cause devastating diseases and yield reductions in Mississippi. Moreover, sweetpotato contains lower protein content compared to other staple foods, e.g., maize, rice, wheat and soybean. In this study, we developed an efficient Agrobacterium-mediated transformation approach to create transgenic sweetpotato plants with improved performance. The SPLCV and SPVC dual resistance genetic segment was introduced into a binary vector for expression. Polymerase chain reaction revealed positive signs of transgene expression in transgenic plants induced from leaf and petiole. The detection of transgenic plants' viral resistance is in progress via an optimized cleft grafting technique. Moreover, Arabidopsis QQS gene and Sweetpotato NF-YC4 gene s have been transformed into sweetpotato via Agrobacterium-mediated transformation. The overexpression of these two genes will significantly improve the protein contents in sweetpotato.

O1.19

09:30 TRANSLATION OF RURAL AGRICULTURE INTO HOMELAND SECURITY

Sam Nwaneri

Alcorn State University, Lorman, MS, USA

The reality of 2021December tornadoes across five states in the U. S. immediately became a threat to Homeland Security, especially to hard-hit areas of rural Kentucky. It is also a threat to rural agriculture in the United States. These rural areas are homes to great people in the nation and must not be so disadvantaged. Challenges faced by rural farmers in the U. S. were compared to be equivalent to challenges farmers face in West African. This research was focused on cocoa farmers in Liberia. In 2016, the Office of the Minister for Agricultural and Rural Development in Liberian indicated that there is very limited fund or reduced funds available for financing agricultural farm operations, especially at subsistence levels. This condition made it very difficult for small rural disadvantaged farmers to secure needed credits or loans to run their farms. The farmers produce very large quantity of cocoa beans for western countries, where the beans are used for the manufacture of beverages such as chocolate. Irrespective of vast economic cocoa markets around the world, the Liberian cocoa farmers are still identified as rural disadvantaged subsistent farmers (DSF). A basic problem identified with DSF is facility definition for gainful large-scale agriculture. Facility definition is an analytical description, adopted in this research, to show how agriculture determinants (land, labor, and capital), including land ownership risk coverage turn cash-crops into cash**.** As indicated earlier, bank reports show that banks have reduced funds available for financing agricultural operations due to increased agricultural risk exposure, such as high debt-to-equity ratio and the effects of climate change. These conditions challenge rural farmers around the world and make it difficult to secure needed credits from banks and other financial agencies. The purpose of this project is to use a 2016 ACDI/VOCA Farmer-2-Farmer sponsored program to show how America's rural farming translates into Homeland Security. This study used mapping functions to relate these problems to general and specific USDA assistance programs. The study further evaluated how these functions satisfied USDA requirements, such as land imagery requirements for economic and community development. The objective was focused on using farmland status mapping for agriculture risk coverage, price loss coverage, and program payment maps. These maps serve as collaterals with banks for land development. Field data acquired from Liberian satellite farmers were used for the analysis of facility definition. The analysis was based on farm output and marketplace linear objective functions (LOF), such as production and stock rates. The basic agriculture determinants were evaluated using the LOF to determine farmland solvency ratio. The evaluation served as feasibility study for the prediction of farm productivity. This ratio also shows that farm operations are dependent on agriculture determinants identified in this research. The finding is that cocoa farming improvement in Liberia is sufficiently likely with farmland status mapping, which shows reduced agriculture risks. It also creates significant relationships with community improvement empowerment programs and farmland yield.

O1.20

09:45 USE OF WEED EXTRACTS TO REDUCE DEER AND INSECT STRESSES IN MISSISSIPPI SOYBEAN PRODUCTION

Ziming Yue[1]*, Parth Sharma*[2]*, Alyssa Miller*[1]*, Vidur Katyal*[1]*, Mark Shankle*[1]*, Te-Ming Tseng*[1]

[1]*Mississippi State University, Mississippi State, MS, USA.*
[2]*Mississippi State Univertsity, Mississippi State, MS, USA*

Insects and deer are two main pests in Mississippi soybean production. While deer damage of soybean focuses on the edge of the field, insect damage extends to the whole field. Insect damage of soybean increases from May to September exponentially, while deer damage of soybean decreases along the same above time course. Soybean is one of the primary crops in Mississippi that suffers heavy defoliation from both deer and insects. The former browses the whole leaf while the latter lead to holes in leaves. It is reported that insect saliva may induce a defense response in plants to synthesize secondary metabolites to defend unspecifically against herbivores and pathogens. However, soybean seems an exception as we see it suffer from heavy defoliation by insects and deer, thus suggesting that soybean may not have enough defense-related genes. The project tried to extract secondary metabolites from sicklepod, coffee senna, and sesbania weeds for application on soybean plants to protect them from deer and insect stress. The extracts were prepared by extracting fruits of sicklepod, coffee senna, and sesbania and sprayed on soybean plants at the V5 stage in a row crop environment. Treatments of a commercial deer repellent and blank control were included in the randomized experimental layout. After exposure to deer and insects for 40 days, the results showed that sicklepod had similar deer repelling effects as the commercial repellent. Coffee senna showed fewer leaf holes from insects than other treatments. Soybean looper, one of the top three damaging insects in midsouth soybean production, was selected to test the effects of the weeds extracts in the lab. The results showed that sesbania extract leads to around 60% looper mortality after exposure to the extract-treated soybean leaf for 24 hours, higher than coffee senna (20%) and sicklepod. Our

findings suggest that sicklepod extract is an effective deer repellent, coffee senna extract may have induced defense response in soybean plants, and sesbania extract contains insecticidal properties.

O1.21

10:00 SOIL POTASSIUM DO NOT ALLEVIATE RENIFORM NEMATODE DAMAGE ON EARLY COTTON GROWTH

Bhupinder Singh[1], *Daryl Chastain*[2], *Gurbir Singh*[1]

[1]*National Center for Alluvial Aquifer Research, Mississippi State University, Leland, MS, USA.* [2]*USDA ARS Sustainable Water Management Research Unit, Stoneville, MS, USA*

The individual or combined effects of Potassium (K) fertilization and reniform nematode (RN) on early-season growth of cotton may vary across germplasm. A greenhouse study was, therefore, conducted to investigate the role that host plant resistance plays in affecting RN populations and early-season cotton growth response to a range of soil potassium (K) levels in the presence and absence of RN. Two upland RN-resistant cotton lines (***G. barbadense*** accession; 08SS110-NE06.OP and 08SS100), a genetic standard (Deltapine 16) and a commercial susceptible cultivar (PHY 490 W3FE) were evaluated at four different levels of K [100% of recommended rates, 150% of recommended, 50% of recommended, and a base level] from seeding until harvesting, 60 days after sowing (DAS), in the presence and absence of RN. The quadratic functions (r^2 = 0.82 to 0.95) best-described early-season growth responses of cotton genotypes to K fertilization. The base K level showed significantly lower values on an average than higher K levels for most of measured parameters including plant height (PH), mainstem nodes (MSN), leaf area, and dry weights at both 30 DAS and 60 DAS. While no effect of K fertilization was observed on reniform nematode population counts (RC). Further, rate of change in growth parameters to increasing K levels was not different among genotypes. The resistant genotype 08SS110-NE06.OP showed significantly greater growth in terms of time to first true leaf, PH, MSN, and above-ground dry weights when compared to susceptible commercial check. No interaction between K and RN was found on early-season cotton growth based on measured parameters. While RC in the pots grown with resistant genotypes were significantly less than pots grown with susceptible genotypes. The information on early-season growth response of studied novel resistant genotypes along with commercial susceptible cultivars to soil K would be useful for cotton breeders and agronomists to develop RN resistance in cotton concerning fertilization management.

10:15 BREAK

10.30 – 11.30 AM BUSINESS MEETING

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Cellular, Molecular, Developmental Biology

Chair: James A. Stewart, Jr.

University of Mississippi

Vice-Chair: Davida Crossley

Mississippi University for women

Vice-Chair: Yvette Langdon

Millsaps College

Thursday, March 31, 2022

MORNING

Room D3

Oral Presentation Session I:

Moderators: Drs. James A. Stewart, Jr., Davida Crossley and Yvette Langdon

8:50 AM Welcome

O2.01

9:00 PIF4 PROMOTES DAYTIME THERMOSENSORY GROWTH BY RECRUITING THE MEDIATOR COACTIVATOR COMPLEX

Abhishesh Bajracharya (Presenting Graduate Student)[1], Jing Xi[2], Karlie Grace[1], Eden Bayer[1], Chloe Grant[1], Caroline Clutton[1], Scott Baerson[2], Ameeta Agarwal[3,4], and Yongjian Qiu[1]

[1]Department of Biology, University of Mississippi, Oxford, MS, USA; [2]Natural Products Utilization Research Unit, USDA-ARS, Oxford, MS, USA; [3]National Center for Natural Products Research, School of Pharmacy, University of Mississippi, Oxford, MS, USA; [4]Division of Pharmacology, Department of BioMolecular Sciences, School of Pharmacy, University of Mississippi, Oxford, MS, USA

Plants are very sensitive to temperature fluctuations and even a 1°C change in the average temperature triggers thermomorphogenetic responses that may lead to exorbitant loss of crop yield and quality. These thermomorphogenetic responses are regulated by a basic helix-loop-helix (bHLH) transcriptional regulator named PHYTOCHROME INTERACTING FACTOR 4 (PIF4) and its coactivator HEMERA (HMR). Although it is well demonstrated that PIF4 and HMR promote plant thermosensory growth by activating key genes involved in the biosynthesis and signaling of the phytohormone auxin, the detailed molecular mechanism of such transcriptional activation is still not clear. In this report, we investigate the role of the Mediator complex in the PIF4/HMR-mediated thermoresponsive gene expression. Through the characterization of various mutants of the Mediator complex, multiple tail subunits are identified as essential factors for thermomorphogenetic hypocotyl growth. These mediator tail subunits are required for the thermal induction of key PIF4 target genes but have a marginal effect on the levels of PIF4 and HMR. Further transcriptomic analyses confirm that the expression of numerous PIF4/HMR-dependent and auxin-related genes requires the Mediator complex at warm temperatures. Finally, PIF4 and HMR are indispensable for the association of the Mediator complex with the promoters of these thermoresponsive genes. Together, these results unveil an important thermomorphogenetic mechanism, in which PIF4 and its coactivator HMR recruit the Mediator complex to activate auxin-related growth-promoting genes when plants sense moderate increases in ambient temperature.

O2.02

9:20 INTERROGATION OF MYOSIN II ENSEMBLE SYNERGY USING OPTICAL TWEEZERS

Omayma Al Azzam (Presenting Graduate Student), Janie Watts, and Dana Reinemann

University of Mississippi, University, MS, USA

Biological motors are essential to life, converting chemical energy into mechanical work. Muscle contraction is initiated by the dynamics of myosin II interacting with actin filaments. Significant health issues, such as hypertrophic cardiomyopathy, propagate at the molecular level as a result of mutation of myosin II motor protein. Myosin II motors do not work separately, and multiple myosin II motors need to cooperate and work together as ensembles along actin filaments in order to derive muscle contraction. Investigating the mechanisms of force generation by actin-myosin ensembles and factors that might affect this cytoskeletal network are crucial for detecting failure in myosin functionality that could lead to heart diseases. It is necessary to link these problems that originate at the molecular scale to phenotypes observed at the cellular or organ level. However, how molecular level actomyosin force effectors propagate up in scale is not well understood. Optical tweezers were employed in previous studies for measuring force at the single molecule level. This work aims to use optical tweezers to study myosin II motor dynamics as ensembles of motors interacting with each other and with actin filaments. Here, we devised a novel hierarchical optical trapping assay to create a more physiologically relevant environment.

O2.03

9:40 A NEW ATTENUATED ZIKA VIRUS WITH MODIFIED 5′ UNTRANSLATED REGION ELICITS IMMUNITY IN MICE

Farzana Nazneen (Presenting Graduate Student)[1], Elizabeth Thompson[1], Biswas Neupane[2], Faqing Huang[1], and Fengwei Bai[1]

[1]University of Southern Mississippi, Hattiesburg, MS, USA; [2]University of Pittsburgh Medical Center, Pittsburgh, PA, USA

Zika virus (ZIKV), a mosquito-borne Flavivirus with a history of causing an epidemic, has been considered a major public health concern. Although ZIKV infection causes asymptomatic illnesses lasting for 2-7 days in most cases, there is also an increased risk of severe neurological complications including Guillain-Barre Syndrome, neuropathy, and myelitis in human adults. ZIKV infection during pregnancy causes major concerns as it produces a wide range of complications such as pre-term birth, miscarriage, and congenital malformations including microcephaly in infants known as Congenital Zika Syndrome and even fetal demise. However, there are no approved vaccines or effective therapeutics available against ZIKV infection. We generated a new attenuated ZIKV strain, Z7, by inserting 50 nucleotides (nt) at 5′ untranslated region (UTR) of the wild type ZIKV, Z1, a Cambodian strain. The insertion of nt was confirmed by sequencing. Focus forming assay and QPCR assays in our *in-vitro* study confirmed that Z7 showed a lower replication rate than Z1measured by. In animal studies, we inoculated 10^5 PFU) of each of Z7 and Z1 into 4-week-old *Ifnar1*$^{-/-}$ mice through foot-pads. Following the primary infection, Z7 generated a lower level of viral loads in blood and tissue but a similar level of humoral response measured by anti-ZIKV IgG level in ELISA compared to that in Z1. The Z1- and Z7-immunized mice were also monitored for 21 days for weight change and survival. While the Z1-infection resulted in significantly decreased weight but increased mortality in mice, Z7 infection caused no mortality. Z7-infected mice were then challenged with 10^5 PFU of ZIKV (Puerto Rico strain). The post challenge data of blood and tissue confirmed that a single dose of Z7 inoculation provided a sterilizing immunity in *Ifnar*$^{-/-}$ mice. We hypothesized that the mutant ZIKV generated by 5′ UTR modification reduced the viral protein synthesis by decreasing the initiation of translation. Although the mutant had attenuated virulence, it could produce strong immunogenicity and sterilizing immunity against ZIKV infection. Therefore, 5′ UTR modified Z7 is a promising vaccine candidate to protect against ZIKV infection.

O2.04

10:00 GENERATION OF BAIAP3 EXPRESSION CONSTRUCT FOR SUB-CELLULAR LOCALIZATION AND PHENOTYPIC RESCUE

Ireland Little (Presenting Undergraduate Student), Pratikshya Adhikari, and Hao Xu

University of Southern Mississippi, Hattiesburg, MS, USA

Mast cells secrete a variety of biological mediators crucial for innate and adaptive immunity. One such mediator secreted by mast cells, sometimes in a rapid fashion, is TNF (Tumor Necrosis Factor). TNF secreted from mast cells and other immune cells has been shown to interact with TNF Receptor 1 and TNF Receptor 2 on specific target cells to elicit activation of complex signaling pathways that result in the production of pro-inflammatory cytokines; thus, TNF leads to inflammation that is associated with host defense against pathogens, allergy responses, and certain autoimmune diseases. Secretion of TNF is mediated by soluble N-ethylmaleimide-sensitive factor attachment protein receptors (SNAREs) and other regulatory proteins that work together to promote membrane fusion for degranulation and mast cell exocytosis. One regulatory protein, Munc13-4, facilitates the priming of secretory granules, which is required for mast cells to release β-hexosaminidase, histamine, serotonin, and TNF. However, while the release of the first 3 mediators is eliminated in Munc13-4 KO (knock-out) RBL-2H3 mast cells (tumor analogs to mucosal mast cells), the release of TNF is only partially inhibited, indicating that another Munc13 homolog could be involved in TNF secretion in these cells. To test the hypothesis that BAIAP3 (brain-specific angiogenesis inhibitor 1–associated protein 3), a Munc13-4 paralog which is also expressed in RBL-2H3 cells, could be responsible for additional regulation of TNF secretion from mast cells, the Xu lab is in the process of knocking out the BAIAP3 gene so that its function in TNF release can be monitored. My research involves the generation of a recombinant BAIAP3 expression construct that will serve two purposes. The first purpose is to see if the BAIAP3 expression construct can rescue any secretion phenotype associated with the loss of the BAIAP3 gene, to rule out phenotypes associated with any off-target gene deletion. The second purpose is to monitor the sub-cellular distribution of the BAIAP3 protein by taking advantage of a GFP tag downstream of the BAIAP3 gene. Restriction enzyme-based cloning will be done to insert the BAIAP3 cDNA into a pLVX-IB-M18-1-GFP plasmid to obtain a recombinant pLVX-IB-BAIAP3-GFP construct. Restriction enzymes EcoRI and BamHI have been selected because their recognition sites are present in the multiple cloning site of the pLVX-IB-M18-1-GFP plasmid but not in the BAIAP3 cDNA. The pLVX-IB-M18-1-GFP plasmid has undergone double digestion with EcoRI HF and BamHI HF, to pop out the M18-1. The remaining vector DNA has been gel purified. The BAIAP3 cDNA will be amplified from the commercially-available pFASTbacHT-rBAIAP3 plasmid. The PCR product (flanked by EcoRI and BamHI recognition sites) will be digested with EcoRI

and BamHI to yield cohesive ends that would complement the similarly-treated pLVX-IB-GFP vector. After the BAIAP3 cDNA is gel-purified, it will be mixed with linearized pLVX-IB-GFP in a ligation reaction. This ligation mixture will then be used to transform DH5α *E. coli*, and the recombinant plasmid will be isolated and sent for sequencing verification. The verified pLVX-IB-BAIAP3-GFP will be exploited for phenotypic rescue and co-localization studies.

10:20 - 10:30 BREAK

Oral Presentation Session II

Moderators: Drs. James A. Stewart, Jr., Davida Crossley and Yvette Langdon

O2.05

10:30 DELINEATING THE MECHANISMS OF TNF RELEASE IN MAST CELLS

Tolulope Ayo (Presenting Graduate Student) and Hao Xu

University of Southern Mississippi, Hattiesburg, MS, USA

Tumor necrosis factor (TNF) is a pleiotropic cytokine with pathological and physiological functions spanning from immune system to central nervous system and beyond. As a major producer of TNF, mast cell secretes TNF in response to diverse inflammatory signals however, the molecular mechanisms that underlies this process is still unclear. Munc13s and Munc18s have been shown to work conjointly as regulators of exocytosis in a lot of eukaryotic cells. The homologs of Munc13 protein present in mast cells are Munc13-1, Munc13-4 and BAIAP3 while Munc18 homologs in mast cells are Munc18a, Munc18b and Munc18c. The purpose of this study is to identify the Munc13 and Munc18 homologs responsible for TNF release in mast cells as well as the compartment to which TNF is localized. Using confocal microscopy, we show TNF to be contained in Munc13-4 bearing compartments in RBL-2H3 cells (a homolog of mucosal mast cells). Substantial co-localization of TNF with exosome markers in RBL-2H3 cells suggest that TNF is prestored inside multivesicular bodies (MVB). Deletion of Munc13-4 gene from RBL-2H3 cells via CRISPR indicate that while Munc13-4 is essential to the release of other mast cell mediators, it is only partially required for TNF release, suggesting other Munc13 homologs is also required for maximal TNF release. Since Munc18b partners with Munc13-4 to regulate exocytosis in other eukaryotic cells, we went on to quantify TNF release in stable Munc18b KD RBL-2H3 cell line. We show that Munc18b KD RBL-2H3 cells release significantly less TNF compared to wild-type cells, a phenotype that can be rescued upon re-introduction of Munc18b. In conclusion, our studies have demonstrated the importance of Munc13-4 and Munc18b in TNF secretion from mast cells and set a stage to dissect other molecular components involved in TNF exocytosis.

O2.06

10:50 CAN ACCUTASE BE A BETTER ALTERNATIVE TO TRYPSIN IN CELL CULTURE IN THE STUDY OF OBESITY?

Sukhbir Sohal (Presenting Undergraduate Student)[1], Amol Janorkar[2], and Courtney Cates[2]

[1]Mississippi College, Clinton, MS, USA; [2]University of Mississippi Medical Center, Jackson, MS, USA

Obesity is defined by the World Health Organization as abnormal/excessive fat accumulation that presents a significant risk to health. 4,000,000+ people die annually around the globe due to the consequences of excessive body weight. Cultured fat cells (adipocytes) are used to model *in vivo* fat tissues. Traditional two-dimensional (2-D) monolayer cell cultures are limited models since tissues are multilayered structures. Three-dimensional (3-D) cell cultures more accurately portray body systems, spheroids are used in this experiment. Differentiated adipocytes are used since they have a much longer lifespan in comparison to native adipocytes from the body. We are using spheroids of 3T3-L1 cells as a model for adipocyte characterization by differentiating them into adipocytes. One way to characterize adipocyte differentiation is to measure their cell surface markers by flow cytometry. These markers include CD36 and CD106. We aim to use Accutase to prepare single cell suspensions from adipocyte spheroids as required by flow cytometry. These cell suspensions will also be analyzed for DNA content and total triglyceride (fat) content. We will use Oil Red O, which is a fat-soluble dye that stains triglycerides and lipids, giving the ability to measure for cell's proficiency to produce/store fats. This experiment strives to help understand obesity on a cellular level for further research.

O2.07

11:10 PROTEOMIC ANALYSIS OF CHLOROPLAST PROTEINS OF SOYBEAN PLANTS IN RESPONSE TO SILICON APPLICATION

Amandeep Kaur (Presenting Graduate Student) and Jiaxu Li

Mississippi State University, Mississippi State, MS, USA

Soybean is an important economic crop around the world. It has good nutrition value due to rich source of protein content along with dietary minerals and vitamins. Mostly, soybeans are grown over 50 percent of Mississippi non-irrigated sites. Considering a significant area of crop production under water-limited rain-fed conditions, there is a great need to develop production systems to sustain yield potentials under water deficit stress. Drought stress is one the major abiotic stress and climate change may lead to increase the intensity, duration and frequency of drought stress. Silicon has recently been recognized as an important element in plant nutrition. In our previous study, it has been shown that supplying soybean with soluble silicon in the soil could improve vegetative growth and biomass production under water limiting conditions. However, the mechanism how silicon alleviates water deficit stress is not understood. Moreover, the previous studies do not have enough information about the interaction of silicon with chloroplast proteins. In this study, we examined the effects of silicon application on chloroplast proteins expression. Soybean plants were cultivated in pots containing soil supplied with 2 millimolar solution of sodium silicate. Equal amounts of sodium chloride were used to reverse the effects of sodium along with control plants. Intact chloroplasts were isolated from the leaves of silicone-treated and control plants exposed to water stress. Proteins were then extract from isolated chloroplasts. Two-dimensional gel electrophoresis and mass spectrometric approaches were used to identify differential chloroplast proteins in response to silicon application under water deficit stress. Proteins that shown differential expression in response to silicon application include photosynthetic proteins and enzymes. These results suggest that silicon application could affect enzymes important for photosynthesis and stabilize photosynthetic proteins and enzymes under water deficit stress.

O2.08

11:30 CHARACTERIZATION OF PHENAZINE BIOSYNTHESIS, REGULATORY AND RESISTANCE GENES IN *BURKHOLDERIA LATA* 383 (ATCC 17760)

Ankita Bhattacharyya (Presenting Graduate Student), Mallory Jarreau, Niladri Bhowmik, Jessie Fields, Ashley Grantham, James Hinson, and Dmitri Mavrodi

The University of Southern Mississippi, Hattiesburg, MS, USA

Microbial phenazines encompass a family of colored, structurally diverse secondary metabolites that share a common nitrogen-containing tricyclic core. They undergo redox cycling in the presence of oxygen or NAD(P)H and inhibit other bacteria, fungi, and parasites by generating reactive oxygen species (ROS). They also act as molecular signals and extracellular electron shuttles that contribute to biofilm formation and competitiveness in producing strains. Most of our current knowledge about the diverse biological functions of phenazines and their effects on other organisms is based on a single model – the opportunistic human pathogen *Pseudomonas aeruginosa*. Similar knowledge for other groups of phenazine-producing bacterial pathogens is lagging. We addressed this critical gap by focusing on phenazines produced by *Burkholderia* spp. *Burkholderia* encompass a group of ubiquitous Gram-negative bacteria that contain numerous saprophytes, nitrogen-fixing mutualists, and species associated with infectious diseases, hospital-acquired infections and necrotizing pneumonia in individuals with cystic fibrosis (Sousa *et al*., 2011, Stopnisek *et al*., 2016). We have recently demonstrated that strains in the *B. cepacia*, *B. pseudomallei*, and *B.glumae*/*B. gladioli* clades carry phenazine biosynthesis genes (Hendry *et al*., 2021). However, many aspects of the phenazine biology in these economically important bacteria remain unexplored. This study, focused on genes that function in the regulation and resistance of phenazine biosynthesis in *Burkholderia lata* 383, a member of the *B. cepacia* complex. We subjected this strain to transposon mutagenesis with Tn*5* and screened a total of 15,000 mutants for the loss of phenazine pigmentation. The screen yielded 36 non-pigmented mutants that were mapped by a combination of arbitrarily primed PCR and sequencing. The analysis revealed multiple Tn*5* insertions in quorum sensing genes that encode the acyl-homoserine lactone synthase CepI and the LuxR family transcriptional regulator CepR. Insertions were also detected in putative genes of pyruvate fermentation pathways, encoding for LysR type transcriptional regulator of D-lactate dehydrogenase. The involvement of shikimic acid pathway in the synthesis of chorismic acid, the initial precursor of phenazine biosynthesis, was also seen by analyzing mutated genes encoding for shikimate kinase and shikimate-5-dehydrogenase. A few membrane protein signaling genes were also found to be mutated, which might have led to a loss of phenazine efflux. We are currently assessing the effect of these mutations on phenazine biosynthesis genes by RT-qPCR. We are also working on inactivating a gene that encodes the redox-sensitive transcriptional regulator SoxR, which presumably modulates the activity of a multidrug efflux pump that neutralizes phenazine toxicity. The expected results will provide new insights into the regulation of phenazine production in *Burkholderia* spp., a group that includes important plant and animal pathogens.

12:00 - 1:00 GENERAL SESSIONS

Thursday March 31, 2022

AFTERNOON

RoomD3

ORAL PRESENTATION SESSION III

Moderators: Drs. James A. Stewart, Jr., Davida Crossley and Yvette Langdon

O2.09

1:30- WHY BATS CARRY DISEASES THAT AFFECT HUMANS WITHOUT AFFECTING THEM?

Oluwatosin Adeyemi (Presenting Undergraduate Student) and Daniel Oyugi

Mississippi Valley State University, Itta Bena, MS, USA

Much more study is needed to understand bats' innate and acquired immune responses during acute and chronic viral infections. To investigate lymphocyte proliferation, antibody and cytokine generation, bat cell culture-based assays and bat-specific reagents would be required. Bats that are significant repositories of emerging viruses have cell-mediated immune responses and a variety of other immunologic activities. The apparent absence of inbred bat strains is a key barrier in investigating T-cell responses in bats. Because matching major histocompatibility complex molecules on T cells and antigen-presenting cells are required for long-term T-cell investigations, such mice are required. Because captive bat colonies may harbor zoonotic viruses that can infect people, studies on the bats and their cells may necessitate biological containment. The growth factors necessary for the in vitro multiplication and maturation of bone marrow stem cells into competent cells in rats Partially defined antigen-presenting cells led to the creation of cell culture assays for intermediate-term proliferation of rodent T cells from several species of bats may most likely be propagated using similar methods.

O2.10

1:50- THE SMALL RNA UNIVERSE OF *CAPITELLA TELETA*

Sweta Khanal (Presenting Graduate Student), Beatriz Zancanela, Jacob Peter, and Alex Flynt

The University of Southern Mississippi, Hattiesburg, MS, USA

RNAi is an evolutionarily fluid mechanism with dramatically different activities across animal phyla. One major group, where there has been little investigation, is annelid worms. Here the small RNAs of the polychaete developmental model, *Capitella teleta*, are profiled across development. As is seen with nearly all animals, 200 microRNAs were found with ~66 high confidence novel species. Greater miRNA diversity was associated with later stages consistent with differentiation of tissues. Outside miRNA, a distinct composition of other small RNA pathways was found. Unlike many invertebrates, an endogenous siRNA pathway was not observed, indicating pathway loss relative to basal planarians. No processively generated siRNA-class RNAs could be found arising from dsRNA precursors. This has significant impact on RNAi technology development for this group of animals. Unlike the apparent absence of siRNAs, a significant population of piRNAs were observed. For many piRNAs phasing and ping pong biogenesis pathways were identified. Interestingly, piRNAs were found to be highly expressed during early development, suggesting a potential role in regulation in metamorphosis. Critically, the configuration of RNAi factors in *C. teleta* is found in other annelids and mollusks, suggesting that similar biology is likely present in the wider clade. This study is the first providing comprehensive analysis of small RNAs in annelids.

2:10 – 2:20 BREAK

Thursday March 31, 2022
AFTERNOON
RoomD3

2:20- DIVISIONAL KEY NOTE SPEAKER

R.C. Sample, PhD
Assistant Professor of Microbiology
Mississippi University for Women

METHODS UTILIZED BY SARS-COV-2 TO INCREASE VIRULENCE AND EVADE HOST IMMUNE RESPONSES

During the late fall of 2019 the world didn't know that it was about to be confronted with the most impactful and far-reaching pandemic that has occurred since the discovery of HIV. As cases spread from ground zero in Wuhan, China and radiating across the globe at the speed of modern air travel, science and medicine had to come to grips with trying to defeat a virus that could readily spread from person to person before symptoms could even be detected. As the virus spread, and people began to don masks, the potentially devastating outcomes for infected individuals became readily apparent, and the world began to grapple with what would come to be known as coronavirus disease 2019 or CoVID-19. The causative agent of CoVID-19 was later identified as a novel coronavirus, severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Since this first identification, there have been many variants identified, and it appears that there will be many more to come in the immediate future. Therefore, continued vigilance is paramount to confront this challenge. Even though the primary focus has been on what has been perceived as the main component of this variation, the viral spike protein found on the surface of the virion, there are many other aspects of the SARS-CoV-2 virus that contribute to its elevated pathogenicity and virulence, and we attempt to elucidate some of them here. The spike protein facilitates entry into the host cell via the angiotensinogen converting enzyme 2 (ACE-2) receptor and is believed to be a primary driver in the virus's ability to potentially evade any long-term antibody-mediated response targeting future variants. As with the previous, there are a number of other viral genes that contribute to the ability of the virus to evade a vigorous host immune response which range from the induction of a delayed interferon response to the antagonizing of interferon signaling. Moreover, when considering that the ACE-2 gene is an interferon stimulated gene, it is readily apparent that a reduction in interferon expression and the subsequent downregulation of ACE-2 expression would reduce competitive inhibition for viral binding in host cells and thereby enhancing viral. Therefore, we will discuss some of the methods by which SARS-CoV-2 evades immune surveillance and induces severe disseminated illness in infected individuals such as Acute Respiratory Distress Syndrome (ARDS), coagulopathy, lymphopenia, disseminated intervascular coagulation, and myositis. In addition, a brief discussion of how vaccine and pharmaceutical development was approached based on the previously mentioned characteristics of the virus and the tissues that are primarily targeted by the virus will occur. Thus, a comprehensive understanding of the previously mentioned factors is paramount if we are to break free from the grip of this ever changing and devastating pathogen.

MARCH 31, 2022
EVENING
3:30 DODGEN LECTURE/ AWARDS CEREMONY
5:00 GENERAL POSTER SESSION

P2.01

EFFECT OF AN ENDOGENOUS AHR LIGAND, ITE, ON AUTOIMMUNE DISEASE IN MALE AND FEMALE MICE

Trell Sturgis, Ashleigh Nicaise, Barbara Kaplan
Mississippi State University, Starkville, MS, USA

Multiple sclerosis is a neurodegenerative disease that affects less than 200,000 people in the United States. To study possible treatments for this disease, experimental autoimmune encephalomyelitis (EAE) can be induced using myelin oligodendrocyte glycoprotein (MOG) peptide to mimic the symptoms of multiple sclerosis in mice. It has been previously shown that 2,3,7,8-tetrachlorodibenzo-para-dioxin (TCDD), which is an aryl hydrocarbon receptor (AhR) ligand, inhibits EAE by suppressing T and B cell function, however it is toxic. Due to ITE being a ligand that functions similarly to TCDD, but with lower toxicity, it was used in our experimental model as a possible treatment. After the induction of the EAE, we treated the mice with ITE, TCDD, and corn oil by oral gavage for 12 days. We hypothesized that ITE would attenuate EAE by inhibiting T cell and B cells, not unlike TCDD. We examined the splenic cellularity in each mouse after 18 days and saw that splenocyte counts were lowest in the TCDD mice, and that the ITE had little to no effect. After further exploration through flow cytometry with intracellular IgG on CD5+, CD19+, and B220+ B cells, the results remained consistent that TCDD inhibited more than ITE. The results suggest that ITE is not as effective as TCDD in attenuating EAE, but with further exploration could show promise. The significance of this work is that ITE could potentially be beneficial for veterinary or possibly human autoimmune diseases.

P2.02

OVERCOMING DRUG RESISTANCE IN COLORECTAL CANCER CELLS BY MODULATING IGF2BP1

Felicite Noubissi[1], Nicole Betson[1], Vladimir Spiegelman[2], Mohammed Hajahmed[1], Tsige Gebretsadek[1], Paul Tchounwou[1], Kenneth Ndebele[1]

[1]Jackson State University, Jackson, MS, USA. [2]Pennsylvania State University, Hershey, PA, USA

Colorectal cancer (CRC) is the third most common cancer in both men and women, after prostate or breast, and lung cancer. It is estimated that 149,500 new patients will be diagnosed with, and 52,980 men and women will die of cancer of the colon and rectum in the United States in 2021.

Treatment for colorectal cancer may involve surgery, chemotherapy, biological therapy, radiation therapy, or a combination of treatments. The choice of treatment of colorectal cancer depends mainly on the location of the tumor and the stage of the disease. Chemotherapy is used for advanced cancers; however advanced colorectal cancers are notoriously resistant to drugs.

Two major mechanisms employed by colorectal cancer cells are thought to be responsible for insensitivity to therapeutics: i) resistance to apoptosis usually achieved by activation of anti-apoptotic pathways; ii) induction of multidrug resistance (MDR) membrane transporters that pump drugs out of the cells. Targeting

factors involved in these mechanisms should aid in the sensitization of colorectal cancer cells to drugs.

Previous studies suggested activation of the Wnt/β-catenin direct target, insulin-like growth factor 2 mRNA-binding protein 1 (IGF2BP1), might promote resistance of CRC cells to treatment **via** activation of anti-apoptotic pathways and induction of the multidrug resistance (MDR1) membrane transporter that pumps drugs out of the cells. We hypothesized that inhibition of IGF2BP1 will overcome resistance of CRC cells to chemotherapeutics. We used CRC cell lines HCT116, SW480, and RKO to show that knockdown of IGF2BP1 inhibits MDR1 expression ($P<0.01$) and prevents growth ($P<0.01$) and proliferation ($P<0.05$) of colorectal cancer cells with activated Wnt/β-catenin signaling pathway. The anti-growth and anti-proliferative effects of IGF2BP1 inhibition was more pronounced when the cells were treated with the chemotherapeutics, 5-FU, irinotecan, or oxaliplatin ($P<0.001$). We observed that the inhibition of IGF2BP1 significantly increases apoptosis in the same cells ($P<0.001$). A remarkable reduction in the migratory and invasive capabilities of those cells was noted as well ($P<0.05$). We found that inhibition of IGF2BP1 is sufficient to decrease the resistance of chemotherapy-resistant cancer cells with activated Wnt/ β-catenin signaling pathway. These findings portray IGF2BP1 as a good candidate for CRC therapy.

P2.03—(See abstract in O2.01)

PIF4 PROMOTES DAYTIME THERMOSENSORY GROWTH BY RECRUITING THE MEDIATOR COACTIVATOR COMPLEX

Abhishesh Bajracharya[1], Jing Xi[2], Karlie Grace[1], Eden Bayer[1], Chloe Grant[1], Caroline Clutton[1], Scott Baerson[2], Ameeta Agarwal[3,4], Yongjian Qiu[1]

[1]Department of Biology, University of Mississippi, Oxford, MS, USA. [2]Natural Products Utilization Research Unit, USDA-ARS, Oxford, MS, USA. [3]National Center for Natural Products Research, School of Pharmacy, University of Mississippi, Oxford, MS, USA. [4]Division of Pharmacology, Department of BioMolecular Sciences, School of Pharmacy, University of Mississippi, Oxford, MS, USA

P2.04

VISCOELASTIC AND KINETIC CHARACTERIZATION OF ACTIN-MICROTUBULE CROSSTALK USING QCM-D

Henry Seiler, Mallory Moffett, Dana Reinemann

University of Mississippi, University, MS, USA

Cells must be able to organize themselves in space and cooperate with their surrounding environment to change their shape, move themselves from one place to another, and be able to reorganize their internal components as they grow, divide, and adapt. For all of this and more to occur, eukaryotic cells rely on a complex system of filaments called the cytoskeleton. Most animal cells have three types of filaments that make up the cytoskeleton and account for the cells' spatial arrangement and mechanical properties: microtubules, actin filaments, and intermediate filaments. Even though these filaments are the main components of the cytoskeleton, the overall function would not be possible without the hundreds of accessory proteins that combine the filaments and link them to other components in the cell to facilitate long-range communication. Due to this high complexity, the actin and microtubule cytoskeletons have typically been investigated separately **in vitro**. We seek to understand how these disparate cytoskeletal systems interact to propagate and transmit force signals in order to communicate and carry out large scale cellular tasks, such as motility and division. Quartz Crystal Microbalance with Dissipation monitoring (QCM-D) is a real time, surface sensitive analysis technique for interrogating surface-interaction phenomena, kinetics, and viscoelastic properties. We employ QCM-D to analyze interactions and viscoelastic changes over time between microtubules, actin filaments, and different crosslinking proteins to gain a mechanistic understanding of the fundamental structural changes that occur at actin-microtubule intersections.

P2.05

INTERROGATION OF MYOSIN II ENSEMBLE SYNERGY USING OPTICAL TWEEZERS

Omayma Al Azzam, Janie Watts, Dana Reinemann

University of Mississippi, University, MS, USA

Biological motors are essential to life, converting chemical energy into mechanical work. Muscle contraction is initiated by the dynamics of myosin II interacting with actin filaments. Significant health issues, such as hypertrophic cardiomyopathy, propagate at the molecular level as a result of mutation of myosin II motor protein. Myosin II motors do not work separately, and multiple myosin II motors need to cooperate and work together as ensembles along actin filaments in order to derive muscle contraction. Investigating the mechanisms of force generation by actin-myosin ensembles and factors that might affect this cytoskeletal network are crucial for detecting failure in myosin functionality that could lead to heart diseases. It is necessary to link these problems that originate at the molecular scale to phenotypes observed at the cellular or organ level. However, how molecular level actomyosin force effectors propagate up in scale is not well understood. Optical tweezers were employed in previous studies for measuring force at the single molecule level. This work aims to use optical tweezers to study myosin II motor dynamics as ensembles of motors interacting with each other and with actin filaments. Here, we devised a novel hierarchical optical trapping assay to create a more physiologically relevant environment in which to investigate actomyosin dynamics.

P2.06

TUBULIN'S E-HOOK AS AN ADAPTABLE TOOL TO SIGNAL KINESIN MOTILITY

Dana Reinemann

University of Mississippi, University, MS, USA

Microtubules (MTs) are a key component of the cell's cytoskeleton, serving as structural filaments, facilitating dynamic machinery such as the mitotic spindle, and acting as highway system for kinesin and dynein molecular motors. The a- and b-tubulin subunits that polymerize into MTs each have negatively-charged, disordered c-terminal tails, called E-hooks, that extend from the filament surface. This charged, frictional MT "carpet" of E-hooks dictates diffusive properties of microtubule associated proteins and facilitates kinesin processivity. Yet, how the E-hook peptide's molecular structure is influenced by kinesin binding is not understood, as is how kinesin force generation and motility properties are influenced by E-hooks. To advance our knowledge of the elusive mechanistic underpinnings of E-hooks and their interactions with kinesin, we employ a multiscale, interdisciplinary approach: (1) at the molecular level using Raman spectroscopy and electronic structure calculations, (2) at the single protein level using docking simulations, and (3) at the protein system level using optical tweezers. Results suggest that E-hook peptides have the ability to form local sections of secondary structure, allowing for custom fits within kinesin's MT binding domain, which through docking simulations, appears to

be different between kinesin families. Further, kinesin motility on MTs is interrupted if the E-hook binding site is blocked, resulting in a lower run frequency and possible disruption of the ATPase cycle. Thus, while the E-hook has traditionally been characterized to be disordered, it may have the ability to adapt to its binding environment, acting as a custom-fit "hook" to facilitate motility and force output.

P2.07

A NEW ATTENUATED ZIKA VIRUS WITH MODIFIED 5' UNTRANSLATED REGION ELICITS IMMUNITY IN MICE

Farzana Nazneen[1], *Elizabeth Thompson*[1], *Biswas Neupane*[2], *Claire Blackwell*[1], *Faqing Huang*[1], *Fengwei Bai*[1]

[1]*University of southern Mississippi, Hattiesburg, MS, USA.* [2]*University of Pittsburgh Medical Center, Pittsburgh, PA, USA*

Zika virus (ZIKV), a mosquito-borne Flavivirus with a history of causing an epidemic, has been considered a major public health concern. Although ZIKV infection causes asymptomatic illnesses lasting for 2-7 days in most cases, there is also an increased risk of severe neurological complications including Guillain-Barre Syndrome, neuropathy, and myelitis in human adults. ZIKV infection during pregnancy causes major concerns as it produces a wide range of complications such as pre-term birth, miscarriage, and congenital malformations including microcephaly in infants known as Congenital Zika Syndrome and even fetal demise. However, there are no approved vaccines or effective therapeutics available against ZIKV infection. We generated a new attenuated ZIKV strain, Z7, by inserting 50 nucleotides (nt) at 5′ untranslated region (UTR) of the wild type ZIKV, Z1, a Cambodian strain. The insertion of nt was confirmed by sequencing. Focus forming assay and QPCR assays in our in-vitro study confirmed that Z7 showed a lower replication rate than Z1measured by. In animal studies, we inoculated 10^5 PFU) of each of Z7 and Z1 into 4-week-old Ifnar1$^{-/-}$ mice through foot-pads. Following the primary infection, Z7 generated a lower level of viral loads in blood and tissue but a similar level of humoral response measured by anti-ZIKV IgG level in ELISA compared to that in Z1. The Z1- and Z7-immunized mice were also monitored for 21 days for weight change and survival. While the Z1-infection resulted in significantly decreased weight but increased mortality in mice, Z7 infection caused no mortality. Z7-infected mice were then challenged with 10^5 PFU of ZIKV (Puerto Rico strain). The post challenge data of blood and tissue confirmed that a single dose of Z7 inoculation provided a sterilizing immunity in Ifnar$^{-/-}$ mice. We hypothesized that the mutant ZIKV generated by 5′ UTR modification reduced the viral protein synthesis by decreasing the initiation of translation. Although the mutant had attenuated virulence, it could produce strong immunogenicity and sterilizing immunity against ZIKV infection. Therefore, 5′ UTR modified Z7 is a promising vaccine candidate to protect against ZIKV infection.

P2.08

CANCER CELL FUSION AS A SOURCE OF TUMOR HETEROGENEITY AND METASTASIS IN BREAST CANCER

Oluwatoyin V. Odubanjo[1,2], *Paul B. Tchounwou*[1], *Brenda Ogle*[3], *Felicite K. Noubissi*[1]

[1]*Department of Biology, Jackson State University, Jackson, Mississippi, USA.* [2]*Department of Biochemistry, Adekunle Ajasin University, Akungba Akoko, Ondo State, Nigeria.* [3]*Department of Biomedical Engineering, University of Minnesota Twin-Cities, Minneapolis, Minnesota, USA*

Breast cancer is the most common cancer diagnosed among US women and is the second leading cause of cancer related death among women after lung cancer. This year alone, about 281,550 new cases of invasive breast cancer and 49,290 new cases of *in situ* lesions of the breast will be diagnosed in women in the United States. Moreover, 43,600 women will die of breast cancer in the country. Nearly 90% of breast cancer-related deaths are caused by local invasion and distant metastasis of tumor cells. Nearly 10%–15% of patients with breast cancer have an aggressive illness and develop distant metastases within 3 years after the primary tumor's discovery. Although the overall 5 and the 10-year survival rate has improved over time for invasive breast cancer among all women, it remains 9%-10% lower for black women than for white women. While the reasons for these disparities are multifactorial, differences in molecular mechanisms driving the progression of the disease might account at least in part for the survival disparities. Previous studies showed that cancer cells could fuse with different cells of the tumor microenvironment to form a population of hybrids that are genetically heterogeneous and exhibit unique properties. In this study, we explore cancer cell fusion-driven tumor heterogeneity and metastasis as a basis for the disproportion in breast cancer survival between white and black women. We hypothesize that breast cancer cells from black women as compared to breast cancer cells from white women are more prone to fuse with cells of the tumor microenvironment to form hybrids leading to increased tumor heterogeneity and resistance to treatment resulting in increased metastasis and death. To test our hypothesis, we used non metastatic and metastatic breast cancer cells isolated from black (HCC 1806, MDA-MB-157) and white (T47D, MDA-MB-231) women as well as mesenchymal stem cells (hMSC4099, hMSC39334) as fusion partners. We used the Cre/loxP-stop-loxP-GFP system to identify fused cells. Co-cultures of breast cancer cells expressing loxP-stop-loxP-GFP plasmid and MSCs expressing Cre recombinase were performed and 48 hours after initiation of co-cultures, fusion products were identified using fluorescence microscopy based on green fluorescence expression of the cells. We observed that the overall frequency of fusion between breast cancer cells and MSCs isolated from black women is higher than that observed between breast cancer cells and MSCs isolated from white women ($P<0.05$). Triple negative breast cancer which is more common in black women compared to white women exhibits extensive heterogeneity driving resistance to treatment and development of metastasis. This extensive heterogeneity might be due at least in part to the high ability of these cells to fuse with other cells. Understanding the mechanisms driving cancer cell fusion could lead to new drug development tactics to cancer treatment.

P2.09

GENERATION OF BAIAP3 EXPRESSION CONSTRUCT FOR SUB-CELLULAR LOCALIZATION AND PHENOTYPIC RESCUE

Ireland Little, Pratikshya Adhikari, Hao Xu

University of Southern Mississippi, Hattiesburg, MS, USA

Mast cells secrete a variety of biological mediators crucial for innate and adaptive immunity. One such mediator secreted by mast cells, sometimes in a rapid fashion, is TNF (Tumor Necrosis Factor). TNF secreted from mast cells and other immune cells has been shown to interact with TNF Receptor 1 and TNF Receptor 2 on specific target cells to elicit activation of complex signaling pathways that result in the production of pro-inflammatory cytokines; thus, TNF leads to inflammation that is associated with

host defense against pathogens, allergy responses, and certain autoimmune diseases. Secretion of TNF is mediated by soluble N-ethylmaleimide-sensitive factor attachment protein receptors (SNAREs) and other regulatory proteins that work together to promote membrane fusion for degranulation and mast cell exocytosis. One regulatory protein, Munc13-4, facilitates the priming of secretory granules, which is required for mast cells to release β-hexosaminidase, histamine, serotonin, and TNF. However, while the release of the first 3 mediators is eliminated in Munc13-4 KO (knock-out) RBL-2H3 mast cells (tumor analogs to mucosal mast cells), the release of TNF is only partially inhibited, indicating that another Munc13 homolog could be involved in TNF secretion in these cells. To test the hypothesis that BAIAP3 (brain-specific angiogenesis inhibitor 1–associated protein 3), a Munc13-4 paralog which is also expressed in RBL-2H3 cells, could be responsible for additional regulation of TNF secretion from mast cells, the Xu lab is in the process of knocking out the BAIAP3 gene so that its function in TNF release can be monitored. My research involves the generation of a recombinant BAIAP3 expression construct that will serve two purposes. The first purpose is to see if the BAIAP3 expression construct can rescue any secretion phenotype associated with the loss of the BAIAP3 gene, to rule out phenotypes associated with any off-target gene deletion. The second purpose is to monitor the sub-cellular distribution of the BAIAP3 protein by taking advantage of a GFP tag downstream of the BAIAP3 gene. Restriction enzyme-based cloning will be done to insert the BAIAP3 cDNA into a pLVX-IB-M18-1-GFP plasmid to obtain a recombinant pLVX-IB-BAIAP3-GFP construct. Restriction enzymes EcoRI and BamHI have been selected because their recognition sites are present in the multiple cloning site of the pLVX-IB-M18-1-GFP plasmid but not in the BAIAP3 cDNA. The pLVX-IB-M18-1-GFP plasmid has undergone double digestion with EcoRI HF and BamHI HF, to pop out the M18-1. The remaining vector DNA has been gel purified. The BAIAP3 cDNA will be amplified from the commercially-available pFASTbacHT-rBAIAP3 plasmid. The PCR product (flanked by EcoRI and BamHI recognition sites) will be digested with EcoRI and BamHI to yield cohesive ends that would complement the similarly-treated pLVX-IB-GFP vector. After the BAIAP3 cDNA is gel-purified, it will be mixed with linearized pLVX-IB-GFP in a ligation reaction. This ligation mixture will then be used to transform DH5α *E. coli*, and the recombinant plasmid will be isolated and sent for sequencing verification. The verified pLVX-IB-BAIAP3-GFP will be exploited for phenotypic rescue and co-localization studies.

P2.10

CAN ACCUTASE BE A BETTER ALTERNATIVE TO TRYPSIN IN CELL CULTURE IN THE STUDY OF OBESITY?

Sukhbir Sohal[1], *Amol Janorkar*[2], *Courtney Cates*[2]

[1]*Mississippi College, Clinton, MS, USA.* [2]*UMMC, Jackson, MS,*

Obesity is defined by the World Health Organization as abnormal/excessive fat accumulation that presents a significant risk to health. 4,000,000+ people die annually around the globe due to the consequences of excessive body weight. Cultured fat cells (adipocytes) are used to model *in vivo* fat tissues. Traditional two-dimensional (2-D) monolayer cell cultures are limited models since tissues are multilayered structures. Three-dimensional (3-D) cell cultures more accurately portray body systems, spheroids are used in this experiment. Differentiated adipocytes are used since they have a much longer lifespan in comparison to native adipocytes from the body. We are using spheroids of 3T3-L1 cells as a model for adipocyte characterization by differentiating them into adipocytes. One way to characterize adipocyte differentiation is to measure their cell surface markers by flow cytometry. These markers include CD36 and CD106. We aim to use Accutase to prepare single cell suspensions from adipocyte spheroids as required by flow cytometry. These cell suspensions will also be analyzed for DNA content and total triglyceride (fat) content. We will use Oil Red O, which is a fat-soluble dye that stains triglycerides and lipids, giving the ability to measure for cell's proficiency to produce/store fats. This experiment strives to help understand obesity on a cellular level for further research.

P2.11

ACUTE EXPOSURE TO ULTRAFINE INHALED PARTICULATE MATTER RESULTING CARDIOVASCULAR FUNCTIONAL CHANGES, LUNG INFLAMMATION, AND OXIDATIVE STRESS

Ross Hodges[1], *George Howell*[2], *Courtney Roper*[1], *James Stewart*[1]

[1]*University of Mississippi School of Pharmacy, University, MS, USA.* [2]*Mississippi State University School of Veterinary Medicine, Starkville, MS, USA*

Inflammation and oxidative stress play key roles in the progression of chronic illnesses, such as type 2 diabetes mellitus (T2DM), and are hypothesized to be one of the driving mechanisms for adverse health effects. Environmental exposures to inhaled PM2.5 (particles less than 2.5 μm in diameter, including ultrafine pollutants) have been demonstrated to be one of the underlying causes of elevated inflammation and oxidative stress, but little is known about these particles and the resulting effects in regions with long-standing health disparities. The goal of this research is to demonstrate an acute PM2.5 exposure exacerbates lung and heart inflammatory and oxidative stress mechanisms to disrupt organ function. To this end, echocardiography measurements were taken in wild-type mice before and 24-hours after a 100 μg/mouse intranasal exposure to a PM2.5 standard reference material resuspended in 0.9% saline. Saline was administered intranasally to a separate cohort of mice to serve as controls. After 24-hours, mice were sacrificed, and heart and lungs were harvested for immunohistochemical staining and molecular analysis. We found significant increases in %ejection fraction, %fractional shortening, and mitral valve (MV) early/late (E/A) ventricular filling ratios in wild-type 24-hours after PM2.5 exposure compared to saline exposure (1-way ANOVA, n=5-6 mice). These findings indicate changes in systolic function possibly as a result in ventricular wall thickening. Additionally, mRNA markers of inflammation (IL-b, IL-6, MCP-1) and oxidative stress (RAGE, SOD2) were significantly elevated (1-way ANOVA, n=5-6 mice) in PM2.5 exposed lungs. Lastly, Immunohistochemical staining confirmed qPCR findings by illustrating increased nitrotyrosine (nTyr; oxidative stress indicator) and RAGE presence in PM2.5 exposed lungs. Our findings indicated acute PM2.5 exposed wild-type mice had elevated inflammation and oxidative stress after 24-hours. Continued exposure to elevated levels of these stressors has the potential to establish a chronic, subclinical inflammatory and oxidative stressed states to exacerbate progression of adverse health conditions. Further work needs to be performed using PM2.5 collected from known health disparity regions.

P2.12

THE WOBBLE EFFECT: DISRUPTION OF GENES ENCODING TRNA-GUANINE TRANSGLYCOSYLASE AND THE QUEUOSINE SALVAGE PROTEIN HAS PHYSIOLOGICAL CONSEQUENCES IN *DROSOPHILA MELANOGASTER*

Seth Davis, Chance Anderson, Caleb Snoddy, Natraj Krishnan

Mississippi State University, Starkville, MS, USA

Queuosine (Q) is a hypermodified 7-deaza-guanosine that occurs at the wobble anticodon position 34 of four tRNA (Tyr, Asn, Asp, His) species for amino acids His, Asn, Tyr, and Asp with 5′GUN anticodons. Although the Q-modification occurs in most organisms, its precise role remains unclear in eukaryotes. The enzyme that substitutes Q for G34 in the Q-tRNAs is tRNA-guanine transglycosylase (TGTase), encoded by the tRNA-guanine transglycosylase (*Tgt*) gene. Eukaryotic TGTases consist of a catalytic subunit (QTRT1) and a homologous accessory subunit (QTRTD1), forming a functional complex. Unlike eubacteria, eukaryotes are unable to synthesize the Q-nucleoside or its precursors de novo. Animals must therefore salvage the nucleobase of queuosine, known as queuine, using salvage proteins such as DUF2419. Drosophila melanogaster has a single Tgt gene (CG4947) encoding the QTRT1 protein (NP_608585.1) and the accessory subunit gene (CG3434) encoding the protein QTRTD1 (NP_6483201.1) necessary for Q-tRNA formation. There is also a single gene (CG9752) encoding the potential Q-salvage protein family DUF2419 (NP_611573.1). It is hypothesized that lack of Q-tRNA modifications would impact an organism's physiology. To understand the physiological consequences of lack of such modification, disruption of the Tgt gene and its accessory subunit gene was achieved by ubiquitously driving the expression of an RNAi transgene targeting these genes using the powerful GAL4/UAS system. The lifespan, accumulation of protein carbonyls, dopamine levels and neuronal degeneration was documented in flies which lacked Q-tRNA compared to control flies. In parallel, gene-disrupted and control flies were subjected to stress by exposing them to hydrogen peroxide (21 mM) and oxidatively modified proteins documented using Western blotting. The obtained data lend strong support to the hypothesis that lack of Q-incorporation affects tRNA species such as tRNA-Asn, tRNA-Tyr and tRNA-His, which ultimately leads to compromised stress response and neurodegenerative symptoms.

P2.13

THERAPEUTIC EFFECT OF GARLIC EXTRACT AGAINST BREAST CANCER

Keara Johnson[1]*, Ariane Mbemi*[1]*, Clement Yedjou*[2]

[1]*Jackson State University, Jackson, MS, USA.* [2]*Florida A & M University, Tallahassee, FL, USA*

Breast cancer (BC) is the second leading cause of death amongst women. Every 2 minutes, a woman is diagnosed with breast cancer in the United States (US). It is estimated that about 95% if all breast cancers in the occur in women aged 40 and older. Study has also showed that more than 220,000 women are diagnosed with breast cancer and more than 40,000 will die. Research data revealed a high survival and prevention ratio of 80% with early stage diagnosis. Studies has been proven that a healthy diet, remarkably increasing the consumption of fruits and vegetables, is pivotal in reducing breast cancer. Garlic is a vegetable that belongs to the Allium class of bulb-shaped plants. It is widely consumed in many countries as spice and as condiment in many dishes, and for medicinal purposes and contains high level of sulfur arginine, oligosaccharides, flavonoids, and selenium, all which are beneficial to human health. The aim of this study is to examine the therapeutics effects of garlic in human breast cancer cells. The breast cancer cells were treated with 0, 2, 4, 6, 8, and 10 µg/mL respectively for 48hrs. The cell viability, oxidative stress, and apoptosis effect were measure using MTS, lipid peroxidation, Annexin V/PI assay, and acridine orange/PI. The result indicated the cell viability decrease as garlic dose increase. Garlic also induces oxidative stress and apoptosis in concentration depend manner. Our data revealed that garlic could be a potential anti-cancer drugs against breast cancer.

P2.14

PROTEOMIC ANALYSIS OF CHLOROPLAST PROTEINS OF SOYBEAN PLANTS IN RESPONSE TO SILICON APPLICATION

Amandeep Kaur, Jiaxu Li

Mississippi State University, Mississippi State, MS, USA

Soybean is an important economic crop around the world. It has good nutrition value due to rich source of protein content along with dietary minerals and vitamins. Mostly, soybeans are grown over 50 percent of Mississippi non-irrigated sites. Considering a significant area of crop production under water-limited rain-fed conditions, there is a great need to develop production systems to sustain yield potentials under water deficit stress. Drought is one of the major abiotic stresses. Moreover, climate change may also lead to increase the intensity, duration and frequency of drought stress. Silicon has recently been recognized as an important element in plant nutrition. In our previous study, it has been shown that supplying soybean with soluble silicon in the soil could improve vegetative growth and biomass production under water limiting conditions. However, the mechanism how silicon alleviates water deficit stress is not understood. Moreover, the previous studies do not have enough information about the interaction of silicon with chloroplast proteins. In this study, we examined the effects of silicon application on chloroplast proteins expression. Soybean plants were cultivated in pots containing soil supplied with 2 millimolar solution of sodium silicate. Equal amounts of sodium chloride were used to reverse the effects of sodium along with control plants. Intact chloroplasts were isolated from the leaves of silicone-treated and control plants exposed to water stress. Proteins were then extract from isolated chloroplasts. Two-dimensional gel electrophoresis and mass spectrometric approaches were used to identify differential chloroplast proteins in response to silicon application under water deficit stress. Proteins that shown differential expression in response to silicon application include photosynthetic proteins and enzymes. These results suggest that silicon application could affect enzymes important for photosynthesis and stabilize photosynthetic proteins and enzymes under water deficit stress.

P2.15

CHARACTERIZATION OF PHENAZINE BIOSYNTHESIS, REGULATORY AND RESISTANCE GENES IN *BURKHOLDERIA LATA* 383 (ATCC 17760)

Ankita Bhattacharyya, Mallory Jarreau, Niladri Bhowmik, Jessie Fields, Ashley Grantham, James Hinson, Dmitri Mavrodi

The University of Southern Mississippi, Hattiesburg, MS, USA

Microbial phenazines encompass a family of colored, structurally diverse secondary metabolites that share a common nitrogen-containing tricyclic core. They undergo redox cycling in the

presence of oxygen or NAD(P)H and inhibit other bacteria, fungi, and parasites by generating reactive oxygen species (ROS). They also act as molecular signals and extracellular electron shuttles that contribute to biofilm formation and competitiveness in producing strains. Most of our current knowledge about the diverse biological functions of phenazines and their effects on other organisms is based on a single model – the opportunistic human pathogen *Pseudomonas aeruginosa*. Similar knowledge for other groups of phenazine-producing bacterial pathogens is lagging. We addressed this critical gap by focusing on phenazines produced by *Burkholderia* spp**.**

Burkholderia encompass a group of ubiquitous Gram-negative bacteria that contain numerous saprophytes, nitrogen-fixing mutualists, and species associated with infectious diseases, hospital-acquired infections and necrotizing pneumonia in individuals with cystic fibrosis (Sousa *et al*., 2011, Stopnisek *et al*., 2016). We have recently demonstrated that strains in the *B. cepacia*, *B. pseudomallei*, and *B.glumae*/*B. gladioli* clades carry phenazine biosynthesis genes (Hendry *et al.*, 2021). However, many aspects of the phenazine biology in these economically important bacteria remain unexplored. This study, focused on genes that function in the regulation and resistance of phenazine biosynthesis in *Burkholderia lata* 383, a member of the *B. cepacia* complex. We subjected this strain to transposon mutagenesis with Tn**5** and screened a total of 15,000 mutants for the loss of phenazine pigmentation. The screen yielded 36 non-pigmented mutants that were mapped by a combination of arbitrarily primed PCR and sequencing. The analysis revealed multiple Tn**5** insertions in quorum sensing genes that encode the acyl-homoserine lactone synthase CepI and the LuxR family transcriptional regulator CepR. Insertions were also detected in putative genes of pyruvate fermentation pathways, encoding for LysR type transcriptional regulator of D-lactate dehydrogenase. The involvement of shikimic acid pathway in the synthesis of chorismic acid, the initial precursor of phenazine biosynthesis, was also seen by analyzing mutated genes encoding for shikimate kinase and shikimate-5-dehydrogenase. A few membrane protein signaling genes were also found to be mutated, which might have led to a loss of phenazine efflux.

We are currently assessing the effect of these mutations on phenazine biosynthesis genes by RT-qPCR. We are also working on inactivating a gene that encodes the redox-sensitive transcriptional regulator SoxR, which presumably modulates the activity of a multidrug efflux pump that neutralizes phenazine toxicity. The expected results will provide new insights into the regulation of phenazine production in *Burkholderia* spp., a group that includes important plant and animal pathogens.

P2.16

MICROWAVE ASSISTED ORGANIC SYNTHESIS AND CHARACTERIZATION OF DRUGS, SOLUBILIZATION STUDIES OF DRUGS IN AQUEOUS MEDIA USING CYCLODEXTRINS

Haley Clark, RaChaud Brown, George Armstrong

Tougaloo College, Tougaloo, Mississippi, USA

Cyclodextrins are ring shaped oligosaccharides that are used for the improvement of solubility and are produced by enzymatic conversion of starch. The pharmaceutical industry uses cyclodextrin because it serves as a powerful delivery agent. Cyclodextrin is available in 3 forms: Alpha, Beta, and Gamma. We found that we can dissolve 2-Hydroxypropyl-γ-Cyclodextrin in aqueous media while heating and stirring; then adding the drug dissolved in DMSO This solution he drug goes into solution. This drug is now soluble in the media, and we can test the efficacy of the drugs killing cancer cells.

P2.17

SURVEYING THE ANTI-PROLIFERATIVE AND APOPTOTIC EFFECTS OF *GARCINIA KOLA* IN BREAST CANCER

Michael-Ryan Lowe[1], *Ariane T. Mbemi*[2,3], *Paul B. Tchounwou*[1,3]

[1]*Molecular Toxicology Research Laboratory, NIH-Center for Environmental Health, College of Science, Engineering and Technology, Jackson State University, 1400 Lynch Street, Box 18750,, Jackson, MS, USA.* [2]*Molecular Toxicology Research Laboratory, NIH-Center for Environmental Health, College of Science, Engineering and Technology, Jackson State University,, Jackson, MS, USA.* [3]*Department of Biology, College of Science, Engineering and Technology, Jackson State University, 1400 Lynch Street, Jackson, MS, USA*

Breast cancer (BC) is still the second most diagnosed and the second most common cause of cancer death among women in the United States, despite remarkable progress in screening and patient management. Previous studies have shown that women are more likely than men to develop breast cancer (BC). However, compared to Caucasians, African American women have a low incidence rate but a higher mortality rate. Radiation therapy, chemotherapy, and hormone replacement therapy are common treatments for BC. Unfortunately, adverse side effects often accompany these treatments. Known as Bitter Kola, Garcinia kola is a flowering plant found mostly in tropical rain forests in Central and West Africa. According to folkloric medicine, every part of the plant is medicinal, including the seeds, stems, and leaves. However, the ability of Garcinia Kola to induce inhibition and apoptosis in breast cancer is currently unknown. Our study aims to determine the anticancer activity of Garcinia Kola (GK) to understand the extract's medicinal properties for inhibiting cell proliferation and promoting apoptosis in breast cancer MDA-231 and T47-D cells. Therefore, to examine Garcinia kola's antiproliferative and apoptotic effects on cellular proliferation, biochemical, and morphological modifications generated in vitro by breast cancer cells. Breast carcinoma MDA-231 and T47 cells were treated with various concentrations of GK for 24 and 48 Hrs. Data demonstrated that Garcinia Kola inhibited cellular proliferation in a dose-dependent manner and induced apoptosis in the MDA-231 and T47-D cell lines; these findings are associated with phosphatidylserine externalization, showing a robust concentration-response relationship between GK extract treatment and mitochondrial membrane potential and annexin V/PI positive MDA-231 and T47-D cells. The results of this in vitro study provide new insight into the molecular mechanisms of GK as a potential treatment for breast cancer.

P2.18

ANTINEOPLASTIC ACTION OF CATHEPSIN L (CATL) INHIBITORS AGAINST HEPATOCELLULAR CARCINOMA

Olamide Crown, Victor Ogungbe, Felicite Noubissi

Jackson State University, Jackson, MS, USA

Cathepsin L (CatL) is a cysteine protease that is overexpressed in a variety of cancers, including hepatocarcinoma. Treatment options for advanced malignant hepatocellular carcinoma are limited (HCC). CatL has been studied as a diagnostic marker as well as a pharmacological target for cancer therapies. New CatL inhibitors were studied for their biochemical activities, antiproliferative effects, and ADME qualities in this study. The long-term goal of the research is to make it easier to find and

develop CatL inhibitors and analogs as potential anti-hepatocellular carcinoma drugs. The inhibitors' antiproliferative properties were studied utilizing Hep G2 and Hep 3B cell lines in dose-dependent cell viability and migration tests. CatL inhibition was investigated in live cells and lysates from Hep G2 cells using recombinant CatL and endogenous CatL. In live cells and lysates, drug target selectivity was tested using recombinant Cathepsin B and endogenous Cathepsin B. In addition, the chemicals' ability to generate reactive oxygen species (ROS) was evaluated in HCC (Hep G2 and Hep 3B). In vitro ADME studies were also performed as a preliminary step. With low micromolar IC50 values, the inhibitors exert antiproliferative effects on Hep G2 and Hep 3B cell lines. In addition, the main compound has a time-dependent inactivation of recombinant and endogenous CatL. Xenograft and pharmacokinetics studies in mice, as well as medicinal chemistry optimization studies, are currently being conducted. Overall, the CatL inhibitors being studied appear to be promising prospects for further development as possible HCC treatments.

P2.19

LOSS OF ADVENTITIA RESULTS IN AN ALTERATION OF VASCULAR PHENOTYPE MARKERS PROMOTING CALCIFICATION IN AN EX VIVO MODEL OF TYPE 2 DIABETIC AORTIC CALCIFICATION

Christopher Adams[1,2], *Amber Kennon*[2], *James Stewart Jr*[2]

[1]*Mississippi college, Clinton, Mississippi, USA.* [2]*University of Mississippi, Oxford, Mississippi, USA*

As the prevalence of type 2 diabetes (T2DM) rises, greater numbers of individuals are at risk for increased cardiovascular complications, such as vascular calcification. Diabetes-mediated vascular calcification is often studied using medial layer vascular smooth muscles cells (VSMCs) or adventitial layer fibroblasts (AFBs) in in vitro models of the calcification. In these modeling systems, VSMCs and AFBs are studied separately; however, in in vivo setting these cell types are in physical contact and conduct cellular communication. Previous studies by our laboratory have demonstrated calcification of these cell types are differentially regulated by AGE-RAGE signaling mechanisms. The goal of this study was to elucidate the phenotypic changes occurring when whole aortic rings were cultured in an ex vivo setting with and without the adventitial layer. Mouse thoracic aorta rings were calcified for 7 days with and without the adventitia present. Histological analysis, immunohistochemistry staining, and western blotting experiments to determine differences in smooth muscle cell phenotype marker, -SMA, and bone protein, OPN were performed. Data revealed the loss of the adventitial layer with calcification plus exogenous AGE treatments caused an increase in calcification as well as an increase in -SMA in non-diabetic aortic rings. Diabetic aortic rings without adventitia had increased calcification despite a loss in -SMA expression due to calcification plus AGEs. These changes appeared to occur independent of AGE-RAGE signaling mechanisms. While further investigation is required to determine the role for AGE/RAGE and the adventitia in the calcification response in diabetes-mediated calcification, we can conclude the loss of the adventitial layer promoted ex vivo calcification as a result in altered phenotype markers in T2DM.

P2.20-for abstract see oral presentation O2.05

DELINEATING THE MECHANISMS OF TNF RELEASE IN MAST CELLS.

Tolulope Ayo, Hao Xu

University of Southern Mississippi, Hattiesburg, MS, USA

P2.21

HETEROACENE-BASED AMPHIPHILE AS A MOLECULAR SCAFFOLD FOR BIOIMAGING PROBES

Christine M. Hamadani, Indika Chandrasiri, Mahesh Loku Yaddehige, Gaya S. Dasanayake, Iyanuoluwani Owolabi, Alex Flynt, Mehjabeen Hossain, Lucy Liberman, Timothy P. Lodge,

Thomas A. Werfel, Davita Watkins, Eden E. L. Tanner

University of Mississippi and University of Southern Mississippi, Hattiesburg, Mississippi, USA

The rising demand and use of nanoparticles for many industrial, medicinal and domestic purposeshave led to their increasing production volume. Regardless of the progress in nanomedicine, intravenous therapies are still limited by biological barriers like protein corona-based opsonization and non-selective organ accumulation. New modular nanomaterials like cationic polyamidoamine (PAMAM)-Linear Dendritic Block Copolymers (LDBCs) have emerged with high encapsulation efficiencies that can be functionalized with varying terminal groups, dyes for bioimaging, cancer drugs, and small biomolecules for efficient cancer-cell targeted delivery. But depending on structural composition and surface properties, LDBCs exhibits high polydispersity (PDI), poor shelf-life, and potentially high cytotoxicity to non-target interfacing blood cells for purposes of intravenous drug delivery. Room-temperature Ionic Liquids (ILs) are composed of asymmetric, bulky cations and anions, and are liquid <100°C. ILs are composed of choline carboxylic acids that can form a serum protein-phobic surface coating to resist corona formation, improve PDI, and increase the stability of 50 kD Poly-lactic-glycolic Acid (PLGA) linear block copolymer nanoparticles (NP's). Also, this coating induced red blood cell (RBC) hitchhiking and drove selective biodistribution to the lung in-vivo. There was dramatically different uptake behavior of IL-LDBCs vs. IL-PLGA NPs in RAW macrophage cells which suggested a different conformational IL-NP surface assembly. Thus, to confirm that the nanoparticles are safe for biomedical applications, we performed a cytotoxicity assay. Evidence provided by cell viability and cellular uptake studies confirm the low cytotoxicity of the NP's and by controlling the physical chemistry of polymer-IL interactions and assembly on the nanoscale, we can drive biological function for more effective and targeted intravenous nano therapies for cancer drug delivery.

P2.22

GNETIN-H PURIFIED FROM PEONIES SEEDS EXTRACT ACTS AS A GLYCOLYSIS INHIBITOR, AND IT IS CYTOTOXIC IN COMBINATION WITH A PPP INHIBITOR IN HUMAN CANCER CELL LINES.

Flavia De Carlo[1,2], *Shivendra Singh*[3], *Premalatha Balachandran*[1], *Mohamed Ibrahim*[1], *David Pasco*[1], *Pier Paolo Claudio*[1,4,5,6]

[1]*University of Mississippi, School of Pharmacy, National Center for Natural Products Research, University, MS, USA.* [2]*University of Mississippi Medical Center, Cancer Center and Research Institute, Jackson, MS, USA.* [3]*St. Jude Children's Research Hospital, Department of Surgery, Memphis, TN, USA.* [4]*University of Mississippi, Cancer Center and Research Institute, Jackson, MS, USA.* [5]*University of Mississippi, School of Pharmacy, Department of BioMolecular Sciences, University, MS, USA.* [6]*University of Mississippi Medical Center, Department of Radiation Oncology, Jackson, MS, USA*

Introduction. Cancer cells are characterized by an atypical use of metabolic pathways such as glycolysis, glutaminolysis, and

pentose phosphate pathway (PPP). This hallmark can be exploited to induce metabolic catastrophe when combining specific inhibitors.

Methods. Peonies seeds extract (PSE) was produced at the NCNPR-UM. Paeoniflorin, Gnetin-H (GH), Suffructicosol A and B, Trans-Viniferin, fractions were detected by UPLC-MS and purified. The antitumor activity of PSE fractions was tested in T98G human cancer cells by HTS using WST8 metabolic assay. T98G cells were treated with GH, and cell viability was assessed by protease assay. T98G cells were treated with GH and glycolysis inhibitors (2DG, BPX, DCA) +/- DHEA, PPP inhibitor, and analyzed by WST8. T98G cells were treated with GH +/- DHEA and analyzed by protease activity. MIA PaCa-2, MDA-MB-231, T98G, SKOV3, Hep3B, SW620 human cancer cell lines were treated with GH, DHEA, +/- DHEA, or chemotherapies (CDDP, BCNU, OXA), and cytotoxicity was assessed by crystal violet.

Results. GH displayed unique features by reducing cell metabolism that correlated with a delay in cell proliferation and the absence of media acidification, indicating glycolysis inhibition. We showed that GH could uniquely synergize with DHEA compared to other known glycolysis inhibitors and induced severe cytotoxicity. We also demonstrated that GH+DHEA could more efficiently reduce cell viability of different cancer cell lines when compared to their standard of care chemotherapy.

Discussion. The novel glycolysis inhibitor, Gnetin-H, exhibits a potent cytotoxic effect when combined with PPP inhibitor DHEA. This data support the importance of targeting metabolic reprogramming in cancer cell as a powerful treatment strategy.

P2.23

INVESTIGATING THE FUNCTION OF YAP1 PROTEIN IN *Histoplasma capsulatum*

Davida Crossley

Mississippi University for Women, Columbus, MS, USA

Histoplasma capsulatum (*Hc*) is a dimorphic pathogenic fungus that is the causative agent for the respiratory infection histoplasmosis. YAP1(Yeast AP-like) in *S. cerevisiae*, has been found to be a global regulator for several oxidative stress response proteins including; TSA1(Thiospecific Antioxidant), TRX2 (Thioredoxin), TRR1 (Thioredoxin Reductase), as well as glutathione metabolism proteins including GSH1 (Glutamyl Cysteine Synthetase) and GSH2 (Glutathione Synthetase), which are thought to be involved in dimorphism in *Hc*. There is a YAP1 homolog in *Hc*. Therefore, we are currently creating a YAP1 RNAi vector in order to investigate the function of YAP1 in *Histoplasma capsulatum*. This investigation will allow for us to investigate YAP1 involvement in oxidative stress response, the glutathione pathway, and dimorphism in *Hc* all at once. To do so, we will conduct a reactive oxygen species (ROS) assay, glutathione activity assay, and qRT-PCR on genes that are involved in these pathways. We will also use bright field microscopy and SEM to observe changes in dimorphism. Future work will consist of RNA seq or mass spectrometry of the RNAi vs wildtype strain to see if YAP1 is involved in other pathways that are currently unknown.

P2.24

INVESTIGATING YAP1 INVOLVEMENT IN SULFUR METABOLISM AND DIMORPHISM IN *Histoplasma capsulatum*

Karen Love, Davida Crossley

Mississippi University for Women, Columbus, MS, USA

Histoplasma capsulatum (*Hc*) is the etiologic agent for the respiratory infection histoplasmosis. It is a dimorphic fungi that exist at 25ºC as a multicellular mold in contaminated soils of birds and bat excrements, and at 37ºC, converts to a unicellular yeast in mammalian host. It is the yeast that is responsible for histoplasmosis. Temperature and sulfur metabolism are two aspects that independently are thought to play a role in dimorphism. Our investigation focuses on investigating a YAP1(Yeast AP-1 like) homolog in *Hc*, that is found in *S. cerevisiae* and *C. albican* (a dimorphic fungi). YAP1 is thought to be involved in glutathione metabolism that plays a role in sulfur metabolism. We will investigate a YAP1 RNAi strain and compare it to wild-type to see if it is able to convert to mold to yeast and yeast to mold, by recording observation of the cells grown in liquid media via bright field microscopy and SEM, and solid media via a Dino-lite microscope. We will also determine YAP1 involvement in sulfur metabolism directly, by conducting a glutathione assay. If YAP1 is shown to play a role in sulfur metabolism and dimorphism, then it could be used as a target to combat histoplasmosis.

P2.25

INVESTIGATING YAP1 INVOLVEMENT IN OXIDATIVE STRESS IN *Histoplasma capsulatum*

Terraline Green, Davida Crossley

Mississippi University for Women, Columbus, MS, USA

Histoplasma capsulatum (*Hc*) is a dimorphic fungi that can exists as a mold or a yeast. It is the yeast which causes the respiratory infection histoplasmosis. YAP1 (Yeast AP-like) in *S. cereivisiae* and *C. albican*, has been shown to be involved in survival in oxidative stress. There is a YAP1 homolog in *Hc***.** We will investigate YAP1 involvement in oxidative stress in *Hc*, by conducting a Reactive Oxygen Assay (ROS) of wild type vs YAP1 RNAi strain, as well as conduct a spot assay of the wild type and YAP1 RNAi strain with various concentrations of hydrogen peroxide and paraquat. If YAP1 is involved in survival of *Hc* in oxidative stress conditions, then it could be used as a target to combat histoplasmosis.

P2.26

OVER-EXPRESSED AND UNDER-EXPRESSED GENES IN CERVICAL CANCER IN AFRICAN DESCENT POPULATIONS: A COMPREHENSIVE STUDY BASED ON DATA MINING AND BIOINFORMATICS

Nyosha Moore, Victor Bii

Mississippi Valley State University, Itta Bena, Mississippi, USA

Cervical cancer is the fourth most common malignant disease in women worldwide, with an estimated 527,600 new cases and 265,700 deaths. However, identifying key genes or genetic signatures that drive their progression in minority populations of African descent are widely under-studied. By employing a comprehensive bioinformatics analysis on microarray data of cervical cancer patients, we identified the common differentially expressed genes in cancer patients of African descent. In our preliminary study we have identified significantly over expressed and under expressed candidate driver gene phosphatidylinositol-4, 5- biophosphate 3-kinase, catalytic subunit alpha (PIK3CA) and Caspase 8 (CAS8). We hypothesize that data from the heterogenous African-descent cervical cancer patients would identify genes and molecular pathways that promote disease progression, which could be potential biomarkers and or therapeutic targets.

P2.27

ESTABLISHING A *DROSOPHILA MELANOGASTER* MODEL FOR STUDYING THE EFFECTS OF DIETARY LIPIDS ON GROWTH, DEVELOPMENT, AND FORAGING BEHAVIOR

Rebecca Grewe, Ethan Tullos, Mary Coleman, Amir Chhetry, Drew Martin, Johnathan Riley, Jerry Reagan

Mississippi College, Clinton, MS, USA

Unlike vertebrate animals, which are able to synthesize cholesterol, insects are cholesterol auxotrophs. Consequently, an exogenous source of sterol is required for successful progression through the larval stage of development. Therefore, to examine potential mechanistic links between dietary lipids, developmental milestones and survival behaviors, we maintain a colony of wild-type (Oregon R strain) *D. melanogaster* on a chemically defined diet that contains 11.50 g/L essential amino acids, 8.12 g/L nonessential amino acids, 78.4 g/L carbohydrates (sucrose, glucose, trehalose, lactose), 0.87 g/L lipids (cholesterol and phospholipid precursors), 1 g/L RNA, 0.50 g/L DNA, and 3.20 g/L micronutrient mix (standard diet). To determine the effect of cholesterol starvation on larval development, synchronous eggs, obtained from flies maintained on the standard diet were transferred to diets (one egg per vial) that were identical to the standard diet except for the absence (0 %) or presence of cholesterol (0.05%). At various time points after placing eggs into vials containing the test diet, larvae were collected, photographed and stored at -80ºC for further analysis. Prior to storage, mass, length at the midline of the longitudinal axis, and perimeter length were determined. In the absence of dietary cholesterol, larvae mass was reduced by 55% (0.1198 $\pm$ 0/016 µg vs 0.2662 $\pm$ 0.014 µg). Larvae size, determined by length measurements, were similarly affected. Larvae transferred to the cholesterol-containing diet after six days of feeding on the cholesterol-free diet, resumed growth, reached critical weight, pupated and eclosed to produce apparently normal adult flies. These data demonstrate that our laboratory has successfully modified a commercially available diet which allows for the design of experiments to test the effects of dietary lipids on relevant parameters related to *D. melanogaster* larvae growth, development and foraging behavior.

P2.28

PHARMACOLOGICAL DEPLETION OF CIRCULATING IMMUNE CELLS (HEMOCYTES) IMPAIRS SURVIVAL AGAINST BACTERIAL CHALLENGE IN *Amblyomma maculatum* (Gulf Coast tick)

Sidney Brown, Abdulsalam Adegoke, Shahid Karim

The University of Southern Mississippi, Hattiesburg, Mississippi, USA

Ticks are obligate blood-feeding arthropods and serve as vectors for several human and animal diseases. Pathogens that are acquired from an infected blood meal must traverse the midgut epithelium into the hemocoel and migrate through the hemolymph to the salivary gland for subsequent transmission to a mammalian host. The tick immune system plays an integral role in pathogen acquisition and transmission by mounting a defense response which limits pathogen colonization. The tick immune cells also known as the hemocytes are critical for the activation of several humoral and cell mediated immune responses upon pathogen exposure, however, the lack of genetic and molecular tools have limited the study of these specialized immune cells. Here in, we have utilized a pharmacological approach, using clodronate liposomes (CLD) to deplete the phagocytic hemocytes in *Amblyomma maculatum*. We were able to demonstrate the successful depletion of phagocytic hemocytes using microscopic and molecular techniques. We also identified and validated nimrodB2 and eater as phagocyte markers. Using in-vivo bacterial challenge assay, we also demonstrate the essential role of phagocytic hemocytes in combating microbial pathogens within the tick vector. These experiments showed first time the utility of CLD as a tool to functional study tick phagocytic hemocytes and their role in the overall innate immune response.

P2.29

A NOVEL APPROACH TO COMBINATION DRUG THERAPIES AGAINST CHEMORESISTANT OVARIAN CANCER CELLS

Brenita Jenkins[1], *Debarshi Roy*[1], *Bidisha Sengupta*[2], *Aqeeb Ali*[2], *Jacob Herschmann*[2], *Michele Harris*[2], *Matibur Zamadar*[2], *Laken Simington*[2], *Odutaya Odunuga*[2], *Prakash Adkihari*[3], *Prabhakar Pradham*[3], *Sanjay Sarkar*[4], *Mahesh Pattabiram*[5]

[1]*Alcorn State University, Lorman, MS, USA.* [2]*Steven F. Austin State University, Nacogdoches, TX, USA.* [3]*Mississippi State University, Mississippi State, MS, USA.* [4]*University of North Carolina at Chapel Hill, Chapel Hill, NC, USA.* [5]*UNK, USA*

Ovarian cancer (OVCA) is the fifth leading cause of gynecological cancer nationwide. Symptoms can go undetected until the patient has reached the advanced stage of the disease. The cause of the delayed detection is due to the drug-resistant nature of the disease. The cationic porphyrin *meso*-tetra(4-**N**-methylpyridyl) porphine (TMPyP) is a well-known photosensitizer (PS) used in Photodynamic Therapy (PDT) for curing cancer due to its strong affinity for DNA and high yield of reactive oxygen species (ROS) upon light activation. Since irradiating tumor cells alone in the physiological system is slim, we looked for a variation in the PDT using a mixture of TMPyP with 1,5-dihydroxynapthalene (DHN) and Fe(III) ions at a mole ratio of 1:20:17 respectively in aqueous solution. This drug combination needs no photoactivation in H_2O_2 rich environments, which mimics the microenvironment of cancer/tumors. The drug combo was found to generate ȮH, and Juglone in the presence of H_2O_2. *In vitro* studies of the drug combo in drug resistant and sensitive ovarian cancer cell lines showed drastic growth inhibition and cell death compared to normal epithelial cells. Moreover, our molecular study on plasmid DNA with the drug combo showed evidence of DNA damage only upon irradiation by blue light (447 nm laser). Furthermore, the drug combo was found to generate ROS in vitro. This inhibition of ROS by the antioxidant improved cell viability, suggesting that the drug combo is acting through ROS production and triggering cell death. This drug combo intervention provides an effective, non-invasive alternative to conventional PDT.

P2.30

THE SMALL RNA UNIVERSE OF *Capitella teleta*

Sweta Khanal, Beatriz Zancanela, Jacob Peter, Alex Flynt

The University of Southern Mississippi, Hattiesburg, MS, USA

RNAi is an evolutionarily fluid mechanism with dramatically different activities across animal phyla. One major group where there has been little investigation is annelid worms. Here the small RNAs of the polychaete developmental model, *Capitella teleta*, are profiled across development. As is seen with nearly all animals, nearly 200 hundred microRNAs were found with ~66 high confidence novel species. Greater miRNA diversity was associated with later stages consistent with differentiation of tissues. Outside miRNA, a distinct composition of other small

RNA pathways was found. Unlike many invertebrates, an endogenous siRNA pathway was not observed, indicating pathway loss relative to basal planarians. No processively generated siRNA-class RNAs could be found arising from dsRNA precursors. This has significant impact on RNAi technology development for this group of animals. Unlike the apparent absence of siRNAs, a significant population of piRNAs were observed. For many piRNAs phasing and ping pong biogenesis pathways were identified. Interestingly, piRNAs were found to be highly expressed during early development, suggesting a potential role in regulation in metamorphosis. Critically, the configuration of RNAi factors in *C. teleta* is found in other annelids and mollusks, suggesting that similar biology is likely present in the wider clade. This study is the first providing comprehensive analysis of small RNAs in annelids.

P2.31

THERAPEUTIC TARGETING OF ALTERED LIPID METABOLIC PATHWAYS IN OVARIAN CANCER

Debarshi Roy[1], *Brenita Jenkins*[1], *Viji Shridhar*[2]

[1]*Alcorn State University, Lorman, MS, USA.* [2]*Mayo Clinic, Rochester, MN, USA*

Ovarian cancer (OVCA) ranks fifth in cancer related deaths among the women and it is mostly detected in the late stage due to absence of clinical symptoms. Inability to perform early screening in the patients coupled with poor prognosis presents the need for a novel treatment measures for OVCA. The present study focuses on characterizing the altered lipid metabolic pathways in ovarian cancer and furthermore proposes application of a repurposing agent, metformin (met) for the treatment of OVCA. Met is an anti-diabetic drug, it has been identified as a promising approach for therapeutic treatment in different cancers including OVCA. Preliminary results show that Met inhibits cell proliferation and clonogenic growth in both HeyA8 and HeyA8MDR which are drug-sensitive and drug-resistant isogenic OVCA cell lines, respectively. In combination with chemotherapeutic agent carboplatin, Met treatment enhanced chemosensitivity in both cell lines. Lipidomic analysis was done to monitor the impact of lipid metabolites on OVCA cells. Our analysis showed differential neutral lipid composition in drug-sensitive and resistant cells which indicates the role of various lipid species in mediating drug-resistance. Furthermore, Met treatment triggered anti-cancerous pathways through targeting the syntheses of various lipid species. This data indicates that cell proliferation, along with clonogenic growth are inhibited dose dependently by Met treatment in drug-resistant and drug-sensitive cell lines. Chemosensitivity is enhanced by Met treatment in combination with carboplatin in HeyA8 and HeyA8MDR cell lines. Together, the data suggests that lipid metabolic pathways can be altered by Met treatment. Through the use of repurposed Met, this approach shows promising results of a treatment regimen and potential prevention of OVCA.

P2.32

PROPER GLYCOSYLATION OF IGA1 IS REQUIRED FOR CLEAVAGE BY *Streptococcus pneumoniae* IgA1 PROTEASE

Mary Carr, Kevin Lovell, Mary Marquart

University of Mississippi Medical Center, Jackson, MS, USA

Streptococcus pneumoniae is a gram-positive bacterium known to cause pneumonia and otitis media. Prior to infection**,** *S. pneumoniae* colonizes mucosal surfaces of the host. In humans, these surfaces are passively protected by immunoglobulin A1 (IgA1). The bacteria must overcome the protection provided by IgA1 to mount a successful colonization *S. pneumoniae* circumvents IgA1 by producing the zinc metalloprotease, IgA1 protease. IgA1 protease cleaves the peptide bond between proline 227 and threonine 228 within the hinge region of IgA1. Cleavage results in the separation of the antibody's Fc and Fab regions. Once separated, the Fab region can still bind antigens, but the Fc region can no longer mediate antibody-dependent or complement-dependent phagocytosis of the bound antigens. Besides the cleavage site, little is known about the specificity of this protease. We aim to address this knowledge gap by determining the effect of glycosylation on the susceptibility of IgA1 to *S. pneumoniae* IgA1 protease. We used various glycosidases to remove both N- and O-glycans from purified human IgA1. Cleavage of normal and deglycosylated IgA1 was then tested by incubation with protein supernatant of *S. pneumoniae* strains D39 wildtype and mutant D39 that does not express IgA1 protease. The data from these experiments showed that removal of all glycosylation from IgA1 inhibited cleavage of the antibody by *S. pneumoniae* IgA1 protease. This suggests the glycosylation of IgA1 is required for cleavage by IgA1 protease to occur. IgA1 protease is known to prevent phagocytosis of invading pathogens through cleavage of IgA1, but little else is known. Understanding the importance of glycosylation could lead to the identification of additional IgA1 protease substrates. Identification of additional substrates will result in a more in depth understanding of the function of IgA1 protease.

P2.33

OPTIMIZATION OF HOMOGENOUS TIME-RESOLVED FLUORESCENCE REACTION TO SCREEN SMALL MOLECULES TARGETING *MsaB*

Alyssa Heath[1,2], *Dr. Gyan Sahukhal*[2], *Dr. Jacques Kessl*[2], *Dr. Mohamed Elasri*[2]

[1]*Mississippi State University, Starkville, MS, USA.* [2]*University of Southern Mississippi, Hattiesburg, MS, USA*

The *msaABCR* operon of *Staphylococcus aureus* is a four gene operon that plays a role in several important staphylococcal phenotypes. The *msaABCR* operon is important for biofilm formation, cell wall biosynthesis, oxidative stress response, intracellular survival, capsule production, pigmentation, protease production, and osteomyelitis infection in RAT model. *MsaB* is the only protein translated from this operon and is a dual transcriptional regulator that can repress or activate its target gene promoter. Based on our bioinformatics predictions, *MsaB* can putatively bind to metallic ions like Ca2+, Mg2+, and other molecules like ATP and polynucleotides (DNA/RNA). In this study, we performed Homogenous Time-Resolved Fluorescence (HTRF) reactions to test different compounds: nucleotides, salts, amino acids, and sugars that could affect *MsaB's* activity, thus inhibiting activity of the operon. Our results showed that nucleotides like ATP, GTP, dATP, dGTP, and dTTP significantly reduced *MsaB's* activity. Metallic ions like Ca2+ also reduced activity, thus supporting our predictions. Interestingly, the amino acid cysteine increases *MsaB's* activity. This study will ultimately lead to the high-throughput screening of nucleotide analogues and other small molecules targeting *MsaB* activity that, in the future, could be used as alternative therapeutic targets for treating recalcitrant staphylococcal infections.

P2.34

A MAIN PROTEASE INHIBITOR FOR SARS-CoV-2

Mieyah Garrett

Alcorn State University, Lorman, MS, USA

SARS-CoV-2, the viral agent that causes COVID-19 disease, has resulted in the deaths of 4 million people across the globe. This virus can infect and kill cells of the upper and lower respiratory tracts and lungs. Although effective and safe vaccinations are available throughout the United States, due to factors including vaccine hesitancy, COVID-19 has not yet been controlled. Safe and effective therapeutics are urgently needed to treat COVID-19 patients. In collaborating with Drs. Jacques Kessl and Matthew Donahue at the Department of Chemistry and Biochemistry, we have developed a small molecule inhibitor GJR-7100, an analog of Ebselen, which targets the main protease enzyme of coronavirus. This specific enzyme is important to the replication of the virus' genome and the process of viral proteins. Here, we tested the antiviral activities of this new inhibitor.

P2.35

SMALL MOLECULES' IMPACT ON *S. pneumoniae* VIA METAL DYSREGULATION

Aaliyah Hill[1,2], Sean Stokes[3], Joseph Emerson[3], Dan Kennedy[3], Justin Thornton[3]

[1]Hinds Community College, Utica, MS, USA. [2]Tuskegee University, Tuskegee, AL, USA. [3]Mississippi State University, Starkville, MS, USA

Streptococcus pneumoniae is the leading cause of community acquired pneumonia and acute otitis media. While treatments currently exist for diseases caused by *S. pneumoniae*, the increasing rate of antibiotic resistance underlines the need to develop new compounds to treat these infections. Since pathogens must maintain proper concentrations of transitions metals for their basic physiology, metal homeostasis has become an attractive target for the design of future antimicrobials. AdcR is a Zn-dependent repressor of pneumococcus that regulates expression of several genes involved in zinc import. In the absence of AdcR, PhtD, a Zn-binding surface protein, expression increases allowing for zinc uptake that can ultimately cause zinc toxicity within the cells if not balanced by zinc export. We hypothesized that a group of sulfonamides and other compounds, predicted to inhibit AdcR function, would impact growth and/or survival of pneumococcal strain TIGR4. To determine if these compounds impacted AdcR, we performed qRT-PCR analysis following incubation of TIGR4 with small molecule inhibitors. Exposure to the small molecules for approximately 60 minutes resulted in significant upregulation of PhtD, confirming inhibition of AdcR. Additionally, we have tested over 23 different compounds to determine their effects on the growth of TIGR4 over the course of 24hr. Of the 23 compounds, 10 delayed growth and all increased the initiation of autolysis. Supplementation of exogenous zinc caused several compounds to halt growth almost completely. These findings indicate these compounds potentially impact survival or invasiveness of pneumococcus.

P2.36

UNDERSTANDING WEST NILE VIRUS PATHOGENESIS

Allyson Bryant[1], Fengwei Bai[2], Shazeed-UI Karim[2]

[1]University of Mississippi, Oxford, MS, USA, [2]University of Southern Mississippi, Hattiesburg, MS, USA

West Nile Virus (WNV) is a mosquito-borne flavivirus that can cause neuroinvasive disease within humans, horses, and birds. WNV was introduced into the United States in 1999 during an outbreak in New York City. During the time from 1999 to 2010, there were estimated to be three million cases of people infected with WNV. From the years 1999 to 2019, there were over 25,000 reported cases of West Nile neuroinvasive disease and over 2,000 deaths. There are currently no approved vaccines or treatments available for human use, and the pathogenesis is not fully understood. In this study, our aim was to identify some interferon stimulated genes (ISG) or non-ISGs and determine whether or not there was a significant role of the genes during WNV infection. We performed microarray analysis for gene expression in RAW 264.7 cells (macrophages) of the following genes: Tetherin (BST2), Receptor Transporter Protein 4 (RTP4), Lectin, galactoside-binding, soluble, 3 binding protein (Lgals3bp), Ring Finger Protein 213 (RFP213), Lymphocyte Antigen 6 Complex, (LY6E). We infected these genes with WNV with different multiplicity of infection. We found that BST2, RTP4, Lgals3bp, and RFP213 all showed signs of high upregulation while LY6E did not. Our results showed that RTP4 had the highest upregulation which led us to conclude that the gene would be a good candidate for siRNA transfection. We used the siRNA to inhibit the expression of RTP4 to confirm these results. Our results suggest that RTP4 could inhibit the effects of WNV infection.

P2.37

ADAPTATION OF INFLUENZA FOR GLIOBLASTOMA TREATMENT

Anne Margaret Miller[1], Stephen Stray[2]

[1]Millsaps College, Jackson, MS, USA. [2]University of Mississippi Medical Center, Jackson, MS, USA

Glioblastoma (GB) is not only lethal— carrying a mere 5.8% 5-year post diagnosis survival rate— but is also the most common type of malignant brain tumor. Because of its bleak prognosis, GB is a huge health concern with no cure. We have previously shown selected influenza viruses inhibit GB cells in vitro, and this may be due to the binding of influenza to the α-2,8 linked sialic acid (α-2,8SA) present on GB cells. In this study, influenza A, B and C were used to infect several different GB cell lines in vitro, including U118MG, T98G, BNC-16, BNC-6, BNC-3, and U87MG. Each infection was assayed using hemagglutination (HA) titrations. PCR on RNA from the GB cells was performed to test the hypothesis that they are expressing mRNA for α-2,8sialyltransferase-3 (ST8SIA3), the enzyme that synthesizes α-2,8SA. We are also attempting to adapt influenza viruses for growth in GB cells. Adaptation could be due to altering receptor binding specificity of progeny virus. Increasing virus yield upon serial passaging of the virus indicates that adaptation is occurring. Later research includes identifying influenza progeny with evidence of mutation, which will then be analyzed for changes to carbohydrate preference using glycan arrays. While this study is not complete, positive results could mean influenza has the ability to alter its specificity to utilize α-2,8SA, meaning resulting viruses may be more selective toward GB cells

P2.38

ROLE OF *msaA* AND *msaC* IN THE REGULATION OF *MsaB* EXPRESSION IN *Staphylococcus aureus*

Diavian Cooper[1,2], Bibek G. C[2], Gyan Sahukhal[2], Mohamed Elasri[2]

[1]Tougaloo College, Tougaloo, MS, USA. [2]University of Southern Mississippi, Hattiesburg, MS, USA

Staphylococcus aureus causes a wide variety of infectious diseases including skin infections, pneumonia, and bacteremia.

The pathogen's ability to cause such a wide variety of infections stems from its various virulence factors. The *msaABCR* operon of S. aureus is a four-gene operon that is important for several important staphylococcal phenotypes like biofilm formation, cell wall biosynthesis, oxidative stress response, intracellular survival, capsule production, and osteomyelitis infection in the RAT model. The *msaA* and *msaC* are putative noncoding RNA molecules, while *msaR* is an antisense RNA. Although each region is important for the function of the operon, *MsaB* is the only protein translated from this operon and is a dual transcriptional regulator that can repress or activate its target gene promoter. The needed transcript region(s) to produce the *MsaB* protein remain unknown. The purpose of this project is to determine which portions of the 5' *msaA* region and 3' *msaC* region are important to produce the *MsaB* protein. To best determine which regions of the transcript, play a role in *MsaB* protein production, a series of nested deletions were performed in the *msaABCR* operon, creating multiple complements strains differing in the 5' *msaA* and 3' *msaC* regions. The *MsaB* production was measured in these nested deletion constructs. We performed different phenotypic assays to determine how these variations affect phenotypic changes in the S. aureus strain. The *MsaB* production and phenotypic changes of these variant strains were compared to the wild type, mutant, and *msaABCR* complement strains. Our results show nested deletion constructs, TC-5 and TC-9, complemented the *msaABCR* mutant back to wild type level and also leads to over-production of MsaB. The constructs TC-1, TC-2, TC-3 and TC-4 did not complement the *msaABCR* mutant and did not produce MsaB. Interestingly, TC- 3 and TC-4 complemented biofilm formation suggesting a role for the 3' end in biofilm formation that does not require MsaB. These results suggest that the 5' msaA end and the 3' msaC end of the *msaABCR* transcript play a role in the production of MsaB and biofilm development.

P2.39

ALI C AND ALI D REGULATION OF C REACTIVE PROTEIN BINDING TO NONENCAPSULATED *STREPTOCOCCUS PNEUMONIA* AND ITS EFFECT ON SYSTEMIC SURVIVAL

Wes Miller[1], Courtney Thompson[2], Larry McDaniel[2], Lance Keller[2]

[1]Mississippi College, Clinton, MS, USA. [2]Department of Microbiology, University of Mississippi Medical Center, Jackson, MS, USA

Nonencapsulated *Streptococcus pneumoniae* (NESp)is an emerging human pathogen that colonizes the nasopharynx and is associated with noninvasive diseases such as otitis media, conjunctivitis, and nonbacteremic pneumonia. One-way NESp is cleared from the nasopharynx and during disease is through opsonophagocytosis activated by the classical pathway of the complement system. The classical pathway can be activated by C Reactive Protein (CRP) binding to phosphocholine in the bacterial membrane. NESp proteins AliC and AliD, unique oligopeptide transporters, regulate downstream gene expression and are required for virulence. One gene regulated by AliC and AliD is Choline binding protein AC (CbpAC) whose homologs have shown to reduce CRP binding. We hypothesize that CbpAC regulated by AliC and AliD leads to increased CRP binding, increasing C1q deposition and decreasing systemic survival. Binding of CRP is determined through flow cytometry, fluorescent microscopy, and ELISA to determine deposition of human CRP on whole bacterial cells. NESp and isogenic mutants of AliC, AliD, CbpAC, and other proteins regulated by AliC and AliD will be tested for CRP binding. Previous results indicate increased phagocytosis and C1q deposition in the AliC and AliD isogenic mutants and an increase in the C3b opsonin in CbpAC mutant. Detection of CRP binding to the described stains is still ongoing, but the use of various detection methods should produce an answer to our hypothesis. These ongoing experiments will show how CRP binding is affected by AliC, AliD and CbpAC deletion resulting in immune avoidance by NESp.

P2.40

DEVELOPING A XENOGRAFT MODEL OF LEPTOMENINGEAL METASTASIS DISEASE IN ZEBRAFISH

Leslie McClinton, III[1], Isaiah Edwards[2], Austin Robbins[2], Kassidy Traigle[2], Eddie Perkins[2], Yann Gibert[2], Marcus Zachariah[2]

[1]Tougaloo College, Tougaloo, MS, USA. [2]University of Mississippi Medical Center, Jackson, MS, USA

Leptomeningeal metastasis disease (LMD) occurs in up to 10% of solid tumors and 15% of hematologic malignancies, with over 100,000 new cases diagnose in the United States annually. Breast cancer LMD is of unique importance in Mississippi, which suffers from the third highest rate of cancer overall and the highest mortality from breast cancer in the United States. The microenvironmental factors of the leptomeningeal space is physiologically acellular and poor in protein, glucose, and growth factors, which is poorly understood. Here, we are developing a xenograft model of LMD by performing intraventricular injections breast cancer cells into zebrafish embryos and fluorescent imaging of fluorescent reporters to understand the process by which breast cancer cells grow within the unique microenvironment of the leptomeninges.

To test this hypothesis, several fluorescent proteins were stably expressed in MDA-MB-231 triple negative breast cancer cells using lentiviral overexpression. These cells were injected into the hindbrain ventricle of zebrafish embryos at 48 hours post fertilization. Our results reveal that we establish a stable breast cancer cell lines that express useful fluorescent reporters and metastasize cancer cells in zebrafish embryo. Overall, the completion of establishing a valid model for LMD is not complete. Following of this present work is to inject our cell line reporters and demonstrate fluorescent patterns. Once constituting a valid model for LMD, we will be able to further understand the metabolic conditions of the leptomeninges and LMD's effect on the microenvironment in the brain. This work lays the foundation for the numerous downstream applications of the zebrafish model, including the patient-derived xenografts, transcriptomic and metabolomic analysis of adapted tumor samples, and eventually genome wide dCAS9 activation studies; all of which will be cheaper and higher throughput in zebrafish compared to other models.

P2.41

***Syzygium aromaticum* EXTRACT INDUCES CYTOXITY IN OVARIAN CANCER CELLS**

Ariane Mbemi, Micheal Ryan Lowe

Jackson State University, Jackson, MS, USA

Ovarian cancer (OC) remains global burden due to its lack of effective screening and late-stage diagnosis. It classifies as the leading cause of death among all gynecological malignancies in women. African- American women have a low incidence rate compared to Caucasians, but they have a mortality rate higher than Whites. The standard treatments for OC are chemotherapies, radiation therapies, and hormones replacement therapies.

However, these standard therapies are usually accompanied with negative side effect. *Syzygium aromaticum* L (SAL), a medicinal plant, is commonly used as food flavoring agent or spices and treatment for various ailments such as gastrointestinal diseases, headaches, and cough. Research has reported that chemical composition of SAL and its derivatives exhibit multiple biological activities including anti-inflammatory, anti-obesity, anti-diabetics, anti-hypertension, and anti-allergic effect. The purpose of this research is to examine the anti-proliferative effects of SAL in ovarian cancer cells (OVCAR-3). OVCAR-3 cells were treated with various concentration of SAL for 48 Hrs. The MTS assay, Acridine Orange/PI, annexin V/PI were used to evaluate cells viability and apoptosis. Data showed that SAL inhibited cell proliferation in dose dependent manner. SAL induced apoptosis in OVCAR-3 cells and was associated with phosphatidylserine externalization, showing a strong dose-response relationship between SAL treated and non-treated cells. Taken together, the findings of this study provide new insights into the molecular mechanism of SAL as a source of a potential drug for the treatment of ovarian cancer.

P2.42

INVESTIGATING THE ROLE OF HTRA PROTEASE IN PNEUMOCOCCAL VIRULENCE.

Corbin Jones, J.A. Thornton

Mississippi INBRE Research Scholar, Mississippi State University, Mississippi State, MS, USA

Streptococcus pneumoniae (pneumococcus) is a Gram-positive, significant, opportunistic pathogen which is one of the leading causes of acute otitis media and community acquired pneumonia, it can also lead to sepsis and meningitis. Pneumococcus secretes many proteases such as CbpG which is thought to relate to both mucosal colonization and sepsis, and PrtA which has been shown to contribute to the pathogenesis of pneumococcal infections while studied with mice (Murtadha.A,et.al,2021). The protease we've focused on is the HtrA protease. We hypothesize that pneumococcus uses the HtrA protease as a defense mechanism against phagocytic killing. We have also amplified and cloned the gene into pET-100 and D-TOPO vector for attempted expression. We also conducted phagocytosis and bacterial killing assays using wild type *S. pneumoniae* T4R and an isogenic mutant lacking HtrA (JAT97). For our phagocytic cell we used the human HL-60 neutrophil cell line. Preliminary results indicate that the presence of HtrA does not significantly protect the bacteria from phagocytic killing. Once completed, this study will allow us to learn more about how the pneumococcal proteases help contribute to virulence and possibly allow for development of novel therapeutic treatments.

Acknowledgement: This work was supported by the Mississippi INBRE, Funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476

P2.43 (poster will be displayed Friday in the High School Session under Health Sciences)

MoWa: A DISINFECTANT FOR HOSPITAL SURFACES CONTAMINATED WITH METHICILLIN RESISTANT Staphylococcus aureus (MRSA) AND OTHER NOSOCOMIAL PATHOGENS

Landon Murin[1,2], Tyler Gregory[2], Jorge Vidal[2], Ana Vidal[2], Babek Alibayov[2]

[1]*Base Pair Program – Murrah High, Jackson MS, USA.* [2]*University of Mississippi Medical Center, Jackson, MS, USA*

Introduction. Staphylococcus aureus strains, including methicillin-resistant S. aureus (MRSA) and methicillin-sensitive S. aureus (MSSA), are a main cause of nosocomial infection in the world. The majority of nosocomial S. aureus-infection are traced back to a source of contaminated surfaces including surgery tables. We assessed the efficacy of a mixture of levulinic acid (LA) and sodium dodecyl sulfate (SDS), hereafter called MoWa, to eradicate nosocomial pathogens from contaminated surfaces.

Methods and Results. A dose response study demonstrated that MoWa killed 24 h planktonic cultures of S. aureus strains starting at a concentration of (LA) 8.2/(SDS) 0.3 mM while 24 h preformed biofilms were eradicated with 32/1.3 mM. A time course study further showed that attached MRSA bacteria were eradicated within 4 h of incubation with 65/2 mM MoWa. Staphylococci were killed as confirmed by bacterial counts and fluorescence micrographs stained with the live/dead bacterial assay. We then simulated contamination of hospital surfaces by inoculating bacteria on a surface prone to contamination. Once dried, contaminated surfaces were sprayed with MoWa, or mock-treated, and treated contaminated surfaces were swabbed and bacteria counted. While bacteria in the mock-treated samples grew at a density of ~104 cfu/cm2, those treated for ~1 min with MoWa (1.0/0.04 M) had been eradicated below the detection limit. A similar eradication efficacy was obtained when surfaces were contaminated with other nosocomial pathogens such as Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter baumannii, or Staphylococcus epidermidis.

Conclusions. MoWa kills planktonic and biofilms made by MRSA and MSSA strains and showed great efficacy to disinfect MRSA-, and MSSA-contaminated, surfaces and surfaces contaminated with other important nosocomial pathogens.

Friday, April 1, 2022
MORNING
Room D3

8:30 Welcome and Cellular, Molecular, Developmental Biology Division Awards

8:40 Cellular, Molecular, Developmental Biology Division Meeting

ORAL PRESENTATION SESSION IV

Moderators: Drs. James A. Stewart, Jr., Davida Crossley and Yvette Langdon

O2.11

9:00 OVERCOMING DRUG RESISTANCE IN COLORECTAL CANCER CELLS BY MODULATING IGF2BP1

Felicite Noubissi (Presenting Faculty/Staff)[1], Nicole Betson[1], Vladimir Spiegelman[2], Mohammed Hajahmed[1], Tsige Gebretsadek[1], Paul Tchounwou[1], and Kenneth Ndebele[1]

[1]*Jackson State University, Jackson, MS, USA;* [2]*Pennsylvania State University, Hershey, PA, USA*

Colorectal cancer (CRC) is the third most common cancer in both men and women, after prostate or breast, and lung cancer. It is estimated that 149,500 new patients will be diagnosed with, and 52,980 men and women will die of cancer of the colon and rectum in the United States in 2021. Treatment for colorectal cancer may

involve surgery, chemotherapy, biological therapy, radiation therapy, or a combination of treatments. The choice of treatment of colorectal cancer depends mainly on the location of the tumor and the stage of the disease. Chemotherapy is used for advanced cancers; however advanced colorectal cancers are notoriously resistant to drugs. Two major mechanisms employed by colorectal cancer cells are thought to be responsible for insensitivity to therapeutics: i) resistance to apoptosis usually achieved by activation of anti-apoptotic pathways; ii) induction of multidrug resistance (MDR) membrane transporters that pump drugs out of the cells. Targeting factors involved in these mechanisms should aid in the sensitization of colorectal cancer cells to drugs. Previous studies suggested activation of the Wnt/β-catenin direct target, insulin-like growth factor 2 mRNA-binding protein 1 (IGF2BP1), might promote resistance of CRC cells to treatment *via* activation of anti-apoptotic pathways and induction of the multidrug resistance (MDR1) membrane transporter that pumps drugs out of the cells. We hypothesized that inhibition of IGF2BP1 will overcome resistance of CRC cells to chemotherapeutics. We used CRC cell lines HCT116, SW480, and RKO to show that knockdown of IGF2BP1 inhibits MDR1 expression ($P<0.01$) and prevents growth ($P<0.01$) and proliferation ($P<0.05$) of colorectal cancer cells with activated Wnt/β-catenin signaling pathway. The anti-growth and anti-proliferative effects of IGF2BP1 inhibition was more pronounced when the cells were treated with the chemotherapeutics, 5-FU, irinotecan, or oxaliplatin ($P<0.001$). We observed that the inhibition of IGF2BP1 significantly increases apoptosis in the same cells ($P<0.001$). A remarkable reduction in the migratory and invasive capabilities of those cells was noted as well ($P<0.05$). We found that inhibition of IGF2BP1 is sufficient to decrease the resistance of chemotherapy-resistant cancer cells with activated Wnt/ β-catenin signaling pathway. These findings portray IGF2BP1 as a good candidate for CRC therapy.

O2.12

9:20 TUBULIN'S E-HOOK AS AN ADAPTABLE TOOL TO SIGNAL KINESIN MOTILITY

Dana Reinemann (Presenting Faculty/Staff)

University of Mississippi, University, MS, USA

Microtubules (MTs) are a key component of the cell's cytoskeleton, serving as structural filaments, facilitating dynamic machinery such as the mitotic spindle, and acting as highway system for kinesin and dynein molecular motors. The a- and b-tubulin subunits that polymerize into MTs each have negatively-charged, disordered c-terminal tails, called E-hooks, that extend from the filament surface. This charged, frictional MT "carpet" of E-hooks dictates diffusive properties of microtubule associated proteins and facilitates kinesin processivity. Yet, how the E-hook peptide's molecular structure is influenced by kinesin binding is not understood, as is how kinesin force generation and motility properties are influenced by E-hooks. To advance our knowledge of the elusive mechanistic underpinnings of E-hooks and their interactions with kinesin, we employ a multiscale, interdisciplinary approach: (1) at the molecular level using Raman spectroscopy and electronic structure calculations, (2) at the single protein level using docking simulations, and (3) at the protein system level using optical tweezers. Results suggest that E-hook peptides have the ability to form local sections of secondary structure, allowing for custom fits within kinesin's MT binding domain, which through docking simulations, appears to be different between kinesin families. Further, kinesin motility on MTs is interrupted if the E-hook binding site is blocked, resulting in a lower run frequency and possible disruption of the ATPase cycle. Thus, while the E-hook has traditionally been characterized to be disordered, it may have the ability to adapt to its binding environment, acting as a custom-fit "hook" to facilitate motility and force output.

O2.13

9:40 ANTINEOPLASTIC ACTION OF CATHEPSIN L (CATL) INHIBITORS AGAINST HEPATOCELLULAR CARCINOMA

Olamide Crown (Presenting Post-Doctoral Fellow), Victor Ogungbe, and Felicite Noubissi

Jackson State University, Jackson, MS, USA

Cathepsin L (CatL) is a cysteine protease that is overexpressed in a variety of cancers, including hepatocarcinoma. Treatment options for advanced malignant hepatocellular carcinoma are limited (HCC). CatL has been studied as a diagnostic marker as well as a pharmacological target for cancer therapies. New CatL inhibitors were studied for their biochemical activities, antiproliferative effects, and ADME qualities in this study. The long-term goal of the research is to make it easier to find and develop CatL inhibitors and analogs as potential anti-hepatocellular carcinoma drugs. The inhibitors' antiproliferative properties were studied utilizing Hep G2 and Hep 3B cell lines in dose-dependent cell viability and migration tests. CatL inhibition was investigated in live cells and lysates from Hep G2 cells using recombinant CatL and endogenous CatL. In live cells and lysates, drug target selectivity was tested using recombinant Cathepsin B and endogenous Cathepsin B. In addition, the chemicals' ability to generate reactive oxygen species (ROS) was evaluated in HCC (Hep G2 and Hep 3B). In vitro ADME studies were also performed as a preliminary step. With low micromolar IC50 values, the inhibitors exert antiproliferative effects on Hep G2 and Hep 3B cell lines. In addition, the main compound has a time-dependent inactivation of recombinant and endogenous CatL. Xenograft and pharmacokinetics studies in mice, as well as medicinal chemistry optimization studies, are currently being conducted. Overall, the CatL inhibitors being studied appear to be promising prospects for further development as possible HCC treatments.

O2.14

10:00 FUNCTIONAL DIVERSITY OF INSECT UDP-GLYCOSYLTRANSFERASE GENE FAMILY

Seung-Joon Ahn (Presenting Faculty/Staff))

Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS, USA

Glycoside conjugation is one of the important mechanisms in xenobiotic detoxification in living organisms. UDP-glycosyltransferase (UGT) is a multigene family found in all kingdoms of life, catalyzing the sugar conjugation with small lipophilic compounds and playing important roles not only in detoxification, but in other physiological processes in insects. The glycoside conjugation increases water solubility making the compounds more easily excretable, thereby protecting the cellular system from damage by toxic compounds. It is also involved in pigment sequestration providing color to the cuticle, wings or cocoons in insects. Some UGTs are highly expressed in insect antennae, proposing a novel function in olfaction. UGTs, thereby, playing multifaceted roles in insects, have been identified in a number of insect genomes over the last decade and much progress has been achieved in characterizing their expression patterns and molecular functions. I present an update of insect UGTs and their putative roles, including the *Drosophila melanogaster* UGT gene

family. A total of 35 UGT genes are found in the *D. melanogaster* genome, localized to chromosomes 2 and 3 with a high degree of gene duplications on chromosome arm 3R. All *D. melanogaster* UGT genes have now been named following the unified nomenclature approved by the UGT nomenclature committee, thereby facilitating comparisons between species. Extended searches reveal that similar numbers of UGT genes are present in other *Drosophila* species, and comparative phylogenetic analyses suggest an overall high conservation as well as some species-specific gene duplications and losses. Research findings have included the demonstration of roles in detoxification, olfaction, and cold tolerance. Together, the updated genomic information and research overview provided will aid further research in this developing field.

10:20-10:30 BREAK

O2.15

10:30 A NOVEL APPROACH TO COMBINATION DRUG THERAPIES AGAINST CHEMORESISTANT OVARIAN CANCER CELLS

Brenita Jenkins (Presenting Faculty/Staff)[1], Debarshi Roy[1], Bidisha Sengupta[2], Aqeeb Ali[2], Jacob Herschmann[2], Michele Harris[2], Matibur Zamadar[2], Laken Simington[2], Odutaya Odunuga[2], Prakash Adkihari[3], Prabhakar Pradham[3], Sanjay Sarkar[4], and Mahesh Pattabiram[5]

[1]Alcorn State University, Lorman, MS, USA; [2]Steven F. Austin State University, Nacogdoches, TX, USA; [3]Mississippi State University, Mississippi State, MS, USA; [4]University of North Carolina at Chapel Hill, Chapel Hill, NC, USA; [5]UNK, USA

Ovarian cancer (OVCA) is the fifth leading cause of gynecological cancer nationwide. Symptoms can go undetected until the patient has reached the advanced stage of the disease. The cause of the delayed detection is due to the drug-resistant nature of the disease. The cationic porphyrin *meso*-tetra(4-*N*-methylpyridyl) porphine (TMPyP) is a well-known photosensitizer (PS) used in Photodynamic Therapy (PDT) for curing cancer due to its strong affinity for DNA and high yield of reactive oxygen species (ROS) upon light activation. Since irradiating tumor cells alone in the physiological system is slim, we looked for a variation in the PDT using a mixture of TMPyP with 1,5-dihydroxynapthalene (DHN) and Fe(III) ions at a mole ratio of 1:20:17 respectively in aqueous solution. This drug combination needs no photoactivation in H_2O_2 rich environments, which mimics the microenvironment of cancer/tumors. The drug combo was found to generate ȮH, and Juglone in the presence of H_2O_2. *In vitro* studies of the drug combo in drug resistant and sensitive ovarian cancer cell lines showed drastic growth inhibition and cell death compared to normal epithelial cells. Moreover, our molecular study on plasmid DNA with the drug combo showed evidence of DNA damage only upon irradiation by blue light (447 nm laser). Furthermore, the drug combo was found to generate ROS in vitro. This inhibition of ROS by the antioxidant improved cell viability, suggesting that the drug combo is acting through ROS production and triggering cell death. This drug combo intervention provides an effective, non-invasive alternative to conventional PDT.

O2.16

10:50 THERAPEUTIC TARGETING OF ALTERED LIPID METABOLIC PATHWAYS IN OVARIAN CANCER

Debarshi Roy (Presenting Faculty/Staff)[1], Brenita Jenkins[1], and Viji Shridhar[2]

[1]Alcorn State University, Lorman, MS, USA; [2]Mayo Clinic, Rochester, MN, USA

Ovarian cancer (OVCA) ranks fifth in cancer related deaths among the women and it is mostly detected in the late stage due to absence of clinical symptoms. Inability to perform early screening in the patients coupled with poor prognosis presents the need for a novel treatment measures for OVCA. The present study focuses on characterizing the altered lipid metabolic pathways in ovarian cancer and furthermore proposes application of a repurposing agent, metformin (met) for the treatment of OVCA. Met is an anti-diabetic drug, it has been identified as a promising approach for therapeutic treatment in different cancers including OVCA. Preliminary results show that Met inhibits cell proliferation and clonogenic growth in both HeyA8 and HeyA8MDR which are drug-sensitive and drug-resistant isogenic OVCA cell lines, respectively. In combination with chemotherapeutic agent carboplatin, Met treatment enhanced chemosensitivity in both cell lines. Lipidomic analysis was done to monitor the impact of lipid metabolites on OVCA cells. Our analysis showed differential neutral lipid composition in drug-sensitive and resistant cells which indicates the role of various lipid species in mediating drug-resistance. Furthermore, Met treatment triggered anti-cancerous pathways through targeting the syntheses of various lipid species. This data indicates that cell proliferation, along with clonogenic growth are inhibited dose dependently by Met treatment in drug-resistant and drug-sensitive cell lines. Chemosensitivity is enhanced by Met treatment in combination with carboplatin in HeyA8 and HeyA8MDR cell lines. Together, the data suggests that lipid metabolic pathways can be altered by Met treatment. Through the use of repurposed Met, this approach shows promising results of a treatment regimen and potential prevention of OVCA.

11:30-12:00 BUSINESS MEETING

Chemistry and Chemical Engineering

Chair: M. Saiful Islam

Jackson State University

Co-Chair: Samuel SR Darsary

Holmes Community College

Vice-Chair: MD Mhahabubur Rhaman

Jackson State University

MARCH 31, 2022

MORNING

Room D11

8:45 Welcome Remarks

Moderators: Dr. Julia Saloni

O3.01

9:00 EXOSOMES FOR EFFICIENT DELIVERY OF CANCER THERAPEUTICS

Rajashekhar Kanchanapally

Tougaloo College, Tougaloo, MS, USA

Majority of the currently used cancer drugs in clinics are non-targeted. Non targeted cancer drugs do not discriminate between healthy and cancerous cells. Moreover, untargeted delivery necessitates the administration of higher amounts of drug, and only a partial quantity of administered drug reaches the target site. Recently, FDA approved a few nano-based drug delivery vehicles, that highlighted the targeting ability of nanoparticles. However, synthetic nanomaterials pose the risk of inducing an immune reaction or may be cleared out of the system by biological scavengers. Here, we propose to use Exosomes, so called cellular trash bags, for the efficient delivery of cancer therapeutics to cancer cells. We have loaded Doxorubicin, Honokiol, and Paclitaxel in Exosomes, derived from various sources, either by co-incubating the source cells with drug or by sonicating the exosomes in presence of drug. Loading of the drugs inside the Exosomes was confirmed by UV-spectroscopy or HPLC or both methods. Upon confirming the loading of drug inside the exosomes, exosomal-drugs were delivered to either pancreatic or breast cancer cells. We observed that exosomal-drugs are relatively more efficient in inducing apoptosis in cancer cells compared to their free-drug counterparts. Our results also indicate that relatively small amount of drug is needed to neutralize the cancer cells when the drugs are delivered in exosomal form rather than in free form.

O3.02

9:15 ELECTROCHEMISTRY OF YTTERBIUM IN BIS(TRIFLUOROMETHYLSULFONYL)AMIDE-BASED IONIC LIQUIDS

Heather Hamilton, Charles Hussey

University of Mississippi, Oxford, MS, USA

Ionic liquids (ILs) are molten salts that are liquid at room temperature. One popular class of these unique and interesting solvents are those based on unsymmetrical quaternary ammonium cations and the fluorinated anion, bis(trifluoro-methylsulfonyl)imide (Tf2N-). These ILs are hydrophobic, chemically inert, and they exhibit good electrical conductivity and low viscosity relative to comparable solvents based on non-fluorinated anions. The electrochemical windows of these ionic solvents are quite large and approach 6 V. The windows are limited only by the oxidation of the Tf2N- ion and the reduction of the extant organic cation. Thus, the prospects for using these ILs to study the electrochemistry of reactive solutes seems very good. There continues to be considerable interest in the application of these solvents to low temperature fission product separation and processing as part of the nuclear fuel cycle. However, the exploitation of these ILs for the processing of spent nuclear fuel (SNF), particularly the f-block components, cannot proceed without information about the stable oxidation states, redox potentials, and transport properties of the potential lanthanide (Ln) and the actinide (An) components of the SNF. During previous investigations in our laboratory, we have examined the electrochemistry and transport properties of several Ln3+ species, including Ce, Eu, Nd, Pr, Sm, and Yb as the corresponding octahedrally-coordinated chloride complexes in Tf2N-based ILs containing excess chloride ion at platinum electrodes.1-4 The ILs used for this work were derived from the 1-butyl-3-methylimidazolium, 1-ethyl-3-methylimidazolium, 1-butyl-1-methylpyrrolidinium, 1-butylpyridinium, butyl trimethyl ammonium, and tributyl-methylammonium cations. In this presentation, we discuss the results of electrochemical investigations of Yb3+ solvated by Tf2N- in the absence of chloride in these same six ILs. The techniques used for this investigation include cyclic and rotating disk electrode voltammetry, electrochemical impedance spectroscopy, and controlled potential coulometry. These measurements were carried out at glassy carbon, gold, platinum, and tungsten electrodes. The purpose of this investigation is to probe the extent to which solvation/coordination and electrode material affects the general electrochemical behavior of the Yb3+/2+ couple. Other goals are to understand how the absolute viscosity of these glass-forming ILs affects the diffusivity of Yb3+ as well as the heterogenous transfer electron rate of the Yb3+/2+ couple according to the Marcus theory of electron transfer.

O3.03

9:30 DEVELOPMENT OF BIOCHAR NANOCOMPOSITES FOR WATER PURIFICATION

Ye Gao

Jackson State University, Jackson, MS, USA

As per the World Health Organization (WHO) and United Nations, by 2025, two-thirds of the population in this world will face safe drinking water shortage problems. Meanwhile, the reality we are facing now is, there are no new antibiotics have been discovered since 1990s, because the resistance of multi-drug resistant bacteria to new antibiotics has appeared too fast even before entering the market. Infectious diseases of multi-drug resistant super bacteria are the biggest threat to our society. 1-3 These diseases cannot be cured with commercially available antibiotics. According to Center for Disease Control and Prevention (CDC), in the United States, at least 2.8 million people are infected with drug-resistant infections every year, and more than 35,000 people die for this.4 Due to the lack of effective antibiotics in the past two decades, there is an urgent need to develop new broad-spectrum anti-super bacteria biomaterials. Driven by the need, current proposal aims to design anti-super bacteria nanocomposites using human host defense antimicrobial peptide conjugated biochar. Research activities includes, 1) Development of nanocomposite using biochar, 2) Characterization of nanocomposites using TEM, SEM, IR, XRD, Raman, Absorption and Fluorescence spectroscopy. 3) Demonstrating the use of the nanocomposites for the removal of

heavy meal ions from water. 4) Demonstrating the use of the nanocomposites for removal and killing of superbugs. For this purpose, we use several gram-negative carbapenem-resistant Enterobacteriaceae (CRE) Escherichia coli (E. coli) and Klebsiella pneumoniae (KPN) superbugs, as well as Gram-positive methicillin-resistant Staphylococcus aureus (MRSA) and vancomycin-resistant enterococci (VRE) superbugs.

O3.04

9:45 THIENYLPIPERIDINE DONOR NIR XANTHENE-BASED DYE FOR PHOTOACOUSTIC IMAGING

Chathuranga S. L. Rathnamalala[1], Nicholas W. Pino[2], Bailey S. Herring[1], Mattea Hooper[1], Steven R. Gwaltney[1], Jefferson Chan[2], Colleen N. Scott[1]

[1]Department of Chemistry, Mississippi State University, Mississippi State, Mississippi 39762, USA and [2]Department of Chemistry, University of Illinois at Urbana−Champaign, Urbana, Illinois 61801, USA

Photoacoustic tomography is a state-of-the-art biomedical imaging technique that converted absorbed light into soundwaves via the photoacoustic effect. Near-infrared (NIR) dyes with higher molar absorptivity and lower quantum yields have the advantage for PA imaging of biological samples to cm depths. However, there are a limited number of dyes that absorb over 800 nm with higher tissue penetration. The longer synthetic routes and tedious purification methods associated with such dyes are a disadvantage. We have designed a donor-acceptor-donor (D-A-D) NIR dye with xanthene core as the acceptor unit and a 2-aminothiophene unit as the donor unit. This dye can be made in 2-3 synthetic steps in good yields. This dye exhibited a strong PA signal at 880 nm and good biological compatibility towards esterase, and reduced glutathione.

Moreover, the dye shows excellent photostability. This dye can be used to perform multiplexed imaging using as aza-BODIPHY as the reference dye. The phantom study with swine tissues of increasing thickness revealed that the dye is detectable even as deep as 4 cm. The rhodamine 6-G version and water-soluble PEGylated version of the dye were also synthesized.

O3.05

10:00 THE INHIBITION OF SARS-CoV-2's $M^{protease}$ USING SELENIUM HETEROCYCLES

Rosemary Panella, Matthew Donahue, Jacques Kessl, Fengwei Bai

University of Southern Mississippi, Hattiesburg, MS, USA

About two years ago, the world saw its first case of a human SARS-CoV-2 infection, commonly referred to as COVID-19. Since then, there have been over 260 million cases, 5.2 million deaths, and 8 billion vaccine doses. This project is one born out of an interest in this novel virus and molecules that actively block its path to replication. This project encompasses the creation of ebselen derivatives. Ebselen is a heterocyclic compound that contains selenium. We seek similar compounds that possess ebselen's selenium-nitrogen bond. We have chosen to study ebselen due to its inhibition properties on the enzyme M^{pro}, which serves to replicate the protein code for SARS-CoV-2. The aforementioned selenium-nitrogen bond breaks and the selenium binds with a cysteine in M^{pro}, which deactivates the enzyme. The project design involves the cyclization of halogenated amides with the selenium. These compounds are then tested for enzymatic inhibition on a plaque-resistance assay and for virological testing on virally infected Vero E6 and Calu 3 cells. Our synthesis scheme involves the use of copper (I) iodide, 1,10-phenanthroline, potassium carbonate, and heat to catalyze a selenium cyclization containing unique substituents. Based on current virological and inhibition data, the most promising compounds contain oxygenated substituents at the 3 position of the eastern aromatic ring and compounds with oxygenated substituents on the western aromatic ring at the 5 position. This study seeks to increase efficiency and specificity on the model molecule, ebselen, by arranging and rearranging substituents on the aromatic rings.

10:15-10:30 BREAK

Moderators: Dr. M. Saiful Islam

O3.06

10:30 IMPORTANT OF MATERIALS SCREENING FOR HIGHER ENERGY AND HIGH-POWER DENSITY BATTERIES

Ruhul Amin

Ridge National Laboratory, Oak Ridge, Tennessee, USA

Energy storage systems become an essential part of our daily life. The portable electronics revolution over the past two decades and the rising availability of affordable and convenient battery electric vehicles (EVs) have been possible due to the impulse provided by the significant advances in the Li-ion battery technology. In recent years, the success story of Li-ion batteries has garnered additional interest towards the implementation of grid-scale energy storage and urban air mobility (UAM) by EVTOL (electric vertical takeoff and landing). Apart from handling load fluctuations, the technology can be a promising solution to tackle the challenges associated with grid-scale integration of renewable energy sources. On the other hand, with the growing urbanization and the development of new megacities, the traffic congestion situation is getting bad to worse worldwide. UAM can potentially mitigate the rush hour traffic congestion issue by diversion a small portion of traffic to UAM. The key concepts for energy storage systems for Grid, EVs, and VTOLs applications correspond to the specific energy density (Wh/kg) and the specific power density (W/kg) of the battery pack. The energy density of the battery pack typically dictates the range or duration attainable, while the power density of the pack dictates the potential acceleration/payload sizes. Noting that batteries are fabricated in combination of several types of materials; therefore, selection of materials is very crucial for safe and sustainable batteries in a specific application. This talk will discuss the characterizations, engineering, and integration of materials for higher energy and power density battery with higher safety.

O3.07

11:00 MISSISSIPPI STATE UNIVERSITY ADVANCED COMPOSITES INSTITUTE -- THE ENGINEERING PROCESS

Wayne Huberty

Mississippi State University, Mississippi State, MS, USA

Mississippi State University's Advanced Composites Institute (ACI) is equipped and positioned to support RDD&D, manufacturing innovation, and transdisciplinary programs that address fundamental upstream and broader downstream needs in automotive, aerospace, marine, energy, military, and other crucial markets and to spur job creation, and enhance manufacturing

competitiveness. The 50,000 ft2 facility also houses the distinguished Marvin B. Dow Stitched Composites Development Center, dedicated to R&D of stitched composite technologies that improve the efficiency of material structures. The ACI is home to an automated VARTM process with production-scale working volumes, a 50x20x10 ft3 programmable curing oven up to 450°F, an automated robotic stitching system with 8 ft reach by 40 ft travel, a production scale CNC ply cutter, temperature and humidity-controlled layup rooms, 5-axis CNC machine, small-scale auto-injection system, advanced AM, walk-in freezers, and sophisticated NDI equipment. The ACI is a trusted partner of many major OEMs in multiple market segments for ideation, engineering, design, fabrication, scale-up, and evaluation of innovative solutions. The ACI has successfully executed hundreds of fabrication orders for tier-one partners providing the foundation for cutting-edge advanced material manufacturing, research, and development in valuable innovation portfolios. This includes multiple vehicle light weighting projects, full-scale vehicle parts manufacturing using VARTM, and copious amounts of aerospace parts. This presentation will highlight the integrated process used at the ACI to meet customer demands, ensure high quality, and cover the entire engineering process for producing composite materials.

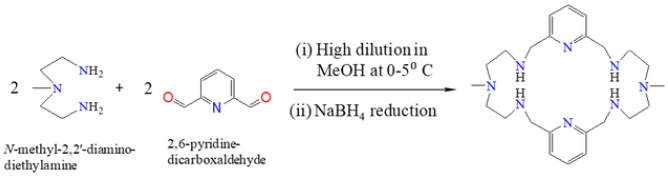
O3.08

11:30 ANION BINDING STUDIES WITH A PYRIDINE-BASED MACROCYCLIC POLYAMINES IN WATER

Md Mhahabubur Rhaman[1], *Douglas R. Powell*[2], *Md. Alamgir Hossain*[1]

[1]*Jackson State University, Jackson, MS, USA.* [2]*University of Oklahoma, Norman, OK, USA*

Anion binding chemistry has raised the attention over past few decades because of its vital roles in many biological and environmental aspects. Therefore, the recognition of anions becomes an imperative field of research. Since anions possess different geometries, sizes and electronic environments, the construction of suitable receptors with complementary functionalities, geometries, and appropriate molecular pockets still remains a quite challenging task. The tendency of anions to occupy empty spaces reinforces the formation of encapsulation through noncovalent interactions, for example, N─H…anion, C─H…anion, and anion…π interactions. This research area is expanding with diverse acyclic and cyclic systems with different functional groups such as urea, thiourea, ammine, and amide that are capable of hosting different anions in solution and solid state. Among the various systems, macrocyclic polyamines are promising because they carry positive charges through protonation creating a positive molecular cavity. Such a molecular device is capable of binding anions in aqueous solution and mimicking many biological polyamines. During the course of our studies, a polyamine-based macrocycle was synthesized using 2,6-pyridinedicarboxaldehyde spacers and **N**-methyl-2,2′-diaminodiethylamine linkage from the Schiff base condensation followed by $NaBH_4$ reduction. The receptor was explored for the binding of anions (F^-, Cl^-, Br^-, I^-, NO_3^-,ClO_4^-, HSO_4^- and $H_2PO_4^-$) by ^1H NMR spectroscopy in water and single crystal X-ray diffraction method in solid state. As investigated by proton NMR titration studies, the receptor showed the strong selectivity for sulfate over other anions in water. This presentation will highlight the synthesis, anion complexation studies in solution and solid states.



Scheme: Synthesis of pyridine-based macrocyclic polyamines

Acknowledgement: The research was funded by National Science Foundation CAREER award (CHE-1056927) to MAH. It also acknowledges the US Department of Defense (Grant number W911NF-19-1-0006), and the National Science Foundation for the supporting of purchasing the diffractometer (Grant CHE-0130835).

O3.09

11:45 A BRIEF OVERVIEW ON SPIRO-ISOXAZOLINE NATURAL PRODUCT AND OUR SUCCESS

Prasanta Das[1], *Ashton Hamme*[2]

[1]*Jackson State University, Jackson, Ms, USA.* [2]*Jackson State University, Jackson, MS, USA*

Bromotyrosine-derived spiroisoxazoline metabolites were first isolated from marine sources. Four spiro units, including cyclohexadiene, bromo epoxy ketone, bromohydrins, and oxepine have been unique subsets in this class of natural product. Including monomeric and dimeric compounds, these spiro-isoxazoline constitutes a diverse class of physiologically active compounds. In addition, a quinone-based spiroisoxazoline natural product clavatadine C, and D, have been isolated as anti-coagulant agents. Other than the marine source, four novel tyrosine-derived spiroisoxazoline analogues were isolated from the flowers of Xanthoceras sorbifolia Bunge. Over the past 50 years, several synthetic approaches have been significantly directed toward the cyclohexadiene, bromo epoxy ketone, and bromohydrins containing natural products; however, to the best of our knowledge, there is no synthesis known for oxepin-core or its related natural product psammaplysin. On the other hand, quinone-based spiro-isoxazoline has become a recent interest in the last few years. Furthermore, synthetic spirocyclic isoxazoline derivatives are also promising drug candidates.

In this context of interest, an unconventional route involving a base-promoted Dieckmann type keto-ester condensation strategy has been demonstrated to construct the spiroisoxazoline moiety followed by the total synthesis of 11-deoxyfistularin-3. Additionally, an oxidative dearomatization strategy has been suitably utilized to synthesize several spiro-isoxazoline-quinone derivatives as a potential source of natural product analogues. Finally, our recent efforts toward the psammaplysin natural product are also presented.

Acknowledgement: The project described was supported by NIH/NIGMS (Award Number: 2SC3GM094081-08) and National Science Foundation (HBCU-EiR) (1900127), and NIH/NIMHD (Award Number: G12MD007581).

12:00-1:00 GENERAL SESSION

MARCH 31, 2022

AFTERNOON

Room D11

Moderators:

1:00-1:45 CAREER WORKSHOP

1:45-2:00 BREAK

MARCH 31, 2022

AFTERNOON

Room D11

Moderators: Dr. Subrata Chandra Roy

O3.10

2:00 TRANSPORT OF URANIUM IN US ARMY RANGES

Fengxiang Han

Jackson State University, Jackson, MS, USA

Anthropogenic activities, such as ore mining and processing, nuclear power industry and weapon testing have generated depleted U (DU) contamination to soils and waters. Exposure is likely to have impact on humans or the ecosystem where military operations have used DU. Yuma Proving Ground in Arizona, USA has been using depleted uranium ballistics for 36 years. At a contaminated site in the Proving Grounds, soil samples were collected from flat, open field and lower elevated trenches that typically collect summer runoff. Spatial distribution and fractionation of uranium in the fields, along the ditches and within a soil profiles with DU penetrators were analyzed. Results show that DU was transported in the field, along the ditch horizontally with surface runoff as well as both downward leaching and upward vertical transport from the buried and oxidized penetrators. The trench area in the testing site had higher accumulation of total U compared to the open field soil. Laboratory simulation indicated the significant effects of U forms on U upward vertical transport in arid soils driven by dissolution and evaporation. U was transported towards the surface with evaporation in forms of soluble U form, uranyl form. In addition, U was found significantly in field plants on sites, including in ants and wide animal feces. This study indicates a significant spatial variation of U distribution and both vertical and horizontal transport of U in the shooting range site and U was widely distributed in the local eco systems.

O3.11

2:15 INVESTIGATION OF A KAGAN THIOAMIDE AS A CHIRAL SOLVATING AGENT FOR THE SPECTRAL DISCRIMINATION OF ENANTIOMERS BY NMR SPECTROSCOPY

Matthew Donahue

University of Southern Mississippi, Hattiesburg, MS, USA

In this talk, the results from the investigation of a thioamide variant of the Kagan amide as a chiral solvating agent for the differentiation of enantiomers by NMR spectroscopy will be presented. Enantiopure Kagan amide was prepared in one step by the acylation of (R)-α-methylbenzyl amine with 3,5-dinitrobenzoyl chloride. The thioamide variant was prepared by carbonyl metathesis of Kagan's amide with Lawesson's reagent. The thioamide CSA was then screened against a panel of acylated racemic α-methylbenzylamines using 1H NMR spectroscopy as a means to spectrally resolve the enantiomers. Our findings from titration experiments will be presented as to the nature of the chemical shift resolution between the enantiomers CSA adduct. Additionally, we will speculate on the nature of this resolution based on non-covalent interactions observed in a solid state x-ray crystal structure.

O3.12

2:30 LABEL-FREE DISEASE MARKERS DIAGNOSIS USING SERS NANOARCHITECTURES

Sudarson Sinha, Avijit Pramanik, Paresh Ray

Jackson State University, Jackson, MS, USA

The accurate diagnosis of bio-organisms and the marker of disease from pathological samples is highly challenging. Since past decade, researchers are trying to develop nanophotonics techniques that have the capability to identify different biomarkers for diagnosing dementia disease, bio-organisms for infectious disease, and for cancer. Surface-enhanced Raman spectroscopy (SERS), is capable to enhance weak Raman scattering signals by 6-11 orders of magnitude from the surface of the bio-organisms. This is an ultrasensitive vibrational fingerprinting method for chemical analytes as well as biologists. SERS substrate exhibits strong chemical enhancement and extremely high electromagnetic enhancement. It also has the capability for sensitivity in real-life applications. The charge-transfer interactions between the SERS substrate with bio-organisms are responsible for chemical enhancement. On the other hand, due to the formation of a plasmonic “hot spot”, electromagnetic enhancement is observed. In SERS, due to the confinement of incident light into nano-regime in space between two plasmon coupled in metallic nanoparticles, a thousand- to million-fold local electromagnetic field enhancements is observed in the “hot spot”. This allows SERS to be used as an ultrasensitive technique with the detection of a single molecule regime. Here is recent progress in the development of one-dimensional (1D) to three-dimensional (3D) plasmonic SERS substrate is highlighted. This can be used as a highly powerful platform for biological diagnosis. The major design criteria one needs to use to develop a robust SERS substrate to possess high density “hot spots” with very good reproducibility. We also examine the plasmonic coupling that enhances SERS intensity via theoretical finite-difference time-domain (FDTD) simulation modeling. Finally, some of the exciting research findings on the applications of SERS substrate for fingerprint identification of disease biomarkers are presented.

O3.13

2:45 CHEMICAL ANALYSIS AND BIOTOXICITY ASSESSMENT OF PLASTIC BIOREMEDIATION USING *Tenebrio molitor* LARVAE

Lillian Sisson, Claire Stokes, Sydney Melton, Trent Shelby Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

Plastic pollution is a worldwide environmental problem impacting ground water, rivers, oceans, soils, and landfills. Many plastics take anywhere from 20 to 500 years to decompose allowing plastic pollution to accumulate in the environment

adversely affecting wildlife, wildlife habitats, and humans. Recent research has found that the larvae of *Tenebrio molitor* can consume and degrade the common plastic polystyrene. In this study, we examine the bioremediation potential of *Tenebrio molitor* larvae for other common plastics such as: Polyethylene Terephthalate, High Density and Low Density Polyethylene, Polyvinyl Chloride, Polypropylene, as well as various forms of polystyrene. *Tenebrio molitor* larvae were fed different types of plastics and their plastic consumption rates and growth rates were determined. Insect tissues and waste products were analyzed for physical and chemical biodegradation of plastics using Fourier-transform infrared spectroscopy alongside UV spectroscopy. Using a new technique, we purified polystyrene from *Tenebrio molitor* frass material and quantified the percentage of polystyrene in fras. Larvae showed a significant preference for polystyrene as compared to other types of plastic. *Tenebrio molitor* larvae also preferred polystyrene plastic as compared to polystyrene foam. In fras samples, polystyrene plastic was more degraded as compared to polystyrene foam when normalized to polystyrene consumption weights. Taken together, the feasibility of plastic bioremediation using *Tenebrio molitor l*arvae seems to be plastic specific. Use of insects in bioremediation is a growing concept with great potential as a green chemistry solution to the worldwide plastic pollution problem.

MARCH 31, 2022

EVENING

3:30 AWARDS CEREMONY/ DODGEN LECTURE

5:00 GENERAL POSTER SESSION

Poster Session Moderators:

P3.01

SWITCHABLE ARTIFICIAL METALLOPROTEINS TO STUDY THE COBALT-CARBON BOND HOMOLYSIS FOR DRUG DELIVERY

Micah Robinson[1], *Saman Fatima*[2], *Lisa Olshansky*[2]

[1]*Tougaloo College, Tougaloo, MS, USA.* [2]*University of Illinois at Urbana Champaign, Urbana, IL, USA*

Enzymes are highly effective at speeding up reactions by lowering activation energy; however, our general understanding of how enzymes achieve such rate accelerations remains limited. One thing that is known is that many protein systems have evolved to undergo distinct conformational changes in response to stimulation such as the binding of small molecules or pH changes. To explore the role that these triggered conformational changes play in catalysis, we mimicked adenosyl cobalamin dependent enzymes to create our own metalloprotein. We simplified this complex with dimethylglyoximes in the planar positions and focused our investigations on the axial ligands. Other studies have reported that the bond between the cobalt center and the upper axial ligand (the carbon containing R-group in cobalamins) participates in methyl transfer reactions during catalysis. Further information on how this homolysis occurs is needed. Our goal is to create an environment where we can control when this cobalt–carbon bond breaks using conformational changes. Current results include expression and purification of three cysteine modified glutamine binding proteins from E. coli cells, which is a member of the periplasmic binding protein super family, and three cobalt complexes with different upper axial ligands to test for Co–R bond stability in these proteins. This is an ongoing project so further pursuits will be made. Copying these natural enzymes will make a myriad of uses available to us including drug delivery and biosensing.

P3.02

HIGHLY EFFICIENT REMOVAL OF CRO_4^{2-} FROM WATER AND OFF-GAS CONDENSATE OF HANFORD'S LOW ACTIVITY NUCLEAR WASTE BY MO_3S_{13}- MG/AL LAYERED DOUBLE HYDROXIDE

Ahmet Celik[1], *Dien Li*[2], *Kathryn Taylor-Pashow*[2], *Michael Quintero*[3], *Mercouri Kanatzidis*[3], *Mohsen Shakouri*[4], *Zikri Arslan*[1], *Xianchun Zhu*[5], *Alicia Blanton*[1], *Jing Nie*[1], *Shulan Ma*[6], *Saiful M. Islam*[1]

[1]*Department of Chemistry, Physics, and Atmospheric Sciences, Jackson State University, Jackson, MS, USA.* [2]*Savannah River National Laboratory, Aiken, SC, USA.* [3]*Department of Chemistry, Northwestern University, Evanston, IL, USA.* [4]*Canadian Light Source, Saskatoon, SK, Canada.* [5]*Department of Civil Engineering, Jackson State University, Jackson, MS, USA.* [6]*College of Chemistry, Beijing Normal University,, Beijing, Beijing, China*

Hanford Waste Treatment and Immobilization Plant (WTP) is considered to be the world's largest nuclear waste treatment plant that treats both high-level waste (HLW) and Low Activity Waste (LAW). ^{99}Tc is the most problematic radioactive contaminant because it remains in the LAW as a highly soluble pertechnetate (TcO_4^-) anion which under vitrification process vaporizes and thus becomes are challenging to incorporate in glass under the Hanford LAW melter operating conditions. The recycling of off-gas results in TcO_4^- containing condensate streams. Redirecting this stream to a different disposal route would have significant beneficial impacts on the cost, life cycle, and operational complexity of WTP. Here, we introduce the Mo_3S_{13} intercalated layer doubled hydroxides (LDH-Mo_3S_{13}) and its highly efficient removal of chromate (CrO_4^-) from ppm to ppb levels, as a non-radiogenic surrogate TcO_4^- from the deionized water (DIW), natural water and simulated Hanford's LAW off-gas condensate. The removal of CrO_4^{2-} by LDH-Mo_3S_{13} from the LAW condensate stream is very effective in that it removes from ppm (~90.86 ppm, µg/g) to below 1 ppb (ng/g) level with K_d values of up to ~10^7 mL/g. A mechanistic insight of post adsorbed samples by X-ray photoelectron spectroscopy (XPS), X-ray absorption near edge structure (XANES), and extended X-ray absorption fine structure (EXAFS) delineate that CrO_4^- removal proceeds by the reductive precipitation and intercalation. To the best of our knowledge, this study sets the first example of a metal-sulfide intercalated layered double hydroxide for the removal of CrO_4^{-2}/TcO_4^- from the off-gas condensate streams of Hanford's LAW. LDH-Mo_3S_{13}'s remarkable removal efficiency, selectivity, and outstanding affinity tout its promise for the decontamination of CrO_4^{-2}/TcO_4^- from surface water as well as off-gas condensate of the Hanford nuclear waste.

P3.03

ANALYSIS OF SYSTEMATIC ERROR IN AN UNDERGRADUATE CHEMISTRY TEACHING LABORATORY PROCEDURE

Joseph Bentley, Charles Smithhart

Delta State University, Cleveland, MS, USA

Delta State's CHE 103 General Chemistry I laboratory schedule consists of introductory experiments to be performed throughout each semester. The last procedure, "Determination of R",

involves measuring the volume of H_2 gas displaced from dilute HCl acid through the following reaction:

$Mg_{(s)} + 2HCl_{(aq)} \rightarrow Mg^{2+}_{(aq)} + H_{2(g)} + 2Cl^-_{(aq)}$

A weighed sample of magnesium turnings is reacted with an excess of aqueous HCl, and the evolved hydrogen gas is collected using a water trap apparatus. This procedure usually allows a student to calculate a reasonably accurate value for the ideal gas constant, R, using the experimentally determined variables in the Ideal Gas Law. DSU faculty noticed that the student-determined R values had begun to deviate from the standard value.

This work describes the troubleshooting process undertaken to determine the root cause of the accuracy problem, and inspired a modification to the procedure that may be implemented in future teaching labs. This new procedure may be used to determine the weight percentage of active metal (e.g. Al, Zn or Mg) in binary alloys with copper using the same basic reaction and apparatus.

P3.04

SOLUTION AND SOLID STATE STUDIES OF A CONFORMATIONALLY FLEXIBLE RECEPTOR FOR ANIONS

Sanchita Kundu[1], *Tochukwu Egboluche*[1], *Douglas Powell*[2], *Alamgir Hossain*[1]

[1]*Jackson State University, Jackson, MS, USA.* [2]*University of Oklahoma, Norman, OK, USA*

Anions are key species which play important roles in biology, chemistry, and environmental sciences. Therefore, anion binding studies with synthetic receptors are of growing interest during the past decades. In this study, a cyclohexane-based receptor functionalized with two urea groups has been synthesized and its anion binding properties have been studied by 1H-NMR, UV-Vis and colorimetric studies in solution using a variety of anions including fluoride, chloride, bromide, iodide, dihydrogen phosphate, bicarbonate, nitrate, hydrogensulfate and acetate. Our results suggest that the receptor strongly binds an anion in a 1:1 binding fashion, exhibiting the high selectivity for acetate and fluoride over other anions. The structural characterization of a bromide complex by single crystal X-ray diffraction analysis reveals that the receptor encapsulates a bromide anion within its cavity by the virtue of four H-bonding interactions.

Acknowledgement: The project described was supported by the US Department of Defense (Grant Number W911NF-19-1-0006).

P3.05

RATIONAL DESIGN AND THE SYNTHESIS OF THE SEMICONDUCTING "$CO_{1.5}VO_3$ $(MOS_5)_X$" OXYCHALCOGENIDES AEROGEL

Jing Nie, Ahmet Celik, Xianchun Zhu, Alicia Banton, Pramanik Avijit, Pares Chandra Ray, Fengxiang X. Han, Saiful M. Islam

Department of Chemistry, Physics and Atmospheric Sciences, Jackson State University, Jackson, Mississippi, USA

Aerogels are the porous amorphous semisolids of interlocking nanoparticles that exhibit ultralow density, high surface area, and micro to microporosities. Among various aerogels, chalcogenide based aerogels (chalcogel) is one of the most emerging classes of materials that finds applications in energy and environmental remediation. Here, we have designed and developed the novel $Co_{1.5}VO_3(MoS_5)_x$ (CVMS) oxychalcogels that integrates both the oxides and chalcogenides in its solid-state matrixes. The CVMS gel was synthesized by mixing the solution of $Co(NO_3)_2$, NH_4VO_3 and $(NH_4)_2MoS_4$ at ambient conditions. The as synthesized wetgel of CVMS was fabricated into the aerogels by supercritical drying which exhibits a surface area of 106.3229 m^2/g. The amorphous nature of the aerogels was determined by X-ray powder diffraction (XRD), and the composition was obtained by energy dispersive spectroscopy (EDX), Scanning electron microscopy (SEM) and (TEM) shows the presence of the nano to microporosities into the physical structure of the CVMS aerogels. Raman spectroscopy determined the presence of polysulfide S_n^{2-} ion and V=O bonds into the gels of CVMS. Together with the NIR light absorbing properties and the known characteristics of the polysulfides species for the binding of the heavy metal ions makes this material promising for their application in energy conversion and environmental remediation which will be evaluated in the near future.

P3.06

EXPLORATION OF AN ORGANOCATALYZED ASYMMETRIC NUCLEOPHILIC ADDITION TO ALLYLIC AND PROPARGYLIC SUBSTRATES

Ashley Bailey, Billie Jean Brashears, Julie Pigza

University of Southern Mississippi, Hattiesburg, MS, USA

Noncovalent interactions (NCIs) are the collection of both favorable and unfavorable interactions between molecules, such as hydrogen-bonding, ion-dipole, and π-π interactions. These interactions are at the core of asymmetric catalysis using chiral catalysts to convert an achiral or prochiral substrate to a chiral product. Squaramide organocatalysts (SQs) are a privileged type of catalyst that can catalyze a wide variety of reactions by taking advantage of NCIs via one of two main modes of activation – either dual activation or chiral anion catalysis. The latter type involves a chiral ion pair and has been of interest recently based on the discovery of a chiral, SN1-type alkylation developed by Jacobsen. We are interested in extending this system to other allylic and propargylic substrates and a variety of nucleophiles. This presentation will describe the results of our work utilizing synthesized achiral squaramide organocatalysts to more quickly and cost effectively screen reactions. The products are small, chiral building blocks that provide a valuable derivatization of petroleum feedstocks.

P3.07

SYNTHESIS OF ACHIRAL SQUARAMIDE ORGANOCATALYSTS FOR SCREENING NEW REACTIONS

Tristan Parsons, Julie Pigza

University of Southern Mississippi, Hattiesburg, MS, USA

Squaramide organocatalysts (SQs) are a privileged type of catalyst that can catalyze a wide variety of reactions by taking advantage of noncovalent interactions between substrates. While these noncovalent interactions are minute in impact alone, collectively they ultimately dictate the fate of the reaction and observed stereoselection. SQs are particularly attractive due to the relative ease of synthesis and tunability of each arm of the catalyst and there has been enormous interest using these catalysts to induce asymmetry. Chiral SQs have the drawback of being fairly cost prohibitive and requiring lengthy or complex syntheses of the enantiopure arm of the catalyst. For use with undergraduate students and for investigating new reactions, we have found achiral SQs to be a very good substitute. They are still able to achieve the requisite noncovalent interactions to encourage bond forming and are readily accessible in two steps. They also can be used to provide the racemic samples required for chiral HPLC

when determining the enantioselectivity of the reaction. This presentation will discuss the synthesis of a variety of achiral SQs with an electron-withdrawing acidifying group and a diamine as the basic group. The catalysts are readily assignable by ^{1}H NMR and can be isolated via a simple filtering procedure without the need for further purification.

P3.08

APPLICATION OF FUNCTIONALIZED LDH FOR ENVIRONMENTAL REMEDIATION OF HEAVY METALS AND RADIONUCLIDES

Subrata Chandra Roy[1,2], *Saiful M. Islam*[1]

[1]*Department of Chemistry, Physics and Atmospheric Chemistry, Jackson State University, Jackson, Mississippi, USA.* [2]*Department of Chemistry, Jagannath University, Dhaka, Dhaka, Bangladesh*

Among the common inorganic adsorbents Layer Double Hydroxides (LDH), $M^{2+}_{1-x}M^{3+}_x(OH)_2)]A^{n-}_{(x/n)}\cdot mH_2O$, where M is metal ions and A is interlayer anions, have become promising for the sequestration of heavy metals and radionuclides. This is mostly because of its unique crystal-structure that consists of ion-exchangeable anions and positively charged LDH layers. Despite their 2D structural features as well as facile solution processable synthesis, the applications of LDH are limited mainly because of lack of selectivity and inefficiencies in trace level, e.g. ≤ 5 ppb, removal of noxious metal ions from wastewater. Besides, sulfur-based materials have emerged as a superior sorbents of heavy metals cations and its sorption mechanisms is governed by the Pearson's hard-soft Lewis acid base (HSAB) paradigm. In this regard, a coalescence of the positively charged LDH and metals-sulfides anions has proven to be highly efficient for the removal of toxic ions. Very recently, our study revealed that $[Sn_2S_6]^{4-}$ functionalized LDH can concurrently remove numerous heavy metals even in ppb level [2]. Such a high-efficient removal can be achieved by the synergistic role of multiple adsorption modes, such as surface sorption, ion exchange, and adduct formation. These findings endowed a great opportunity for the development of novel metal sulfide anions, such as $[Sn_4S_{10}]^{4-}$, $[SbS_4]^{3-}$, $[(S_4)_2MoS]^{2-}$, $[(S_4)_2MoO]^{2-}$, $[Mo_3S_{13}]^{2-}$ intercalated LDH materials and the exploration of their chemistry for the separation of toxic cations and anions from wastewater, an investigation that is currently being undertaken.

P3.09

DITOPIC RECOGNITION OF ANIONS WITH A UREA-BASED RECEPTOR IN SOLUTION

Tochukwu Egboluche, Sanchita Kundu, Md. Alamgir Hossain

Jackson State University, Jackson, MS, USA

A urea based dipodal molecular receptor (L) has been synthesized and its binding properties have been studied for a variety of anions by ^{1}H-NMR, UV-Vis and colorimetric techniques in DMSO. Both the ^{1}H-NMR and UV-Vis titration studies suggest that the receptor exhibits binding affinity for halides in the order of fluoride > chloride > bromide > iodide and for oxoanions in the order of acetate > dihydrogen phosphate > bicarbonate > hydrogen sulfate > nitrate, forming a 1:2 complex with each of anions **via** hydrogen bonding interactions. Colorimetric study shows that the receptor L shows a visible color chnage with fluoride, acetate, bicarbonate and dihydrogen phosphate. Acknowledgement: The project described was supported by the US Department of Defense (Grant Number W911NF-19-1-0006).

P3.10

SURFACE FUNCTIONALIZATION ON THE ENHANCED WATER-SOLUBLE OF IRON OXIDE MAGNETIC NANOPARTICLES

Jing Qu, Pohlee Cheah, Yongfeng Zhao

Jackson State University, Jackson, MS, USA

The water dispensability and stability of iron oxide magnetic nanoparticles are very essential for biomedical and biological applications. In this paper, we report a new strategy for preparing water-soluble iron oxide nanoparticles with surface functionalization. The iron oxide nanoparticles are first synthesized by thermal decomposition of iron (III) acetylacetonate ($Fe(acac)_3$) in tetra ethylene glycol (TEG). After that, the iron oxide nanoparticles were reacted with surface ligands at room temperature. Different coating materials (PEI, DHCA, PAA, PVA, PVP, Dextran, PEG) were also demonstrated. We found that polyacrylic acid (PAA) shows the best stability in aqueous solution. Based on the result, the molecular weight of PAA and the concentration of PAA on the surface of Fe_3O_4 in the reaction mixture were considered to be the key parameters for obtaining highly water-soluble nanoparticles. The structure of surface ligands is confirmed by Fourier transform infrared spectroscopy (FTIR) and Thermogravimetric Analysis (TGA). The crystal structure and morphology of nanoparticles are studied by X-ray diffraction (XRD) and transmission electron microscopy (TEM). Furthermore, the synthesized 22 nm Fe_3O_4-PAA1800 exhibit extremely transversal relaxivities, which is much higher than iron oxide nanoparticles without surface modification. This report will provide a novel and significant approach for synthesizing water-soluble nanoparticles.

P3.11

CONVENTIONAL STRAIN ENERGIES OF THREE-MEMBERED HETEROCYCLES

Ryan Ivey, David Magers

Mississippi College, Clinton, Mississippi, USA

The conventional strain energies for cyclopropane, aziridine, oxirane, silirane, phosphirane, thiirane, germirane, arsirane, and selenirane are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models to compare the effect of third-row and fourth-row elements to second-row elements on the strain energies of three-membered rings. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using self-consistent field theory, second-order perturbation theory, and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Thular and Zhao, and the ωB97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets: cc-pVDZ, cc-pVTZ, and cc-pVQZ. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.12

CONVENTIONAL STRAIN ENERGIES OF CYCLOPROPYLBORANE, BORIRANE, BORETANE, THE DIBORETANES, BOROLANE, THE DIBOROLANES, BORINANE, AND THE DIBORINANES

Kaylee Hood, Rachel Rocray, David Magers

Mississippi College, Clinton, Mississippi, USA

In 2012, Rubina and Rubin reported the first generation and spectroscopic identification of boretane through a strain-release-driven ring expansion of cyclopropylborane. Prior to this discovery, all four-membered boracycles which had been reported were unsaturated. In the current study, we build upon this discovery by calculating the conventional strain energies of cyclopropylborane , borirane, boretane, 1,2-diboretane, 1,3-diboretane, borolane, 1,2-diborolane, 1,3-diborolane, borinane, 1,2-diborinane, 1,3-diborinane, and 1,4-diborinane within the isodesmic, homodesmotic, and hyperhomodesmotic models. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using SCF theory, second-order perturbation theory, and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional and the M06-2X high nonlocality hybrid functional from Thular and Zhao. Three correlation-consistent basis sets are employed: cc-pVDZ, cc-pVTZ, and cc-pVQZ. Results are compared to the conventional strain energies of cyclic hydrocarbons. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.13- See abstract O3.03

DEVELOPMENT OF BIOCHAR NANOCOMPOSITES FOR WATER PURIFICATION

Ye Gao

Jackson State University, Jackson, MS, USA

P3.14

EARTHWORM (Lumbricus Terrestris) RESPONSE TO HIGHLY CONCENTRATED URANIUM (U) SITES IN CONTAMINATED SOILS

Olanrewaju Olafuyi Olafuyi

Jackson State University, Jackson, MS, USA

Several species of small insects and animals have already been studied for their response to radioactive situations and their utilization as biomarkers. However very few resources are available regarding Earthworms being a source to decide soil conditions in highly contaminated Uranium sites. Worms were exposed 5 different contaminated soil sites for 35 days and moistened periodically. Worms were then extracted and subjected to purge for 3 days. Worms were treated with a series of bio remedial processes to examine their response to the contaminated soil regions. The purpose of these assays is to Study the effect of earthworms on the bioaccumulation of Depleted Uranium (DU) in 5 different soil sites and examine different methods in their uptake. We noticed that in the soil regions Riley and ERDC there is a common increase of U concentrations present. Each uptake method displayed a significant difference in their concentrations based of off what part of the worm is being used.

P3.15

SYNTHESIS OF ANIONIC METAL SULFIDE INTERCALATED LAYERED DOUBLE HYDROXIDE FOR THE WASTEWATER TREATMENT

MD Robiul Alam, Ahmet Celik, Subrata Chandra Roy, Saiful M. Islam

Department of Chemistry, Physics, and Atmospheric Sciences, Jackson State University, Jackson, MS, USA

The industrial revolution has generated a large quantity of wastewater containing heavy metals such as mercury, arsenic, chromium, and other complex mixtures of heavy metals. Existing trace levels water purification systems for toxic heavy metals are bottlenecked with cost, efficiency, and selectivity. Layered Double Hydroxides (LDHs) have become a promising sorbent for the decontamination of heavy metal polluted water which is mostly due to their unique 2D structure and anion-exchange properties. This class of materials consists of positive charge metal oxides layers which have robust flexibility to be stabilized with diverse anions of various ionic sizes, shapes, and charges. Sulfide-based materials tend to bind with soft Lewis acidic soft heavy metals ions. Thus, the development of "oxide-sulfide" hybrid LDH-metal sulfides can offer great potential for the sequestration of heavy metal anions from water. In this study, we have synthesized a hybrid LDH-$[MoO_2S_2]$ by the exchange of nitrate anions with a $[MoO_2S_2]^{2-}$ at room temperature. This new material was characterized by scanning electron microscopy, infrared spectroscopy, energy-dispersive X-ray spectroscopy, and X-ray powder diffraction that confirm the desired plate-like morphology, chemical compositions, and 2D crystal structures. Further investigations to determine the heavy metals sorption performance and to understand the sorption mechanisms are in progress.

P3.16

PREPARATION OF MACROCYCLIC POLYPHENYLETHYNYLARENE ETHERS

Bailey Steen, Trent Selby

Mississippi College, Clinton, MS, USA

The preparation of macrocyclic organic molecules containing π-conjugation is a focus of our group. Structures of this type are expected to show directed energy and electron transfer and thus should be effective in the preparation of photoreactive materials such as electronic sensors or light harvesting materials. The syntheses of several macrocyclic model systems, with varying degrees of conjugation will be presented. All of the model structures can be prepared from the same key intermediate structure, (3-ethynylphenoxy)(tert-butyl)dimethylsilane. This key intermediate was prepared from the commercially available 3-hydroxybenzaldehyde. Protection of the hydroxyl with **tert**-butyldimethylsilyl chloride in the presence of a weak base (imidazole), under microwave conditions gave the protected compound in 94% yield. Next the aldehyde functional group was converted into the alkyne via Corey-Fuchs olefination reaction conditions. This involved reacting with an ylide (formed from carbon tetrabromide, triphenylphosphine and zinc) to give the dibromide in high yield. The second part of the olefination was accomplished by reaction of the dibromide with **n**-butyllithium to give the terminal alkyne, key intermediate. Sonogashira coupling (palladium/copper(I) iodide catalyst) of the alkyne with aryl halides gave polyphenylethynylarenes in high yields. Cyclization of the polyphenylethynylarenes alcohols can be accomplished under dilute conditions via nucleophilic substitution reactions.

P3.17

RELATIVE STABILITIES OF DERIVATIVES OF 9-METHYLANTHRACENE AND 9-METHYLENE-9,10-DIHYDROANTHRACENE AND DERIVATIVES OF 6-METHYLPENTACENE AND 6-METHYLENE-6,13-DIHYDROPENTACENE

Emily Sullivan, Aaron Plunkett, David Magers

Mississippi College, Clinton, Mississippi, USA

In 1949, Clar and Wright reported that 6-methypentacene exists as 6-methylene-6,13-dihydropentacene at room temperature due to a [1,5]-sigmatropic hydrogen shift (**Nature** 1949, **163**, 921). Thus, the aromaticity of the central ring and the planarity of the overall compound is destroyed by this shift. The same does not occur in anthracene. While the 9-methylene derivative of anthracene is a local minimum, the planar 9-methyl derivative is the more stable. In the current study we investigate if certain derivatives of these anthracene systems stabilize the methylene system relative to the methyl, and if certain derivatives of these pentacene systems stabilize the methyl derivative relative to the methylene. Specifically, nitro and trifluoromethyl derivatives of anthracene are considered, and amino and methoxy derivatives of pentacene are examined. Optimum equilibrium geometries, harmonic vibrational frequencies, and the corresponding zero-point vibrational energies are computed for each set of isomers using density functional theory. The DFT functionals employed are the M06-2X high nonlocality hybrid functional from Thular and Zhao and the ωB97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets cc-pVDZ and cc-pVTZ. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.18

CONVENTIONAL STRAIN ENERGIES OF THIAZIRIDINE AND THE THIAZETIDINES

Joshua Gramm, David Magers

Mississippi College, Clinton, Mississippi, USA

The conventional strain energies for thiaziridine, 1,2-thiazetidine, and 1,3-thiazetidine are determined within the isodesmic, homodesmotic, and hyperhomodesmotic models to investigate the effect of third-row elements on the strain energies of three- and four-membered rings. Optimum equilibrium geometries, harmonic vibrational frequencies, and corresponding electronic energies are computed for all pertinent molecular systems using self-consistent field (SCF) theory, second-order perturbation theory (MP2), and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional and the M06-2X high nonlocality hybrid functional from Thular and Zhao. The basis sets employed are Dunning and coworkers' correlation consistent basis sets: cc-pVDZ, cc-pVTZ, and cc-pVQZ. In addition, cc-pV(D+d)Z, cc-pV(T+d)Z, and cc-pV(Q+d)Z basis sets are also investigated to determine the effect of the extra **d** function for sulfur on the overall results. Results are compared to the conventional strain energies of small cyclic hydrocarbons and to other heterocyclic systems. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.19

AB INITIO ANALYSIS OF POLARIZABILITY IN MOLECULAR PIEZOELECTRIC RESPONSE FOR ORGANIC DIMER SYSTEMS

David Zetterholm, David Magers

Mississippi College, Clinton, Mississippi, USA

In seeking to describe macroscale piezoelectric response, having a better understanding of piezoelectric response at the single-molecule level is a necessity. In the case of organic molecules, there are millions of possible candidates which possibly have the desired properties, revealed in the magnitude of the d_{33} coefficient. In seeking to extend research done by Daniel Lambrecht and co-workers which discovered a possible relationship between first-order polarizability of a molecule and its piezoelectric response (d_{33}), the current study seeks first to confirm this relationship with different levels of computational theory and to extend the previous work to application, where new molecules with even higher responses can be designed from principles discovered in the calculations. These results specifically take the calculations from Arun Gagrai and coworkers' previous results and model them in the Hartree Fock level of theory to see if the relationship is maintained, and then consider the extension of period 16 of the Periodic Chart to see if the relationship is maintained for heavier atoms, for which relativistic effects would need to be considered for in their computation, using tailored basis sets and effective core potentials. We gratefully acknowledge support from the Mississippi

P3.20

REGIOSELECTIVITY OF ACID-CATALYZED EPOXIDE RING-OPENING REACTIONS

Breana Chastang, David Magers

Mississippi College, Clinton, Mississippi, USA

Epoxide opening reactions occur through two known mechanisms: base catalyzed, in which nucleophilic attack opens the ring, followed by a proton transfer to produce the substituted alcohol, and acid catalyzed, in which the oxirane oxygen is protonated via proton transfer, followed by nucleophilic attack to produce the substituted alcohol. There is little debate about base catalyzed reactions involving the least substituted carbon in the epoxide due to the lack to steric hindrance to nucleophilic attack. Two leading textbook authors, however, disagree about the regioselectivity involving acid catalyzed epoxide opening reaction when the carbons are primary and secondary. Joel Karty asserts that the more substituted carbon is attacked in the acid catalyzed mechanism and offers bond length data to augment his argument. David Klein suggests that the less substituted carbon is attacked when the competing electrophiles are primary versus secondary due to "the steric effect predominating over the electronic effect." To investigate these dissenting opinions, we consider a series of asymmetric derivatives of oxirane. The equilibrium geometry of each oxirane derivative is computed using SCF theory, second-order perturbation theory, and density functional theory. The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X hybrid functional from Thular and Zhao, and the ωB97XD functional from Head-Gordan and coworkers. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ and cc-pVTZ. Bond lengths should be indicative of bond strength; thus, the different C-O

bonds are compared in each optimized structure and protonated structure.

P3.21

ENTHALPIES OF FORMATION OF QUINOLINE DERIVATIVES BY HOMODESMOTIC REACTIONS

Caitlin McCormick, David Magers

Mississippi College, Clinton, Mississippi, USA

Derivatives of quinoline and quinolone, specifically 5-nitro-8-hydroxyquinoline and 5-chloro-8-hydroxyquinoline, are useful as ligands in coordination compounds with Zn(II), Al(III), Cu(II), and Ru(II) and can be used as antimicrobial or antineoplasic (anticancer) agents. In the current study, we focus on the computation of the standard enthalpy of formation of these quinoline derivatives by homodesmotic reactions. In homodesmotic reactions the number and types of bonds and the bonding environment of each atom are conserved. The enthalpy of all of the reactants and products in each homodesmotic equation is computed using SCF theory and density functional theory (DFT). The DFT functionals employed are Becke's three-parameter hybrid functional using the LYP correlation functional, the M06-2X high nonlocality hybrid functional from Thular and Zhao, and the ωB97XD functional from Head-Gordan and coworkers which includes empirical dispersion. The basis sets employed are Dunning and coworkers' correlation consistent basis sets, cc-pVDZ, cc-pVTZ, and cc-pVQZ. From the resulting enthalpy of reaction, the desired enthalpy of formation is determined by use of reference values for all other systems in the reaction, and the computation of atomization energies is avoided. The results are so consistent that computed enthalpies of smaller compounds can be used as reference values for the computation of the enthalpies of larger compounds. We gratefully acknowledge support from the Mississippi College Catalysts, the alumni support group of the Department of Chemistry & Biochemistry.

P3.22

SYNTHESIS OF MACROCYCLIC DIAMINOPOLYPHENYLETHYNYLARENES

Megan Stewart, David Magers, Trent Selby

Mississippi College, Clinton, MS, USA

Molecules containing high degrees of **π**-conjugation are ideal materials for advanced electronic and photonic applications. Conjugation should be promoted by constructing flat 2-dimensional architectures. We report here, the synthesis of highly-conjugated 2-dimensional diaminopolyphenylethynylarenes and diaminopyridinylethynylarenes. The synthesis of diaminopolyphenylethynylarenes begins with alkynylation of 3-nitro-1-bromobenzene or 2-amino-1-bromobenzene with trimethylsilylacetylene under Sonogashira coupling conditions. The resulting alkyne is deprotected under mild conditions using potassium carbonate and methanol to give 1-ethynyl-3-nitrobenzene or 1-ethynyl-3-aminobenzene in good yields. These two key intermediates can be used to synthesize a large variety of flat macrocyclic 2-dimensional structures. Macrocyclic diaminopyridinylethynylarenes are prepared from 6-ethynyl-2-pyridinamine. Sonogashira coupling of 6-ethynyl-2-pyridinamine with aryl halides gave pyridinylethynylarene amines in high yield. Cyclization was accomplished by reacting the amino groups with glyoxal in the presence of methanol. Additionally, these nitrogen containing molecules can easily be oxidized to radical cations giving rise to some unique electronic properties. Finally, we have investigated these systems and a few derivatives computationally to determine what intramolecular steric interactions are present which might lead to twisting and reduction of conjugation. Geometries have been optimized using various density functionals and lowest energy electronic excitation energies have been computed using time-dependent density functional theory.

P3.23

MauG CATALYZES THE CHEMILUMINESCENCE REACTION BETWEEN LUNINOL AND HYDROGEN PEROXIDE

Kamryn Thomas, Manliang Feng

Tougaloo College, Tougaloo, MS, USA

Bacterial diheme peroxidases represent a diverse enzyme family with functions that range from hydrogen peroxide reduction to post-translational modifications. A well-known example is the bacteria di-heme cytochrome c peroxidase (**CcP**), which contains two heme groups but has a function similar to other monoheme cytochrome c peroxidases, reducing hydrogen peroxide to water using c-type heme as an oxidizable substrate. MauG is a diheme protein, which is structurally similar to bacteria **CcP** but with distinct functions, catalyzing posttranslational modification of precursor methylamine dehydrogenase (preMADH) to form mature tryptophan tryptophylquinone (TTQ). The catalytic process involves oxygen insertion, cross-linkage of two tryptophan and oxidation of quinol to quinone. In this research, we have observed a new virtue of MauG, catalyzing the chemiluminescence from the oxidation reaction of luminol by hydrogen peroxide. The reaction kinetics of the MauG catalyzed chemiluminescent reaction, a prolonged process, is different from that catalyzed by horseradish peroxidation, suggesting a new reaction mechanism. Effects of peroxide and luminol concentration on the rate of the reaction have be examined. Preliminary results seem to imply that the key oxidative intermediate of the reaction is a small radical species, most likely a reactive oxygen species (ROS). ROS has not been observed before for MauG. To confirm our hypothesis, we immobilized MauG and luminol on graphene oxide. It was found that there chemiluminescence on graphene oxide are very similar to that that in the solution phase. This suggests that direct electron-transfer between MauG and luminol does not exist. Further work is underway to identify the reactive species and to understand the reaction mechanism.

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P3.24

SYNTHESIS OF PYRIDINE-BASED HIV INTEGRASE INHIBITORS

Hannah Mattke[1], *Christopher Bruni*[1], *Sharon Suffern*[1], *Victor Mishoe*[1], *Sarah Hayek*[1], *Gavisha Mugon*[1], *Jacques Kessl*[2], *Matthew Donahue*[2], *Wolfgang Kramer*[1]

[1]*Millsaps College, Jackson, MS, USA.* [2]*University of Southern Mississippi, Hattiesburg, MS, USA*

Out collaborator at USM, Jacques Kessl has developed an assay for the determination of the effectiveness of potential HIV integrase inhibitors. HIV integrase is an important enzyme in the life cycle of the AIDS virus, it incorporates the viral DNA into the host cell genome. HIV integrase, reverse transcriptase and

protease are three prominent targets in HIV drug development as they are unique to the virus.

HIV Integrase inhibitors are mostly based on aromatic heterocycles such as pyridine and quinoline. In this project, we are constructing the pyridine core by reaction of substituted malonic esters with aminocrotonate ester. Variations in 2 positions on the heteroaromatic cycle allows for improving the drug-target interactions. To advance the structure further, the side-chain is developed in a collaborative effort. Finally, the substituents on the pyridine core are introduced via palladium coupling reactions.

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P3.25

PLATINUM (II) COMPLEXES AS ANTI-CANCER DRUGS

Madison Lofton[1], *Christian Hart*[1], *Samuel Pitre*[1], *Regan Cooper*[1], *Angelle Martin*[1], *Yann Gibert*[2], *Dave Monroe*[2], *Wolfgang Kramer*[1]

[1]*Millsaps College, Jackson, MS, USA.* [2]*University of Mississippi Medical Center, Jackson, MS, USA*

Cisplatin (cis-diamminedichloroplatinum(II)) is a FDA approved anticancer agent for the treatment of certain types of cancer. Hydrolysis of cisplatin's two labile chloride substituents forms an electrophilic aqua complex that generally reacts with the N7 position of DNA purine bases. The resulting adducts are mostly intrastrand 1,2-d(GpG) cross-links that cause DNA distortion, which hinders transcription and cell division ultimately leading to cell death. Cisplatin is not effective against all cancer types and induces a number of toxic side-effects, so efforts are ongoing to find novel, more effective and less toxic platinum (II) complexes. Platinum (II) complexes with only one labile substituent are termed "monofunctional" to distinguish them from the "bifunctional" complexes with two substitution-labile sites. Some monofunctional complexes exhibit anticancer properties, and they are useful in modelling the reactions of platinum complexes as the reduction in reactive sites makes interpretation of results easier. In this project, we describe the synthesis of new platinum (II) complexes with commercially available or novel substituents.

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P3.26

Synthetic Approaches to Photoactivatable Aromatic Heterocycles for Photoinduced Cell Death

Christian Hart, Reagan McGuffee, Taylor Sledge, Shizhe Zhang, Wolfgang Kramer

Millsaps College, Jackson, MS, USA

N-Methoxy substituted aromatic heterocycles are photoactivatable compounds that produce two transient reactive species upon excitation. The reactive species, a methoxy radical and a heteroaromatic radical cation, have been shown to cleave DNA, which makes them candidates for photoinduced cell death. Applications of photoinduced cell death are found in Photodynamic Cancer Therapy. The efficiency of DNA cleavage is limited by weak ground-state association for the quinoline and isoquinoline derivatives. To increase cleaving efficiency, a DNA-binder (1,8-naphthalimide) has been synthetically attached. To further improve binding and cleaving efficiency, attempts to synthesize novel amino-heterocycles are undertaken. Our approach is to functionalize alkylquinolines or related heterocycles by radical bromination and then modify the products by various Grignard reactions or direct substitution with potassium phthalimide. The isolation of the alkylamine proved to be the most challenging step and it appears that alkaline work-up does not yield the desired product. Consequently, reaction such as the Delepine reaction, which require acidic conditions, are selected.

Acknowledgement: This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P3.27

SYNTHESIS AND FUNCTIONALIZATION OF METAL-SULFIDE INTERCALCULATED LAYERED DOUBLE HYDROXIDES

Hannah Lewis, Saiful M Islam

Jackson State University, Jackson, MS, USA

Toxic heavy metals have posed a negative effect on public and environmental health in the past and present. Because of their numerous industrial, domestic, agricultural, medical, and technical uses, they are widely distributed in the environment. The widespread use of these metals has generated reasonable concern due to their negative effects. Heavy metals, such as Copper, Silver, Cadmium, Lead, Mercury, and various others are considered extremely toxic and can cause significant damage to many bodily functions. These problems mainly occur when toxic heavy metals are ingested through contaminated drinking water. A plausible solution to this issue can be found through synthesizing and functionalizing Layered Double Hydroxides (LDH). The Layered Double Hydroxides were synthesized with various metal cations using the hydrothermal and co-precipitation methods. Upon completing the synthesis phase, characterization of the various types of LDH was completed using electron microscopy, X-ray and spectroscopy. All these experiments suggest that MgAl and MMg-LDH (M=transition metals) successfully synthesized. The next step in this research will be to use the various synthesis' and characterizations to make an ionic exchange with sulfide ions, so the application phase may begin. In the application phase, the different types of LDH will be tested to see how efficient each is in heavy metal capture, which will lead us to discover which is the best at removing toxic heavy metals from water.

P3.28

DEVELOPMENT AND TESTING OF FORENSIC CHEMISTRY SENSORS TO DETECT DECAYING REMAINS AND PINPOINT CRIME SCENE LOCATIONS

Alexandria Harris, Madeline Holmes, Whitney Schuler, Alison Cevallos, Caitlin McCormick, Emily Sullivan, Ryan Ivey, and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

The United States currently has over 250,000 unsolved murders cases, where this number increases by about 6,000 new cases each year. One of the most common hurdles for solving murder cases is finding the remains of the potential murder victim. Most often victim remains are buried in actively searched wooded areas but not discovered until years later. Decomposing organic remains

of cadavers or animals release a multitude of gases into the environment. We hypothesized that environmental gas sensors could detect and locate decomposing remains. In this study, we developed and tested multiple gas sensors to detect decaying chicken remains and to locate these remains at a mock crime scene. First, we laboratory tested the efficacy of hydrogen sulfide, carbon dioxide, ammonia, carbon monoxide, methane, and volatile organic gas sensors to detect decaying chicken remains over several weeks in soil under both aerobic and anaerobic conditions. The carbon dioxide, ammonia, and volatile organic gas sensors demonstrated the best results. Next, we engineered these gas sensors into handle held devices and blindly surveyed a 200,000 square foot field site location containing an unknown mock crime scene of decomposing chicken remains. The carbon dioxide, ammonia, and volatile organic gas sensors were able to detect environmental gases in the field. The highest concentrations were in and around the mock crime scene burial site. GPS and gas concentrations were recorded and used to produce heatmaps in QGIS software. Overlaying the heatmaps of the gas sensor data revealed the burial site and accurately pinpointed the crime scene location. Overall, we concluded that gas sensors could be potentially effective at locating decaying remains to discover potential crime scenes. Our results warrant further study into gas sensor technology as a forensic chemistry tool.

P3.29

ICP-OES ANALYSIS OF TRACE ELEMENTS IN FISH SPECIES INHABITING MISSISSIPPI RIVER BORROW PITS

Alison Cevallos, Alexandria Harris, Madeline Holmes, Caitlin McCormick, Whitney Schuler, Emily Sullivan, Ryan Ivey, Trent Selby, and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

The Mississippi River levee system, comprised of levees, floodwalls, and various control structures spanning over 2,00 miles next to the Mississippi River. During the construction of the levee system, soil was removed from the nearby river bank and piled up over 19 feet high to create floodwalls. The areas were the soils were removed to build the floodwalls are call borrow pits. These 8-foot-deep borrow pits have become unique man-made aquatic habitats that change with the flooding stages of the Mississippi River. After a flood, different river fish species become trapped and inhabit these borrow pits until the next flood. Fish are one of the most important food resources in Mississippi. Industrial and farming runoff have increased trace levels of toxic elements in the Mississippi River. There are no reports of the lack or presence of these toxic elements in borrow pits or their aquatic wildlife. In this study, we are the first to survey borrow pit fish species for trace elements. We collected Alligator Gar (**Atractosteus spatula**), Spotted Gar (**Lepisosteus oculatus**), White Perch (**Morone americana**), Freshwater Drum, (**Aplodinotus grunniens**), Channel Catfish (**Ictalurus punctatus**), Smallmouth Buffalo (**Ictiobus bubalus**), Bigmouth Buffalo (**Ictiobus cyprinellus**), Largemouth Bass (**Micropterus salmoides**), Bluegill (**Lepomis macrochirus**), and American gizzard shad (**Dorosoma cepedianum**) from burrow pits and analyzed samples of muscle, liver, and gill tissue for trace elements using an ICP-OES. Here, we compare trace elements and toxic metals in the various species of fish inhabiting Mississippi River borrow pits and compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations.

P3.30

ICP-OES ANALYSIS OF TRACE ELEMENTS TO DETERMINE ENVIRONMENTAL FACTORS CAUSING BRITTLE ANTLERS IN WHITE-TAILED DEER

Caleb Dean, Zachary Dixon, Lillian Sisson, Bryant Johnson, Elijah Rummells, Joseph Kazery, and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

Osteoporosis is a progressive disease marked by reduced bone density and thinning brittle bones. Osteoporosis is a major concern for Mississippi, where 27% of the population has reduced bone density. Researchers have identified many environmental factors and deficiencies linked to osteoporosis making causation location specific. Deer antlers are a very unique material used to monitor toxic and trace elements in the environment. Deer antlers are regrown each year allowing for elemental analysis of the environment of a particular region over time. Due to their rapid regrowth, antlers can be used to determine essential elements required for healthy bone growth advancing osteoporosis research. During a 6-mile-long camera survey in Yazoo County, we observed a particular region where a significant number of deer displayed osteoporosis like symptoms of brittle and broken antlers. Broken antlers are more common in nutritionally stressed animals. Research findings in Europe have indicated that brittle and broken antlers can be caused by magnesium deficiency. Toxic metals such as Pb, Cd, Hg, and As can have a significant impact on bone growth. We hypothesized that deer in the region with brittle antlers may have reduce levels of essential trace elements required for normal antler growth or they may have been exposed to high levels of toxic metals. To test our hypothesis, we collected soil, grass, and water samples from different locations along the 6-mile-long survey site in regions with normal and brittle antlers. We also collected bone samples from antler sheds or antlers harvested by hunters with in our 6-mile-long survey site. Currently, we are using ICP-OES to analyzed digested soil, grass, water, and bone samples for toxic and trace elements. We will then assess these findings by location to determine if the cause of brittle antlers is due to an essential element deficiency or the accumulation of environmental contaminates like toxic metals. Completion of this study could reveal essential elements required for bone growth or reveal environmental concerns due to toxic metal accumulation. We suggest that this research can further the understanding of environmental factors and deficiencies that lead to weak and brittle bones progressing osteoporosis research.

P3.31

A NEW EXTRACTION AND QUANTIFICATION METHOD TO DETECT POLYSTYRENE PLASTICS IN BIOLOGICAL AND ENVIRONMENTAL SAMPLES

Claire Stokes, Sydney Melton, Lillian Sisson, Alison Cevallos, Alexandria Harris, Madeline Holmes, Caitlin McCormick, Whitney Schuler, Emily Sullivan, Ryan Ivey, Trent Selby, and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

Plastic pollution is a major global problem impacting every environment around the world. Many plastics are resistant to degradation due to their unique chemical structures allowing

plastics to accumulate in the environment. For these reasons, biodegradation of plastic waste is a major area of research that receives great attention from scientists worldwide. New research has shown that insect larvae from the darkling beetle family (**Coleoptera: Tenebrionidae**) can ingest and degrade plastic waste such as Polystyrene (PS) foam. A major challenge for studying biodegradation of PS by insects is the lack of an accurate extraction and quantitative method to measure PS levels in frass. In this study, we developed a new method to extract and detect PS in the frass of insects and from soil samples. PS was purified from insect frass using density separation and centrifugation techniques. To confirm the accuracy of this new method, QA/QC analysis was performed using recovery rates of laboratory control samples (LCS) and matrix spikes (MS). We also tested this new technique to measure PS levels in soil samples collected at littering sites where trash and plastic waste has accumulated. We demonstrated the importance of the density separation step of our new method for PS detection using contaminated soil samples Overall, we have developed a new technique to extract and quantify PS in biological and environmental samples. We speculate that this simple technique will allow scientists to measure PS in environmental samples and help contribute to a solution to the world's PS plastic pollution problem.

P3.32

ICP-OES ANALYSIS OF TRACE ELEMENTS IN FISH SPECIES INHABITING FORMER WORLD WAR II MILITARY SITE NEAR CLINTON MISSISSIPPI

William Yarbrough, Madeline Holmes, Whitney Schuler, Alison Cevallos, Alexandria Harris, Caitlin McCormick, Emily Sullivan, Ryan Ivey, Trent Selby, and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

The Mississippi College's Choctaw Trails is a nationally recognized cross-country course spanning of 200 acres located between Clinton and Jackson Mississippi. In the 1940's, Choctaw Trails was called Camp Clinton and served as a World War II prisoner camp for holding German and Japanese enemies of war. After the war was over, the Army Corps of Engineers used Choctaw Trails as replica of the Mississippi River to design flood controls. A large lake teeming with aquatic wildlife resides in the center of Choctaw Trails among the ruins of former buildings. Given Choctaw Trails' rich history and military connections, we set out to determine if the lake may contain altered levels of trace elements. In this study, we survey fish species from the lake at Choctaw Trails for trace and toxic elements. We collected white perch (Morone americana), largemouth bass (Micropterus salmoides), and bluegill (Lepomis macrochirus) from the lake at Choctaw Trails and analyzed samples of muscle, liver, and gill tissue for trace elements using an ICP-OES. Here, we compare trace elements and toxic metals in the various species of fish inhabiting the lake at Choctaw Trails and compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations.

P3.33

COLORIMETRIC DETECTION OF AZIDE WITH A DINUCLEAR CU(II) BASED-POLYAMINE MACROCYLIC METAL ORGANIC FRAMEWORK

Jasmine Martin[1], *Md Mhahabubur Rhaman*[1], *Douglas R. Powell*[2], *Frank R. Fronczek*[3], *Md. Alamgir Hossain*[1]

[1]*Jackson State University, Jackson, MS, USA.* [2]*University of Oklahoma, Norman, OK, USA.* [3]*Louisiana State University, Baton Rouge, LA, USA*

Though anions play various important roles in biology, their detrimental effects on human and environment are inevitable. It has become imperative to detect them in order to mitigate the problems caused by anions. Azide is a triatomic anion which is used as a preservative, mutagen, biocide, and assay reagent. However, it is toxic to living beings. It is a potent inhibitor of mitochondrial respiration. At low doses, azide causes dizziness, nausea, vomiting, diarrhea and restlessness. Symptoms occur within minutes of exposure. It also affects the cardiovascular system causing dilation of peripheral blood vessels which results in reduction in blood pressure. In fatal poisoning, it causes a rapid progressive loss of consciousness or even coma with hyporeflexia and metabolic acidosis. In our research, a polyamine macrocycle was synthesized from the Schiff's base reaction of terephthalaldehyde and **N**-methyl-2,2′-diaminodiethalamine in high dilution followed by sodium borohydride reduction. The macrocyclic amine was converted into dinuclear Cu(II) based-polyamine macrocyclic metal organic framework. The metal organic framework (MOF) was used to detect azide selectively over other common anions (F^-, Cl^-, Br^-, I^-, NO_3^-, ClO_4^-, HSO_4^- and $H_2PO_4^-$) in water showing a visual color change. The binding affinity MOF for azide was studied by UV-vis titrations, and single crystal X-ray diffraction method. The detail work will be presented in the poster session.

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P3.34

THEORETICAL AND EXPERIMENTAL MEASUREMENT OF RADIOACTIVE POTASSIUM (K-40) IN SELECTED FERTILIZERS (0-0-60)

Benjamin Billa[1], *Steve Adzanu*[2], *Michael Atkins*[2], *John Adjaye*[2]

[1]*Porter Chapel Academy, Vicksburg, MS, USA.* [2]*Alcorn State University, Lorman, MS, USA*

Fertilizers are part of farming industry and play a major role in improvement of plants growth and enhancement of crop yields. One of the essential elements, potassium, helps in root growth and drought resistance of plants. Depending on soils fertility, farmers tend to provide potassium in the form of potash fertilizer which is derived from potash rock cored from earth's crust. Rocks derived from the earth's crust consist of trace quantities of Naturally Occurring Radioactive Materials (NORM) and their concentrations significantly vary based on rock type, geographical location, and the depth. Potash is a commonly used fertilizer derived from potash rock and to increase concentration of potassium, manufacturers increase percentage of potash which can eventually enhance radioactive concentrations (specifically K-40) in fertilizers. To exactly estimate and experimentally verify the levels of radioactive K-40 in selected fertilizers (0-0-60), a study was performed on fertilizers available in local market. K-40 was theoretically estimated by considering the half-life; molar mass; and decay constant while experimental studies were carried out by performing gamma-spectroscopy. Results suggest that the radioactivity concentrations of K-40 from theoretical estimation and gamma spectroscopy are 15, 162 and 15, 242 Bq kg^{-1},

respectively. Results suggest that both experimental and theoretical K-40 values are compatible. Further, obtained results are compared to average K-40 concentration in soils within the US. Results indicated that K-40 concentration in potassium enhanced fertilizers considered in this study is significantly higher to the average K-40 concentration in US soils.

P3.35

THEORETICAL STUDIES ON THE EXCITED STATE PROPERTIES OF D-A-II-A ORGANIC THIADIAZOLOQUANOXALINE BASED DYES FOR POTENTIAL APPLICATION IN DYE SENSITIZED SOLAR CELLS.

Wojciech Kolodziejczyk, Kimberly Madison, Karina Kapusta, Julia Saloni, Glake Hill

Jackson State University, Jackson, Mississippi, USA

Donor-acceptor-π-acceptor organic dyes have become a topic of significant research interest nowadays on account of their scientific importance in the area of energy conversion and application in photovoltaic cells. The main objective of this research was to study excited state properties of donor-acceptor-π-acceptor thiadiazoloquanoxiline-based organic dyes. Herein eight thiadiazoloquanoxiline-based organic dyes were subjected to time-dependent density-functional theory calculations using a long-range ω-B97XD functional and 6-311G(d,p) basis set. Gaussian09 software package was used for all calculations, while excited states analysis was performed using Multiwfn package. Comprehensive quantum-chemical investigation was carried out and, as a result, we were able to obtain an important information regarding compounds' hole-electron positions and properties, atoms, which contribute to hole and electron, transition density matrixes, and HOMO-LUMO transitions. For the seven out of eight compounds the greatest charge transfer was observed between thiadiazoloquinoxaline and pyrrole or thiohene fragments. Created here model helped us to understand how the structure of donor-acceptor-π-acceptor thiadiazoloquanoxiline-based organic dyes influences its excited state properties. Obtained knowledge enabled us to tune the properties of organic dyes, which consequently opens future opportunities for design and development of novel potent organic dyes for application in solar cells.

P3.36

PACLITAXEL-LOADED EXOSOMES FOR IMPROVED DELIVERY TO BREAST CANCER CELLS

Kristen Brown, Rajashekhar Kanchanapally

Tougaloo College, Tougaloo, MS, USA

Breast cancer is still one of the biggest causes of mortality in women in the United States and around the world. Ineffective distribution of chemotherapeutics at the target site is one of the leading causes of therapy failure. We propose using exosomes, which are natural nanoparticles, to deliver Paclitaxel, a highly effective breast cancer chemotherapeutic. By co-incubating MDA- MB-231 and MCF7 cells with sub-lethal dosages of Paclitaxel, we were able to load exosomes with the drug. An exosome isolation kit was used to separate exosomes from the spent medium. The isolated exosomes have a mean diameter of ~145 nm, which is typical of exosome size, according to DLS data. Exosomes loaded with drugs were analyzed using HPLC analysis which showed that the Paclitaxel inside exosomes is to be 12.3 µg per 1 mg of exosomes. Further studies to assess the toxicity of Paclitaxel-loaded exosomes towards breast cancer cells are undergoing.

P3.37

BIOCONJUGATED NANOMATERIAL FOR TARGETED DIAGNOSIS OF SARS-CoV-2

Shamily Patibandla, Avijit Pramanik, Ye Gao, Paresh Chandra Ray

Jackson state university, Jackson, MS, USA

Infectious diseases by pathogenic microorganisms are one of the leading causes of mortality worldwide. Healthcare and socio-economic development have been seriously a!ected for di!erent civilizations because of bacterial and viral infections. According to the Centers for Disease Control and Prevention (CDC), pandemic in 1918 by the In"uenza A virus of the H1N1 subtype was responsible for 50 to 100 million deaths worldwide. Similarly, the Asian "u pandemic in 1957, Hong Kong "u in 1968, and H1N1pdm09 "u pandemic in 2009 were responsible for more than 1 million deaths across the globe each time. As per the World Health Organization (WHO), the current pandemic by coronavirus disease 2019 (COVID-19) due to the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus is responsible for more than 4.8 M death worldwide until now. Since the gold standard polymerase chain reaction (PCR) test is more time-consuming, the health care system cannot test all symptomatic and asymptomatic Covid patients every day, which is extremely important to tackle the outbreak. One of the signi#cant challenges during the current pandemic is developing mass testing tools, which is critical to control the virus spread in the community. Therefore, it is highly desirable to develop advanced material-based approaches that can provide a rapid and accurate diagnosis of COVID-19, which will have the capability to save millions of human lives. Aiming for the targeted diagnosis of deadly virus, researchers have developed nanomaterials with various sizes, shapes, and dimensions. These nanomaterials have been used to identify biomolecules via unique optical, electrical, magnetic, structural, and functional properties, which are lacking in other materials. Despite signi#cant progress, nanomaterial-based diagnosis of biomolecules is still facing several obstacles due to low targeting e$ciency and nonspeci#c interactions. To overcome these problems, the bioconjugated nanoparticle has been designed via surface coating with polyethylene glycol (PEG) and then conjugated with antibodies, DNA, RNA, or peptide aptamers. Therefore, the current Account summarizes an overview of the recent advances in the design of bioconjugated nanomaterial-based approached as e!ective diagnosis of the SARS-CoV-2 virus and the SARS-CoV-2 viral RNA, antigen, or antibody, with a particular focus on our work and other's work related to this subject. First, we present how to tailor the surface functionalities of nanomaterials to achieve bioconjugated material for targeted diagnosis of the virus. Then we review the very recent advances in the design of antibody/aptamer/peptide conjugated nanostructure, which represent a powerful platform for naked-eye colorimetric detection via plasmonic nanoparticles. We then discuss nanomaterial-based surface-enhanced Raman scattering (SERS) spectroscopy, which has the capability for very low-level #ngerprint identi#cation of virus, antigen, and antibody via graphene, plasmonic nanoparticle, and heterostructure material. After that, we summarized about "uorescence and nanoparticle surface energy transfer (NSET)-based on speci#c identi#cation of SARS-CoV-2 infections via CNT, quantum dots (QDs), and plasmonic nanoparticles.

P3.38

A RAMAN SPECTROSCOPIC AND QUANTUM CHEMICAL INVESTIGATION OF THE NONCONCOVALENT INTERACTIONS BETWEEN GLYCINE AND VARIOUS IONIC LIQUIDS

Claudia Chambliss, Nathan Hammer, Eden Tanner

University of Mississippi, University, MS, USA

Mitosis is an essential biological process that allows humans to grow and cells to replenish themselves. When mitotic cell proliferation is upregulated and uncontrolled, cells can become cancerous. Researchers studying the causes and influences of cancer cells have found that microtubules play a vital role in cell division. Microtubules are a protein-polymer, comprised of alpha and beta dimers, that provide cells with their proper shape, facilitate organelle movement, and are involved in cell division and material transport. The last 10-12 residues of β-tubulin (called the C-terminal tail) are highly electronegative and are considered to be intrinsically disordered, such that these 10-12 residues protrude from the protein surface in a "Hook"-like conformation. These amino acids will interact with the motor proteins kinesin and dynein, which transport specialized structures to different regions within the cell. The presence and upregulation of E-hooks have been correlated with tumor development, cancer aggressiveness, and resistance to microtubule-based chemotherapies. There is evidence from the literature showing how a minor change in microtubule dynamics can lead to apoptosis. In a recent study, the last six amino acids, EGEDEA, of the β-TUBB2A's E-hook were studied in isolation using Raman spectroscopy and density functional theory (DFT). Ionic liquids pose a promising media for drug design and delivery, despite the lack of literature investigating the interactions between even the smallest amino acid, Glycine, and an ionic liquid. In this study, the ionic liquids Choline Glycolic Acid 1:1 and 1:2 are employed to "freeze" the amino acid glycine to elucidate the properties and interactions of glycine in an ionic liquid environment using DFT analysis and Raman spectroscopy. We hope to apply this to investigations of the six-residue EGEDEA molecule with the Choline Glycolic acid solution.

P3.39

USING MUTAGENESIS TO UNDERSTAND HOW A PROTEIN BINDS TO A POLYSTYRENE SURFACE

Blake Katz[1], Ibraheem Abbood[2], Rahul Yadav[1], Radha Somarathne[1], Nicholas Fitzkee[1]

[1]Mississippi State University, Starkville, MS, USA. [2]University of Arkansas at Little Rock, Little Rock, AK, USA

Bacterial biofilms can form on many different types of surfaces and are a leading cause of hospital-related infection. The bacteria in biofilms typically resist antibiotic treatment and are therefore a serious global health concern. Bacterial biofilms are dependent on extracellular polymeric substances (EPS) that surround and protect the cells, and these substances interact with surfaces during the early stages of biofilm formation. R2ab is an example of one such EPS. R2ab is a domain of the autolysin protein from Staphylococcus epidermidis, and it has a high affinity to polystyrene surfaces. R2ab is implicated in biofilm formation, and removal of this domain significantly reduces biofilms in S. epidermidis. However, the molecular mechanism of how R2ab interacts with polystyrene is not well understood. Based on prior research on isolated amino acids, we hypothesize that aromatic residues in R2ab drive binding to polystyrene. In this study, we use site-directed mutagenesis to identify important amino acid residues in R2ab as it binds to polystyrene surfaces and polystyrene nanoparticles. We have designed mutagenesis primers and used the polymerase chain reaction (PCR) to generate several variants, including Y722A and Y844A. Fluorescence-monitored protein denaturation experiments reveal a preliminary unfolding stability of = 3.5 ± 0.3 kcal mol-1 for Y722A. These variants were grown in 15N media for characterization by NMR spectroscopy. Based on two-dimensional HSQC spectra, both proteins are folded and appear to adopt similar structures to the wild-type (WT) R2ab domain. The Y722A and Y844A amino acid substitutions therefore do not appear to affect R2ab itself, making these variants suitable for surface binding studies. Work is ongoing to characterize polystyrene binding as well as to assess whether these variants are effective at interfering with S. epidermidis biofilm growth. Our long-term goal is to identify key surface binding residues as a means of developing new treatments for preventing biofilm growth.

P3.40

INTERACTION OF EXOPOLYSACCHARIDE WITH CLAY MINERALS AND THEIR EFFECTS ON HEAVY METAL ADSORPTION

Huimin Zhang[1,2], Shaloam Dasari[1], Youhua Ma[2], Fengxiang X. Han[1]

[1]Jackson State University, Jackson, MS, USA and [2]Anhui Agricultural University, Hefei, Anhui, China

Heavy metal pollution have a potential impact on the environment and human health. Exopolysaccharides (EPS) are extensively studied bacterial bypolymers with high molecular weight attributed to several applications. In spite of their application in the field of food, pharmaceutical, nutraceutical, herbicidal and cosmeceutical industries they were well known for their efficiency in the bioremediation of water and soil with heavy metals. Clay minerals are important component of the earth's surface, with fine particle size and large surface area. Its variable charge surface can adsorb, analyze and precipitate heavy metal ions. If the two are combined, the effect of heavy metal adsorption may be improved. However, there are few research about it. This study focus on the characterization of exopolysaccharides combined with typical clay minerals, kaolin and montmorillonite. X-ray Power Diffraction (XRD), Scanning Electron Microscopy (SEM), Fourier transform Infrared Spectroscopy (FT-IR) and Fluorescence spectroscopy (XRF) were used to characterize the adsorption process and surface products. The adsorption capacity of various heavy metals on kaolinite and montmorillonite combined with EPS as will be investigated. The interlayer of montmorillonite upon interaction with EPS will be examined as well their ion exchange. The C-O-C, acetyl and hydroxyl functional groups of polysaccharides play an important role in the process. The results will provide an new insight for the application of biopolymers in remediation of contaminated soils.

P3.41

ICP-OES ANALYSIS OF TRACE ELEMENTS IN FISH SPECIES INHABITING THE ROSS BARNETT RESERVOIR SPILLWAY

Whitney Schuler, Alison Cevallos, Alexandria Harris, Madeline *Holmes, Caitlin McCormick, Emily Sullivan, Ryan Ivey, Trent Selby, and Scoty Hearst*

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

The Ross Barnett Reservoir is a reservoir in Mississippi located between Madison and Rankin counties created by the Pearl River.

This lake encompasses over 30,000 acres and serves as Mississippi's largest resource for drinking water. The reservoir is managed by the Pearl River Valley Water Supply District. Over two million people visit the Ross Barnett Reservoir each year to enjoy outdoor recreation. The Ross Barnett Reservoir is prized for its aquatic wildlife and hosts many year fishing tournaments. In recent toxic element studies, arsenic, cadmium, chromium, and lead have been found in the waters of many major lakes across Mississippi. Arsenic levels exceeded the guideline values at multiple locations in Ross Barnett Reservoir. There are no reports of the lack or presence of these toxic elements in the Ross Barnett Reservoir's aquatic wildlife. In this study, we survey fish species from the Ross Barnett Reservoir Spillway for trace elements. We collected hybrid striped bass, (Morone saxatilis x Morone chrysops), white perch (Morone americana), freshwater drum, (Aplodinotus grunniens), smallmouth buffalo (Ictiobus bubalus), channel catfish (Ictalurus punctatus), blue catfish (Ictalurus furcatus), and American gizzard shad (Dorosoma cepedianum) from the Ross Barnett Reservoir and analyzed samples of muscle, liver, and gill tissue for trace elements using an ICP-OES. Here, we compare trace elements and toxic metals in the various species of fish inhabiting the Ross Barnett Reservoir and compare these levels with the maximum permissible levels established by World Health Organization, USDA, and Food and Agriculture Organization of the United Nations.

P3.42

DONOR-ACCEPTOR BASED ORGANIC π-CONJUGATED POLYMERS: DFT/TD-DFT STUDY

*Taylor A. Dorlus[1], Juganta Roy[1], Jerzy Leszczynski[1]**

[1]Interdisciplinary Center for Nanotoxicity, Department of Chemistry, Physics and Atmospheric Sciences, Jackson State University, Jackson, USA

The growing concern for solar efficient ways to conduct electricity and emit light is the driving force for researching the efficiency of organic semiconductors. Compared to inorganic semiconductors, organic material is less expensive in addition to the **π**-conjugated system leading to an increase in the delocalization of electrons and therefore, an increase in conductivity. Moreover, the molecular orbitals within the system are not tightly packed so the semiconductors obtain an effective charge carrier transport. The use of polymers in optoelectronics is an advantage for devices that cover large areas compared to semiconductors with a relatively small molecular weight. In this current project, eight different conjugated polymers were fully optimized using three major methods (B3LYP, CAM-B3LYP, wB97XD) with basis set 6-311G(d, p) in the Gaussian 09 program package. The total energies of these polymers were analyzed. The HOMO LUMO calculations were done based on the overlapping of molecular π-orbitals and anti-bonding π-orbitals (π*), respectively. Based on full geometry optimization, the time-dependent density functional theory calculation was carried out for all polymers using the CAM-B3LYP method and 6-311G(d, p) basis set.

Friday, April 1, 2022

MORNING

Room D11

Moderator: Dr. Wojciech Kolodziejczyk

8:45: WELCOME

O3.14

9:00 VINYL SULFONE-BASED INHIBITORS OF TRYPANOSOMAL CYSTEINE PROTEASES WITH IMPROVED ANTITRYPANOSOMAL ACTIVITIES

Oluwatomi Ajayi, Olamide Crown, Olawale Adeyinka, Damilohun Metibemu, Ifedayo Victor Ogungbe

Jackson State University, Jackson, MS, USA

The kinetoplastid protozoan parasites Trypanosoma brucei and Trypanosoma cruzi are responsible for human African trypanosomiasis (HAT) and Chagas disease, respectively. Available front-line drugs for both diseases are inadequate because of parasite stage-specific activities and drug resistance. In addition, the drug discovery and development pipeline for the diseases remains sparse. Our current work is focused on investigating new chemical identities that have dual-acting modes of action on the kinetoplastid protozoans with no or limited off-target toxicity. Hence, we designed and evaluated molecules that can covalently inhibit the major cathepsin L-like enzymes in the parasites and alter the parasites' antioxidant system. We found that the initial molecules have potent activities on the parasite but have suboptimal ADME properties. Analogs of these compounds have been synthesized and evaluated. The analogs have nanomolar potency on T. brucei and T. cruzi, with much improved ADME properties; On-going studies are focused on in vivo evaluation of antitrypanosomal activities in murine models. The antitrypanosomal cathepsin L inhibitors from this work appear to be good candidates for lead optimization studies.

O3.15

9:15 MODELING SOLVENT EFFECTS ON NIR ABSORPTION OF INDOLIZINE CYANINE AND INDOLIZINE SQUARAINE DYES

Angel B. Cowan[1], Karina Kapusta[1], Jared H. Delcamp[2], Julia Saloni[1]

[1]Jackson State University, Jackson, MS, USA. [2]University of Mississippi, University, MS, USA

This work presents a computational study on the organic dyes, such as indolizine cyanine and indolizine squaraine, that can absorb and emit in the near infrared, NIR, region. Those dyes are very promising candidates towards variety application as potentially non-invasive, high resolution, and rapid biological imaging materials, solar cells or emitting diodes.

As theoretical screenings provide significant support to the experimental design of variety of novel materials by reducing time and cost of necessary syntheses. Hence, the aim of this study is to create a comprehensive theoretical database of solvent effects on the properties of the indolizine-based dyes. Presented data includes, but is not limited to, characteristics of solvent-dye interactions, solvent influence on the interatomic and intermolecular charge transfer, as well as detailed UV spectra analysis.

O3.16

9:30 A GAS-PHASE MECHANISTIC STUDY OF 2-THIOHISITIDNE BIOMIMETIC PATHWAY VIA ELECTROSPRAY-IONIZATION MASS SPECTROMETRY.

Thomas Owens, Douglas Masterson

University of Southern Mississippi, Hattiesburg, MS, USA

The sulfur containing amino acid 2-thiohistidine has been reported in the literature to have potential antioxidant properties for the reduction of peroxides in biological systems. However, 2-thiohistidine can only be obtained through dietary intake, as its synthesis is only found in nature via biological processes. This has led to the development of a biomimetic synthesis of 2-thiohistidine from histidine via a spirocyclic bromolactone intermediate allowing for nucleophilic addition of sulfur via cysteine to the imidazole ring of histidine. However, this method suffers from low yields, and the mechanistic pathway of cleavage of the cysteine adduct formed post sulfur addition is unclear. Herein we present a mechanistic study via electrospray-ionization mass spectrometry (ESI-MS) to offer insight of the cysteine adduct cleavage in efforts to improve the efficiency of the biomimetic pathway and determine the versatility of the imidazole ring towards other sulfur sources. Our analysis, via collision-induce dissociation (CID), suggests an intramolecular cleavage of the cysteine adduct yielding 2-thiohistidine, generating pyruvic acid as a byproduct. The methodology presented allows for further mechanistic investigation and sulfur incorporation, assessing the efficiency of the biomimetic synthesis

O3.17

9:45 HIGH ENERGY DENSITY OF POLYMER AND LAYERED h-BN HETEROSTRUCTURE NANOCOMPOSITES

Priyanka Das, Nihar Pradhan

Jackson State University, Jackson, MS, USA

Here, we report the development of a thin film based dielectric capacitor with enhanced dielectric constant and low dielectric loss polymer nanocomposite by incorporating an exfoliated layered 2D hexagonal-Boron Nitride (h-BN) crystals in between PVDF polymer layer in a heterostructure stacking geometry. To modulate the energy storage capacity and charging & discharging capacity, we exfoliated a layer of h-BN crystals on one of the capacitor electrodes using PMMA layer and studied the temperature dependent broadband dielectric study. The dielectric constant of heterostructure of PVDF and 2D-h-BN samples show a significant enhancement over the pristine PVDF based polymer samples using h-BN nanofillers. Breakdown voltage and energy storage density also substantially improved over the broad range of temperature suggested for potential application in thin film based high energy density storage devices.

O3.18

10:00 COLORIMETRIC AND FLUORESCENT DETECTION OF OXALATE WITH A DINUCLEAR NI(II) COMPLEX OF A THIOPHENE-BASED MACROCYCLIC POLYAMINES

Arlencia Barnes[1], *Md Mhahabubur Rhaman*[1], *Douglas R. Powell*[2], *Md. Alamgir Hossain*[1]

[1]*Jackson State University, Jackson, MS, USA.* [2]*University of Oklahoma, Norman, OK, USA*

There are various carboxylate anions which play important roles in biology, medicine and food industry. The presence of oxalate in the human diet is important because it influences the bioavailability of dietary calcium and magnesium. Since there is no enzyme in the human body to degrade oxalate, an increased amount of dietary oxalate significantly decreases the absorption of calcium and magnesium due to the formation of insoluble oxalate salts that are ultimately deposited in the renal tissue. This effect may result in a number of pathological conditions including renal failure, pancreatic insufficiency, and the development of kidney stones. Therefore, the quantitative information of oxalate is widely used in identifying a number of diseases including *hyperoxaluria*, *vulvodynia*, and kidney stones. Accordingly, a wide variety of techniques have been developed for quantitative analysis of oxalate anion, which are often not convenient for a general purpose. Alternatively, colorimetric or fluorescence sensing of anions becomes an attractive research area because of its low cost, simplicity, and visual detection of target anion without involving expensive instrumentations. In our research, a thiophene-based polyamine macrocycle (L) was synthesized by Schif's base reaction between 2,2'-diamino-**N**-methyldiethylamine and thiophene dicarboxaldehyde in high dilution condition followed by $NaBH_4$ reduction. This macrocycle was converted into dinuclear Ni(II) complex (N) that was studied for the recognition of carboxyl containing anions by indicator displacement assay using Eosin Y, Pyragallol red, and pyrocatechol violet, exhibiting strong selectivity for oxalate displaying visual color change. This presentation will cover the detail of the synthesis and binding studies of the dinuclear Ni(II) complex (N).

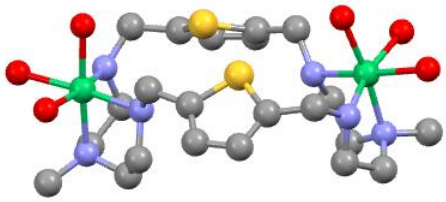


Figure: Ball and stick model of single crystal structure of N

Acknowledgements: The project was funded by LSMAMP Bridge to the Doctorate (National Science Foundation Grant-HRD-1906146). This research also acknowledges US Department of Defense (Grant number W911NF-19-1-0006) and the National Science Foundation (Grant CHE-0130835).

10:15 BREAK

Friday, April 1, 2022

MORNING

Room D11

Moderators: Dr. Sudarson Sinha

O3.19

10:30 PHOTOCHEMISTRY OF PYROMELLITIMIDES: STABLE RADICAL ANIONS IN AQUEOUS SOLUTION

Wolfgang Kramer[1], *Donya Razinoubakht*[1], *Gurjit Kaur*[1], *Sabrina Molitor*[2], *Anne Zimmer*[2], *Axel Griesbeck*[2]

[1]*Millsaps College, Jackson, MS, USA.* [2]*Universitaet Koeln, Cologne, NRW, Germany*

Pyromellitimide (1,2,4,5-Benzenetetracarboxylic acid diimide) is widely used in polymeric films (Kapton) due to its high thermal stability, good mechanical properties, low dielectric constant, low coefficient of thermal expansion and high radiation resistance. Additionally, the characteristic absorption of the radical anion at 720 nm makes pyromellitimide an attractive component of electron-transfer cascade systems.

Aromatic imides such as phthalimide undergo the decarboxylative photocylization, which yields medium to large ring structures, tolerating several functional groups and giving excellent yields. The reduction potential of pyromellitimide identifies it as a potential chromophore for this photochemical transformation.

The photochemical starting materials were synthesized by simple condensation reactions yielding pyromellitimide w-carboxylic acids. Irradiation in basic aqueous solution led to the formation of a stable radical species, which was identified by ESR, UV/Vis and NMR as the radical anion of pyromellitimide. The radical anion concentration, characterized by the absorption at 720 nm and the reported extinction coefficient, was largest after about 100 minutes. It disappeared completely after 200 to 400 minutes, depending on the spacer length of the carboxylic acid substituent. Interestingly, the radical anion has a lifetime of several days in deoxygenated solution.

This is the first time pyromellitimides have been shown to exhibit synthetic photochemical potential.

O3.20

10:45 BENCHMARK MODEL FOR IN SILICO INVESTIGATION OF NATURAL COMPOUNDS AS INHIBITORS OF SARS-COV-2 SPIKE GLYCOPROTEINS FROM DIVERSE VIRAL VARIANTS

Olha Ovchynnykova[1], *Karina Kapusta*[2], *Wojciech Kolodziejczyk*[2], *Kostyantyn M. Sukhyy*[1], *Julia Saloni*[2], *Glake A. Hill*[2]

[1]*Ukrainian State University of Chemical Technology, Dnipro, -, Ukraine.* [2]*Jackson State University, Jackson, MS, USA*

Coronavirus disease (COVID-19) caused by the SARS-CoV-2 virus impacted the life of the globe drastically. It caused millions of deaths around the world and triggered a serious economic crisis. Over the course of the last two years the world scientific community as well as the pharmaceutical industry are devoted to finding an effective therapy for the COVID-19. An existing protective vaccination was developed and showed to be effective against the earliest variants. However, new variants of SARS-CoV-2 continue to emerge, thus raising a question, whether the existing vaccines still work? Targeted drug therapy plays a very important role in such a case. Some flavor and fragrance industries worldwide are making claims regarding their essential oils, extracts, and other natural products to be effective against coronaviruses, which provided a large growth in their sales. Nonetheless such claims are not necessarily supported by the available data on the activity of these plant materials. Not only that the natural compounds are not well studied neither **in-vitro** nor especially **in-vivo**, but also the majority of research papers concentrate on finding a cure against specific variant, rather than performing a broad investigation.

In silico aided drug discovery is aimed to provide a lead for experimental research. In this work our goal is to create a benchmark model for scanning a library of natural compounds presented in essential oils against all known variants of SARS-CoV-2 spike glycoprotein, thus targeting a viral entry into the host cell. If it is possible to find a compound that would possess high efficiency in inhibition of all existing variants it would be safe to say that this compound may serve as a universal inhibitor disregard all the possible future mutations. Herein, crystallographic structures of SARS-CoV and SARS-CoV-2 (wild-type, Alpha (B.1.1.7), Beta (B.1.351), and Gamma (P.1) variants) spike glycoprotein's receptor binding domains were used to create homology models of Delta (B.1.617.2), Epsilon (B.1.427/B.1.429), Lambda (C.37), Mu (B.1.621), and the latest Omicron (B.1.1.529) variants. These ten viral proteins were further used as targets to scan a small library of natural compounds, active ingredients of essential oils and plant extracts presented in some Traditional Chinese Medicines, which were reported to be efficient **in-vivo** and/or **in-vitro**. Employing an extensive molecular docking, molecular mechanics, and molecular dynamics simulations we were able to find three leads, which with decent efficiency bind receptor binding domains of SARS-CoV and SARS-CoV-2 spike glycoproteins. Results of this investigation may become an important asset for **in-silico** drug discovery process, giving a new insight into the comprehensive and accurate methodology improvement. After scanning a larger database and further experimental verification it can benefit the development of industry scale disinfectors or medicines aiding to stop the spread of a viral disease, which became the main foe of humanity in 21st century.

O3.21

11:00 SQUARAMIDE ORGANOCATALYZED DIASTEREOSELECTIVE ADDITION OF A MASKED ACYL CYANIDE TO A BETA-NITROSTYRENE

Haley Hinton, Aiden Leise, Julie Pigza

University of Southern Mississippi, Hattiesburg, MS, USA

Squaramide organocatalysts can catalyze reactions via dual binding modes that activate both the substrate and a nucleophile of appropriate p**K**a. We have demonstrated that masked acyl cyanide (MAC) reagents are applicable nucleophiles under these conditions. MAC reagents serve as an oxidation state 3 equivalent and were added to beta-nitrostyrenes in high yields and enantioselectivities using a chiral squaramide catalyst. This presentation will describe an extension of this reaction to achieve diastereoselectivity by choosing a substituted, cyclic beta-nitrostyrene. We have developed and screened achiral squaramide catalysts for this reaction, which provide a similar organized transition state and effective conversions but are much simpler to access in only two steps. The products can be converted to beta-amino acids and other small chiral building blocks of use in drug discovery.

O3.22

11:15 INVESTIGATING POLYCYCLIC AROMATIC HYDROCARBONS AS BIOSIGNATURES IN THE MARTIAN SUBSURFACE USING GC-MS

Christine Ward[1], *Ardith Bravenec*[2], *Timothy Ward*[3]

[1]*Millsaps College, Jackson, Mississippi, USA.* [2]*University of Washington, Seattle, WA, USA.* [3]*Millsaps College, Jackson, MS, USA*

To explore how Martian biosignatures may be preserved, it is necessary to consider the effects of potential host environments; specifically, subsurface minerals and hydrothermal systems. To examine the preservation potential of biosignatures, polycyclic aromatic hydrocarbons (PAHs) were selected as representative biosignatures and were subjected to simulated subsurface Martian conditions, with their presence and degradation products analyzed by gas chromatography-mass spectrometry. Preservation potential varied significantly between the different PAHs in the simulated conditions. The majority of the preservation potential results were within theoretical estimates, however, several experiments provided unexpected outcomes regarding the preservation of PAHs under simulated conditions. These experiments and simulations will inform in-situ searches for life on Mars in addition to the interpretation of organic analyses from past missions.

O3.23

11:30 SYNTHESIS OF 4-ARYL QUINOLINES AS NOVEL HIV-INTEGRASE INHIBITORS

Jack Patterson, Matthew Donahue, Jacques Kessl

University of Southern Mississippi, Hattiesburg, MS, USA

Since 2018, the southeast United States has accumulated more than 50% of new HIV-infections, with the fifth highest state being Mississippi. As there exists no cure or vaccination for HIV-AIDS, patients must be treated with combination antiretroviral therapies to thwart the virus' progression. There exists less than 30 FDA-approved drugs employed in these combination therapies to treat HIV-AIDS, all of which target specific stages of HIV replication. Out of these ten life stages, the virus' integration of its cDNA genome into the host DNA, accomplished by the HIV-Integrase enzyme (IN), has garnered attention as a potential therapeutic target. Several recent articles published by our collaboration have highlighted the efficacy of 4-aryl quinoline derivatives at inhibiting this integration. These small molecule quinoline-based inhibitors function by blocking interaction with LEDGF/p75 cofactor vital for the interaction between cDNA and host DNA allowing for proper integration. In addition to blocking this interaction, these small-molecule inhibitors also induce aberrant multimerization of IN, preventing maturation of infectious virions. Recent X-ray crystallographic data has highlighted the importance of the western R1 region of the quinoline with regards to inducing multimerization. We seek through this collaborative effort to synthesize a library of 4-aryl quinoline derivatives with various functional groups on the R1 region to be evaluated as potential HIV-Integrase inhibitors. On the small molecule quinoline, substitution of hydrogen bond donor-acceptor groups onto the R1 position will enhance the pharmacophore's ability to induce aberrant multimerization, shutting down the HIV life cycle. Vital to the construction of these quinoline derivatives is the deployment of an umpolung reagent known as TBSMAC which serves to install an acetic acid residue. Throughout this presentation, we plan to disseminate current efforts to synthesize these 4-aryl quinoline derivatives and their ability to combat HIV's replication.

11:45-12:00 BREAK

12:00-12:30 Business Meeting/Awards Ceremony/Group Picture

12:00 GENERAL SESSION

ECOLOGY AND EVOLUTIONARY BIOLOGY

Chair: AHM Ali Reza

Delta State University

Vice-Chair: Nina Baghai Riding

Delta State University

Thursday, March 31, 2022
MORNING
Room L6

8:00 WELCOME

SYMPOSIA ON CONSERVATION THROUGH SCIENCE AND EDUCATION

***Organizers*:** Dr. AHM Ali Reza and Dr. Nina Baghai-Riding
Delta State University

GOPHER TORTOISES (*GOPHERUS POLYPHEMUS*) HEAD-STARTING AND RECOVERY EFFORTS IN MISSISSIPPI

James R. Lee, Biologist with the Mississippi Chapter of The Nature Conservancy, Camp Shelby, MS

ON THE SHORES OF THE WESTERN INTERIOR SEAWAY: THE LATE CRETACEOUS MAMMALS OF TEXAS AND MISSISSIPPI

Alyson A. Brink, Ph.D., Assistant Professor of Geology, University of Southern Mississippi, Hattiesburg, MS; Research Associate at the Sam Noble Museum, University of Oklahoma, Norman, OK.

TURTLES OF BANGLADESH: POPULATION AND CONSERVAITON CHALLENGES IN AN OVER-POPULATED LANDSCAPE.

AHM Ali Reza, Ph.D., Associate Professor of Biology and Environmental Sciences, Division of Math and Sciences, Delta State University, Cleveland, MS.

9:15 BREAK

Thursday, March 31, 2022
MORNING
Room L6

O4.01

9:30 USING FOREST INVENTORY AND ANALYSIS (FIA) DATA TO EXPLORE THE RELATIONSHIP BETWEEN FUNCTIONAL DIVERSITY AND PRODUCTIVITY IN MISSISSIPPI FORESTS

Elizabeth Baach, Austin Himes, Adam Polinko, Joshua Granger

Mississippi State University, Starkville, MS, USA

Numerous studies have evaluated the relationship between biodiversity and productivity, with general global trends suggesting a positive relationship, with some studies finding neutral or negative relationships. We know of no studies that investigate this relationship specifically in Southeastern U.S. forests despite high levels of tree species diversity. Most studies in forest systems have relied on tree species richness as the primary indicator of biodiversity and productivity to indicate ecosystem function. In this study we analyzed the impact of functional diversity on forest productivity. This is of particular importance as functional groups provide a more comprehensive meaning to diversity compared to traditional taxonomic classifications. This is because functional groups are directly based on the relationship between an organism, or group of organisms, and their environment. The use of functional diversity gives important context to the examination of forest productivity due to the direct link it establishes between organisms and their role in a given ecosystem. We incorporated data from the USDA Forest Service Forest Inventory and Analysis (FIA) database collected in the state of Mississippi. We determined plot level productivity as the difference in tree biomass between repeated measurements. Functional diversity, characterized by common tree attributes, and structured equation modeling were used to determine the strength of the relationship between tree functional diversity and biomass productivity. In agreement with previous studies that examined the relationship between biodiversity and productivity as well as studies that examined the relationship between functional diversity and ecosystem function, we noted a positive relationship.

O4.02

9:45 DIFFERENTIAL RETURN RESPONSES OF MAMMALS TO LONG-DURATION FLOODS

Lacy Dolan, Anthony Sévêque, William McKinley[1], Kristine Evans, Bronson Strickland, and Dana Morin

Mississippi State University, Starkville, MS, USA

[1]Mississippi Department of Wildlife, Fisheries, and Parks, Jackson, MS, USA

Increasing the frequency and severity of disturbance regimes can have large and cascading effects on ecosystems. The South Delta region of Mississippi experienced an unusually severe eight-month long flood in 2019 that excluded terrestrial wildlife from over 2,000 km^2 of potentially suitable habitat. A citizen camera trap survey was conducted one month after the floodwaters receded in a joint effort between private and public land stakeholders. White-tailed deer (*Odocoileus virginianus*) occurred throughout the study area at greater encounter rates, while other species were less common. To assess site use of mammals in the former flood zone, we fit single-species occupancy models to make predictions about the return of coyote (*Canis latrans*), bobcat (*Lynx rufus*), wild pig (*Sus scrofa*), raccoon (*Procyon lotor*), and squirrel (*Sciurus* sp.) populations to the habitats that were inaccessible during the flood. We expected return would be driven by damage to the area (areas that were flooded), access and distance to refugia (e.g., areas outside of the flooding, elevation, forested areas for species with arboreal tendencies), and the state of recovery (i.e., vegetation availability) during our camera survey. We also describe site use for species with low detections. Wild pigs, squirrels, and raccoons were affected by distance to the edge of the flooding extent (damage), and latitude and longitude (refuge) also had an effect on squirrel and raccoon site use, while recovery hypotheses showed no response. Wild pigs were mostly found outside the flooding extent while squirrels and raccoons were found in areas that had experienced flooding. Squirrels and raccoons also had a strong association with latitude and longitude. None of the models adequately described coyote and bobcat site use. Small mammals likely suffered substantial declines from this flood event, which

could explain the unpredictable pattern of bobcats and coyotes as they will be driven by prey availability. The return of deer to the area in great numbers may also impact return of small mammals due to resource competition. Other projects started deploying cameras in these areas in 2020 and will continue until at least 2023 which will allow us to look at species site use over time. Extreme floods are expected to become more frequent due to climate change and understanding their effects on wildlife across the landscape is vital to predicting how communities will change.

O4.03

10:00 CONCEPTS OF WILDERNESS

Shawn Simpson

Mississippi State University, Starkville, MS, USA

The nature of wilderness is of key interest to philosophers, scientists, and natural resource managers alike. A better understanding of what constitutes wilderness is important for projects dealing with climate change, wildlife conservation, and the regeneration of wild areas. The issue is pressing as by some estimates wilderness now only covers less than 25% of the globe and its coverage is rapidly shrinking In the US, federally designated wilderness makes up a mere 4.5% of the land. There have been three prominent conceptions of wilderness represented throughout American history. Each concept emphasizes a different focus. The "folk" concept looks at the history of the term and the way it has been used in modern language. This analysis incorporates work of the American historian Roderick Nash, in particular, his 1967 book *Wilderness and the American Mind*. This view of wilderness implies that there will be no (0%) wilderness left on the planet. Aldo Leopold, former US Forest Service wilderness ranger and professor of game management, conveyed the second concept. This view of wilderness remains popular among forest and park rangers, especially horse and mule packers, but lacks much to be desired in terms of precision and utility. This definition also results in wilderness covering even less than 25% of the planet. The third conception of wilderness is represented by the definition put forward by the US Congress in America's key piece of legislation in this area – the Wilderness Act of 1964. Although, much better than the first two conceptions, the definition found in the Wilderness Act is still much too imprecise and unclear to do all the work for which a good concept of wilderness is needed. This definition of wilderness also unfortunately permits too much flexibility of interpretation, making it unclear what exactly counts and how much is left. In the end, I argue, these three concepts of wilderness are inadequate for the purposes for which we might want such a concept to serve. Wilderness as a concept lies on a sort of sliding scale. There are paradigm cases of wilderness and less paradigm ones – ones with more, and ones with fewer, of the markers that we find important when assessing some area's wilderness status. This way of looking at wilderness, I believe, will better capture our most important intuitions. More importantly, this conception seems to function as a better guide for our conservation and preservation efforts and allow us to protect more of the planet.

O4.04

10:15 INTERACTION OF EXTRACELLULAR POLYMERIC SUBSTANCE (EPS) WITH ION METALS

Naira Ibrahim, and Fengxiang Han

Jackson State University, Jackson, MS, USA

Recently, a lot of methods are investigated to remediate the environment from various pollutants including heavy metals (HMs) and radionuclides. Bioaccumulation and Biosorption are considered a microbiological method by which metal species, compounds and particulate materials can be removed from solution through different types of bacteria such as (*Aspergillus niger*, *Mycobacterium chlorophenolicum*, *Rhodanobacter* sp. and *Desulfuromus aferrireducens*). Using bacteria to remove chemical and physical contaminants depends on assorted mechanistic processes: chemical complexation, solvent extraction, and ion exchange. Metal-microbial biosorption interactions are varied among the species of the bacteria according to specific parameters such as a solution pH, physiological cell state, presence of certain polymers affecting the solubility and availability of the metal favorable functional groups. In this study, we investigated the interaction between EPS and different metals including uranium (U), calcium (Ca), aluminum (Al) and iron (Fe). Additionally, the effect of EPS on the solubility and the effect of EPS on the solubility and precipitation of these ions in the case of different pH was analyzed. Four experiments were conducted by preparing 20 ml of EPS solutions in four small beakers. Then, different solutions were prepared from uranyl nitrate, calcium chloride, aluminum chloride and iron chloride. EPS solutions were titrated by the metal ion solutions and by adding 1 ml of these metal solutions; the pH meter recorded the values of pH until it reached the value 1. Significant differences between the values of pH and concentrations of the used metal ions were obtained from the titration curves. It appears that the interaction between the EPS and the metal ions are different due to the favorable functional groups that are present in each of these ions.

O4.05

10:30 DISTRIBUTION, NATURAL HISTORY, AND CONSERVATION OF *CAMBARUS DUBIUS* IN PENNSYLVANIA

Patrick Allison Jr[1]., David Lieb[2], and Zachary Loughman[3]

[1]West Liberty University, West Liberty, WV, USA and University of Mississippi, Oxford, MS, USA

[2]Western Pennsylvania Conservancy, Pennsylvania Fish & Boat Commission, PA Natural Heritage Program, Bellefonte, PA, USA, and West Liberty University, West Liberty, WV, USA

[3]West Liberty University, West Liberty, WV, USA

Due to their burrowing lifestyles that make them difficult to sample, the distributions and habitat associations of most burrowing crayfishes are poorly understood. A distributional study was conducted in southwestern Pennsylvania to better understand the range and habitat associations of the primary burrowing crayfish, *Cambarus dubius*, within the state. A total of 790 new sites and six previously surveyed sites were sampled between the Chestnut Ridge and Allegheny Mountains, with the majority of these localities being roadside ditches. Crayfish were collected using a combination of burrow excavation, baited lines, and by hand. We utilized permutation-based t-tests to determine differences in habitat variables between sites with and without *C. dubius* and sites with and without any burrowing crayfish species. *Cambarus dubius* was collected from 61 total sites, and active crayfish burrows were observed at 137 additional sites. New behavioral observations for *C. dubius* juveniles were observed while collecting specimens with baited lines. Sites with *C. dubius* had significantly more canopy cover and deciduous forest and significantly less pasture-hay land cover than sites without *C. dubius*. Sites with burrowing crayfishes (all species) had significantly more canopy cover and deciduous forest and significantly lower elevation, depth to the water table, percent

sand substrate, and pasture-hay land cover than sites without burrowing crayfish. In Pennsylvania, *C. dubius* has not expanded its range in comparison to its historical range, and populations appear to be concentrated primarily to the southern valleys of the Chestnut Ridge and Allegheny Mountains.

O4.06

10:45 INTERACTIVE HABITAT SELECTION ON SPATIALLY EXPLICIT LANDSCAPES

Peter Zee

University of Mississippi, Oxford, MS, USA

Habitat selection is a critical demographic event for many organisms. While some species colonize habitat patches at random, others can opt to colonize patches based on perceived quality. Patch quality can vary in many ways (e.g., resource availability, presence of competitors and/or predators). Variation in these patch qualities across a landscape may result in context dependencies in whether organisms decide to colonize. These can lead to distinct patterns of population density across landscape. Quantifying how this spatial variation in habitat patch quality affects the patterns of population density and growth is dependent on several variables. I developed a stochastic, individual-based simulation model of habitat selection in variable landscape. This model integrates scales of organization from behavioral choices of individuals to community structure. In each simulation, individuals can move on a spatial array of habitat patches of variable quality and make choices whether or not to colonize a given patch. I simulated across a range of parameter values (e.g., spatial heterogeneity, organismal dispersal, disparity in patch quality) and tracked colonization. Preliminary analyses show that the ratio between the spatial scale of individual movement (local vs. global dispersal) and the spatial structure of patch quality (local vs. regional) is a critical determinant of patterns of colonization and population growth. This modeling framework aims to identify empirical predictions for habitat selection in difference natural systems (e.g., landscape structures, organismal dispersal syndromes). Ongoing work is investigating how the population and community structures that result from this interactive habitat selection can influence the subsequent evolution of traits involved in habitat selection.

O4.07

11:00 COMPARING POLLINATOR INTERACTIONS BETWEEN NATIVE AND NON-NATIVE PLANT SPECIES IN THE MISSISSIPPI DELTA

Mary Margaret Weeks, Katelyn Tramel, Taylor Glass, Shelby Wolfram, and AHM Ali Reza

Delta State University, Cleveland, MS, USA

Plants are essential to all life forms and act as the key players of the ecosystem to function properly. However, non-native or exotic species disrupts the natural ecology of the native species, both plants and animals. For management purpose, it is important to understand the impacts of non-native and/or invasive plant species on the native ecosystem. One impact non-native plant species may have on native species is the attraction of crucial pollinators. We studied three native plant species and three non-native species at three different locations in the Mississippi Delta to determine the prevalence of the common pollinators. Three study sites are: Dahomey National Wildlife Refuge located about 8 miles west of Cleveland, CSEE (Center for Science and Environmental Education) located in Merigold about 4 miles north of Cleveland, and the campus of Delta State University. Climbing Hempvine (*Mikania scandens*), Ironweed (*Vernonia fasciculata*), and Goldenrod (*Solidago nemoralis*) were chosen as native plant species and were observed in thirty minute increments once a week for 3 months in Fall 2021 (September-November). The non-native species in this study are represented by Trumpet Creeper (*Campsis radicans*), Common Hibiscus (*Hibiscus syriacus*), and Butterfly Bush (*Buddleia davidii*). During this study (weather permitting), we identified every pollinator that visited each plant and recorded their time spent on individual plant. Our results shows that one of the native species, Goldenrod had the highest number of recorded visits (123 individuals) by pollinators. Another native plant, Climbing Hempvine, was recorded as the second most popular among pollinators with 84 visitors. All three native plant species proved to be more popular among different species of insects than the non-native plant species. Ironweed possessed the highest divestiy of insect pollinators (should list some of them), whereas Common Hibiscus had the lowest diversity of pollinators. Although there may be other factors that can change the outcome of our study, e.g. variation in weather, time or season of data collection, as well as the location of the individual plant, the outcome was favorabale by the insect pollinators to the native plant than the non native species of the Mississippi Delta.

11:30 Business Meeting

12:00 General Session

Thursday, March 31, 2022

AFTERNOON

Poster Area-Hall C

DIVISIONAL POSTER SESSION

1:30-2:15

Posters will be judged in the division and will also be presented in the General Poster Session

Thursday, March 31, 2022

EVENING

3:30 Dodgen Lecture and Awards Ceremony (Ballroom)

General Poster Session

Immediately Following Dodgen Lecture

P4.01

COASTAL FOREST RESTORATION IMPACTS ON WATER QUALITY AND SOIL HEALTH IN MISSISSIPPI

Jaden Akers, Courtney Siegert, Will Kruckeberg, Ashlyn Naylor, Joshua Granger, and Krishna Poudel

Mississippi State University, Starkville, MS, USA

Forest thinning and restoration through mechanical or chemical methods to remove undesirable understory species aims to reduce competition, open growing space for remaining individuals, and improve overall tree health. Potential side effects of forest thinning could include increasing potential for colonization by invasive species and/or soil disturbance from heavy machinery leading to exposure of bare mineral soil and erosion. Prescribed

fire also can be used as a more natural method of forest thinning to simulate historical fire regimes that were common across the landscape of the southeastern US prior to widespread fire suppression. However, our knowledge of the impacts of these restoration tools on water and soil quality is limited. Wildfires have been shown to increase nitrate in surface and groundwater, while newly exposed soil results in increased surface erosion and subsequently increased sediment transport in stream channels. Excess nitrogen content in surface and groundwater can lead to eutrophication in affected streams and hypoxic zones in the Gulf of Mexico. During summer 2020, water and soil samples were collected and monitored at the Infinity Science Center in Pearlington, MS. Pre- and post-restoration samples were collected along transects that spanned upland and riparian corridors. Water samples were analyzed for nitrate, ammonium, and total nitrogen while soil samples were collected to measure total nitrogen and inorganic nitrogen transformation and availability. Along transects where mulching and thinning occurred, soil carbon decreased from 2.89% to 1.72% and nitrogen decreased from 0.12% to 0.08% over one year. In untreated stands soil carbon increased from 1.66% to 2.54% and soil nitrogen increased from 0.08% to 0.12%. Net losses in soil mineralization were observed across all transects with an average net loss of 0.23 µg NO_3^--N/g soil and 2.07 µg NH_4^+-N/g soil, but that soils within riparian areas experience the greatest net losses. Preliminary results suggest riparian areas were the most effective areas of inorganic nitrogen removal, so care should be taken to avoid disturbing these areas to minimize downstream water quality impacts.

P4.02

EVALUATING NON-INVASIVE ENVIRONMENTAL METHODS FOR DETECTING PANGOLINS IN CENTRAL AND WEST AFRICA TO INFORM CONSERVATION ACTIONS

Ichu Godwill Ichu Ichu[1], John Brooks[2], Stephen Spear[3], Dan Challender[4], Dana Morin[1]

[1]Mississippi State University, Starkville, MS, USA, 2USDA-ARS, Starkville, MSi, USA, [3]US Geological Survey, La Crosse, WI, USA, [4]University of Oxford, Oxford, Oxfordshire, UK

Pangolins in Central and West Africa, and their parts (mainly scales), are trafficked in high volumes, increasingly to Asia. There is an urgent conservation need to mitigate the threat of overexploitation by protecting pangolin habitats in the region. However, little is known about the local distribution of the three species—white-bellied pangolin (*Phataginus tricuspis*), black-bellied pangolin (*P. tetradactyla*), and giant pangolin (*Smutsia gigantea*)—which is needed to inform pangolin conservation actions. Confirming species presence throughout their suspected ranges using standard field sampling methods is challenging and will likely require specific methods and protocols for each species. Our main objective was to identify efficient, rapid assessment methods to document pangolin occurrence at potential habitats in Central and West Africa. We evaluated the effectiveness of two sampling methods: camera-traps and environmental DNA (from soil and water) which have demonstrated variable success in detecting the three tropical African pangolin species. General mammal camera traps have resulted in very few pangolin detections, while microsite camera traps have been used to improve detections. Researchers in Asia have used eDNA techniques to detect the Sunda pangolin (an Asian pangolin) in water associated with salt lakes. The Sunda pangolin is similar to the white-bellied pangolin in Central and West Africa. Based on this premise, we are testing eDNA obtained from water and soil. One pilot study was conducted at Campo Ma'an National Park in Cameroon from February to July 2021 to determine the accuracy and detection rates of the two sampling methods. Presently, we are attempting to identify an optimal standardized protocol for rapid assessment surveys for each species. Efforts pertaining to this protocol will be used to inform pangolin monitoring efforts throughout Central and West Africa to guide conservation actions to protect pangolin populations.

P4.03

A NOVEL METHOD TO DETECT CRYPTIC SHREWS WITH TARGETED ENVIRONMENTAL DNA SAMPLING

Daniela F. Adjaye, Stephen F. Spear[1], John P. Brooks[2], Eric T. Hileman, and Dana J. Morin

Mississippi State University, Starkville, MS, USA, [1]U.S. Geological Survey, La Crosse, WI, USA, [2]U.S.D.A. ARS Genetics and Sustainable Agriculture, Starkville, MS, USA

Shrews are known to occur across Mississippi, but their population status and trends are not well known. The available sampling methods for shrews (pitfall traps and Sherman traps) are logistically and financially expensive to implement across large spatial and temporal scales and have high capture mortality rates. Environmental DNA sampling provides an opportunity to collect DNA from environmental samples like soil and water that contain shed cells of target organisms without the isolation of the species. We created a favorable microhabitat to encourage the use of our sampling areas by placing wooden cover objects at three sites where shrew species are known to occur. We assessed the effectiveness of targeted mitochondrial DNA (mtDNA) primers to detect two of the three shrew genera in Mississippi from 245 soil eDNA samples collected from beneath 27 cover objects distributed across respective sites. We amplified *Sorex* spp. and *Blarina* spp. mtDNA using quantitative PCR (qPCR) and genus-specific mtDNA primers from collected soil samples and successfully detected a representative of at least one shrew genus in 74 out of 245 (30.2%) samples. Both genera were detected at all three sites. Both genera were detected in different subsamples at 12 cover objects; at least one genus was detected at ten cover objects, and mtDNA was amplified for both genera in five subsamples. Our results show that sparsely distributed small terrestrial mammals can be monitored using soil eDNA if appropriate microhabitats and attractants are used for targeted sampling.

P4.04

A PLANT ANATOMICAL INVESTIGATION OF *VIOLA SORONIA* WILLD.

YaeEun Yun, Nina Baghai-Riding, and William Katembe

Delta State University, Cleveland, MS, USA

Viola sororia Willd. (blue violet/common meadow violet), is native to eastern and central North America. This species thrives in the Mississippi Delta and blooms throughout the early spring. It occurs in woodlands, shady banks, sandy substrates, and forest edges. It grows 3-8" in height, has broad heart-shaped leaves with an acute apex, and has bilaterally symmetrical flowers that possess blue-violet petals with distinct purple veins and conspicuous white throats. In this study, anatomical features of roots, stems, leaves, and flowers were prepared using single-edged razor blades or hand hand-held microtomes. Samples were stained with methylene blue or neutral red dyes. Digital photographs were taken with an Olympus SC50 camera attached

to an Olympus BX43 microscope. A phase-contrast condenser was utilized when viewing transparent features such as guard cells on leaf epidermal peels. Interesting anatomical features observed include the presence of lateral roots protruding through the rhizome endodermis, leaf petioles possessing two lateral wings with each wing having its own vascular bundle, calcium-oxalate crystals occurring in the pith of rhizomes, and the center of the peduncle containing two crescent-shaped vascular bundles. The intense bright purple veins in flower petals and the syncolporate pollen grains did not require staining. The combination of plant anatomical characters are unlike other described species associated with this genus. Measurements of cell features were made using a micrometer. Thirty-five measurements were made on starch grains, parenchyma cells, collenchyma cells and vessel elements in rhizomes; collenchyma, parenchyma, and guard cells in petioles; and guard cells and regular epidermal cells in leaves. Significant range variation was noted for petiole stomata which ranged 10-50 μm (mean 24.5 μm) in length and 5-30 μm (mean 13.5 μm) in width and cortex rhizome parenchyma cells which ranged 10-60 μm (mean 31.1 μm) in length and 10-50 μm (mean 21.9 μm) in width. Range variation was less variable for other cell types. For example, leaf guard cells on the lower epidermis ranged from 10-30 μm (mean 22 μm) in length and 6.67-20 μm (mean 14.5) in width. Current research is being made on cell types in the interior of leaves and roots. Studies of these cell types require plant organs to be fixed in alcohol solutions and embedded in paraffin. Chromosome counts on root cells generated by the rhizome endodermis and by root apical meristems also are being investigated. The tentative chromosome number is six. Lateral roots produced by rhizomes, however, are thicker and easier to section compared to roots generated by the apical meristem.

P4.05

EFFECTS OF HISTORICAL HOST-PARASITE COEVOLUTION ON CONTEMPORARY PREDATOR-PREY INTERACTIONS

Parisa Mohaghegh and Peter C. Zee

University of Mississippi, Oxford, MS, USA

Ecological communities host a wide diversity of species interactions. As such, understanding how trait evolution is impacted by multiple simultaneous species interactions for a fuller picture of community ecological processes. In particular, we are interested in how the evolutionary outcomes of prior historical ecological interactions impact the outcomes of interactions in contemporary communities. To test the influence of prior coevolution between a host and natural enemy species, we use a laboratory experimental evolution approach. We use the bacterium *Pseudomonas fluorescens*-SBW25ϕ2 bacteria-phage host-parasite system as a model. We then test how the host interactions with the ciliate predator *Tetrahymena thermophila* are influenced by prior coevolution. Here, we present data from a laboratory coevolution experiment between *P. fluorescens* and its associated phage ϕ2. In our derived strains, we can determine the evolution of resistance and parasite infectivity. Further, we can determine how prior coevolution with one natural enemy (e.g., phage) impacts interactions with other species (e.g., predators) by performing predation assays with evolved lines and ciliate predator.

P4.06

ASSESSMENT OF EVIDENCE FOR ISOLATION-BY-DISTANCE IN THE SOUTHERN PINE BEETLE (*DENDROCTONUS FRONTALIS*), A NATIVE INVASIVE UNDERGOING RANGE EXPANSION, USING MITOCHONDRIAL DNA SEQUENCE DATA

Lora Holman , Isis Arantes, and Ryan Garrick

University of Mississippi, Oxford, MS, USA

The southern pine beetle (*Dendroctonus frontalis*) is expanding its range from the southeastern USA to the northeast, and potentially poses a threat to pine forest habitats that have little or no prior interactions with this irruptive pest. Molecular data are being used to understand dispersal and gene flow of the southern pine beetle, including the geographic mode of range expansion and mechanisms of long-distance movements. The present work involved an assessment of evidence for isolation-by-distance using mitochondrial DNA sequences (cytochrome oxidase 1 gene) from individuals sampled across 17 local populations, spanning the eastern USA from Louisiana to Massachusetts. Several alternative genetic distance metrics were used owing to their potentially difference sensitivities. In addition, data from males, females, and males plus females combined were reanalyzed separately given that sex-biased dispersal is common in many animal species. Overall, there was no compelling evidence for significant isolation-by-distance over the spatial scales under consideration, nor any sex-specific differences, suggesting that long-distance movement is indeed quite common, perhaps mediated by human activities (e.g., inadvertent movement of firewood or lumber). Interestingly, a direct comparison between two genetic distance metrics that are informative over contrasting timescales of population history (i.e., FST vs. ΦST) revealed that even though the population genetic sub-structure that does exist is weak, it nonetheless is of considerable antiquity, almost certainly pre-dating the onset of the current range expansion. This may imply that there is at least some long-standing gene flow limitation. Ultimately, this finding raises questions about what types of landscape features (or other environmental factors) might have served as recurrent barriers to free movement. Future work could explore this further using phylogeographic analytical approaches to reconstruct long-term demographic history.

P4.07

IS THERE A MITOCHONDRIAL DNA "BARCODING GAP" AMONG BURROWING CRAYFISH SPECIES IN THE GENUS *CREASERINUS* (SYNON. *FALLICAMBARUS*)?

Emily Pickich, Patrick Allison, and Ryan Garrick

University of Mississippi, Oxford, MS, USA

Rapid identification of animals (and other biota) down to species level, without relying on expert taxonomists to perform such laborious classifications, would enable large-scale biodiversity surveys to be routinely conducted. In turn, this information would be extremely valuable for detecting changes over time in species distributions and community composition, thereby facilitating conservation. Mitochondrial DNA barcoding has been proposed as a broadly useful approach for rapid species identification, but ultimately, its utility depends on the magnitude by which within-species sequence similarity exceeds between-species sequence similarity (i.e., whether or not there is a barcoding "gap"). The present work focused on burrowing crayfish in the genus *Creaserinus* and assessed the utility of DNA barcoding in this

taxon. All publicly available mitochondrial DNA cytochrome oxidase 1 gene sequences from *Creaserinus* (nine species) were downloaded, aligned and trimmed, and then pairwise intra- and interspecific sequence divergences were calculated and compared. There was a significant difference in mean intra- and interspecific sequence divergences (t-test, $P < 0.001$), with the latter being approximately three times larger than then former. The modal values also differed considerably (0.00-0.01 vs. 0.10-0.11 intra- vs. interspecific divergences, respectively). However, when the frequency distribution of these two sets of pairwise sequence divergences were plotted, there was considerable overlap between them, thereby revealing the absence of a mitochondrial DNA "barcoding gap". Accordingly, additional molecular markers and/or other types of data will be needed to rapidly and reliably distinguish among these currently recognized *Creaserinus* species.

P4.08

AN ANATOMICAL STUDY OF *TRIFOLIUM REPENS* L. (FABACEAE/FABOIDEA)

Hannah Pinter, George Baggett, Charles Darnall, and Nina Baghai-Riding

Delta State University, Cleveland, MS, USA

During the Spring 2021 semester, students enrolled in, BIO 410-Plant Anatomy at Delta State University elected to do semester group projects on various weeds that exist in the Mississippi Delta. Our group selected *Trifolium repens* L. (white clover), in the Fabaceae, subfamily Faboidea, a naturalized, perennial plant that was introduced in North America from Europe as a forage crop. This species occurs in all 50 states. In the southeastern United States, it occurs on rangelands, roadsides, lawns, pastures, and fields. *Trifolium repens* is recognized as increasing the calcium concentration of forage to livestock as well as supplying nitrogen to soil. Its recognizable morphological features include white flower heads consisting of 40-100 florets, that are borne on peduncles. Flower heads range from 1.5-2 cm in diameter. Other features include trifoliate leaves, in the shape of shamrocks, stolons that often form mats, and taproots. Few publications contain images or descriptions about the internal anatomical characteristics of *Trifolium repens*. Specimens of *Trifolium repens*, that grew by the south side of the Walter/Caylor Science building at Delta State University, were collected and studied throughout the semester. Transverse and longitudinal sections were made using single-edged razor blades and then stained with methylene blue and neutral red dyes. Digital photographs were taken using an Olympus Q-Color 3 camera attached to an Olympus BX43F light microscope. A phase contrast objective was used in photographing leaf epidermal peels. Of special interest are the presence of calcium oxalate crystals occurring in adaxial leaf epidermal cells and in xylem cells of flower petals, the abundance of starch grains in parenchyma cortex and pith cells, and helical and annular secondary wall thickening of xylem vessels in stems. Transverse sections of stems and roots portrayed a eustele and protostele arrangement of the vascular tissue, respectively. The abaxial surface of leaves possess anisocytic stomata complexes. Further research will incorporate measuring size of various cell features comparing the leaf petioles to flower peduncles and comparing node and internode regions of the stem.

P4.09

NATURAL DYES FROM PLANTS THAT GROW IN THE MISSISSIPPI DELTA

Hannah Pinter, Nina Baghai-Riding, Jonathan McClure, and Catherine Koehler

Delta State University, Cleveland, MS, USA

Dyeing with plants is an old process. For many centuries people depended on natural dyes to achieve desired colors. It was well known that specific plant organs (fruits, stems, leaves, roots, blossoms, bark) can yield dyes. Today, synthetic aniline dyes are readily available at any major retailer and have cast a shadow on the utility of natural dyes. In this study, natural dyes were made from plants that grow and are abundant in the Mississippi Delta during the fall season. The species and plant organs used are as follows: flowers of goldenrod (*Solidago*), foliage from blackberry (*Rubus fruticosus*), fruit from pokeberry (*Phytolacca americana*) and American holly (*Ilex opaca*), female cones and foliage of bald cypress (*Taxodium distichum*), roots from madder (*Rubia tinctorum*), leaves of *Sassafras albidum*, oak (*Quercus*) galls, foliage of pawpaw (*Asimina triloba*), and more. Glass containers were used for dye preparation; overnight soaking was required for oak galls and bald cypress cones. Three-inch squares from 100% cotton sheets were simmered on a stove with a borax solution for an hour the night before. Some cotton squares were soaked overnight with an alum mordant to brighten the color; Iron (II) Sulfate was added directly to the dye bath to dull the color. The time for a particular dye to bind to the fabric ranged from 30 minutes to several hours. Unsoaked flowers of goldenrod produced a bright yellow dye bath after 30 minutes of heating whereas it took hours for chopped leaves of blackberry to break down despite soaking them overnight. Tannins associated with bark and oak galls allowed the color to easily bind to the fabric and did not require mordants. Pokeberry fruit and American holly produced brightly colored dye bathes, but their color did not bind with the fabric even with the addition of an alum mordant. Madder roots produced a red dye bath that easily bound to the fabric; roots are rich in tannins, which could enhance the pigment of the dye. Future work will explore other dye colors generated by Mississippi plants as well as the chemical makeup of the dyes and pigments responsible for observable bright colors.

P4.10

AN ASSESSMENT OF MICROPLASTICS IN LOCAL WATERWAYS IN AND AROUND MISSISSIPPI DELTA

Hannah Pinter, Matthew Nichols, Zaida Laventure, Charles Smithhart, and AHM Ali Reza

Delta State University, Cleveland, MS, USA

Plastic is one of the most commonly used household materials in our daily life throughout the world. Often, plastic waste ends up in local waterways where it is left to breakdown, resulting in microplastics. Microplastics are plastic particles measuring 5mm or less. These particles are so small that they can infiltrate not just the ecosystem but also the organisms themselves including human body. Through the process of biomagnification, these harmful particles build up in organisms and move up the food chain resulting in disruptions in natural processes including reproduction and digestion. Freshwater environments make up only a small percentage of available water on earth surface. Therefore, protection of the waterways, the ecosystems and the organisms that live there should be of utmost importance. Over the course of this study, six local waterways in the Mississippi Delta with varying degrees of human contact were sampled (both

water and sediments) for microplastics. The Mississippi study sites included: Dahomey National Wildlife Refuge, Bear Pen Park (a city park in the west side of Cleveland city), Cleveland Country Club Golf Course (located at the city center), an agricultural area in the heart of Mississippi Delta, a private United States Department of Agriculture (USDA) catfish pound in Stoneville, and a heavily used access point of the Mississippi River (Terrene Landing and Port of Rosedale). We conducted the laboratory analysis following a protocol developed by NOAA Marine Debris Program in 2015. Based on our analysis, microplastics occurred in majority of samples with fibers being the most common, polyethylene plastics were also found. Microplastic concentrations were found to be highest in public areas within walking distance from the neighborhood. Our results revealed that Bear Pen Park had the highest concentration of microplastics (0.56%/ml) followed by the Cleveland Golf Course (0.42%/ml). However, microplastics were not present in samples from Dahomey NWR and the private USDA catfish pond in Stoneville, MS. In summary, our results show that levels of microplastics concentration in a particular area strongly correlate to the intensity of human interactions in it.

Friday, February 21, 2020

10:00-12:00 Field Trip to the Mississippi Aquarium

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Geology and Geography

Chair: Jonathan Leard

Mississippi Dept of Environmental Quality-Office of Geology

Vice-Chair: Claire Babineaux

Mississippi State University

Thursday, March 31, 2022

MORNING

Room D5

Paleontology and Archaeology

9:00 Welcome

O5.01

9:20 BIOSTRATIGRAPHIC COMPARISON AND ANALYSIS OF THE BLUFFTOWN FORMATION-CUSSETA SAND CONTACT AT HANNAHATCHEE CREEK, *GA*

Seth Fradella[1], *Alyson Brink*[1,2]

[1]*University of Southern Mississippi, Hattiesburg, MS, USA.* [2]*Sam Noble Museum, Department of Vertebrate Paleontology, University of Oklahoma, Norman, OK, USA*

This undergraduate research thesis is a biostratigraphic comparison and analysis of the fossil assemblage of either side of the Blufftown Formation-Cusseta Sand contact at Hannahatchee Creek, Georgia. The Late Cretaceous fossil taxa directly above this disconformity is a topic of interest, as previous studies propose that Blufftown-aged fossils have been reworked and deposited into the overlying Cusseta Sand. Fossil taxa from the upper Blufftown and basal Cusseta will be identified, and the ages of the taxa will be determined by referencing published literature. The purpose of this research is to determine whether the accepted ages of fossils in the base Cusseta are consistent with the accepted time of deposition of the stratum or if the ages conflict. Taxa identified thus far include reptilian bone fragments and crocodilian teeth, lepisosteid scales, *Enchodus sp.* tooth fragments, abundant chondrichthyan material such as *Scapanorynchus sp*. and *Squalicorax sp*. teeth as well as **Ischyrhiza mira** oral and rostral teeth, and mollusk shell material such as *Flemingostrea sp.* and various gastropods. Consistent with previous findings, our preliminary results show heavy fragmentation and abrasion of the fossil material from the base of the Cusseta Sand. Determining the age of these specimens is necessary to interpret whether the fossil material was reworked and deposited from a different stratigraphic unit.

O5.02

9:40 A* FOSSIL FAUNAL COMPOSITION OF THE LATE CRETACEOUS BLUE SPRINGS SITE IN NORTHEASTERN MISSISSIPPI AND COMPARISON WITH FAUNA FROM THE COON CREEK *TYPE LOCALITY IN SOUTHEASTERN TENNESSEE

Ginger Trochesset[1], *Alyson Brink*[1,2]

[1]*The University of Southern Mississippi, Hattiesburg, MS, USA.* [2]*Sam Noble Museum, Department of Vertebrate Paleontology, University of Oklahoma, Norman, OK, USA*

This undergraduate honors research project analyzes the fossil content of the early Maastrichtian Blue Springs site in northeastern Mississippi and compares it to the Coon Creek type

locality in southeastern Tennessee. The Blue Springs site is within the Coon Creek Member of the Ripley Formation and is located near Tupelo in Union County. Three fossiliferous beds from the Blue Springs site were bulk sampled, and specimens found thus far include bivalves (**Exogyra costata** and **Corbula sp.**), decapods (*Dakoticancer australis*), and gastropods (*Turritella sp.*). The fossils from the Blue Springs site will be compared to the fauna of the Coon Creek type locality to determine the paleoecology of the Ripley Formation during the Maastrichtian and the time-transgressive nature of the Coon Creek Member.

A fossil faunal composition list of all specimens from the Blue Springs site will be compiled using published literature and the bulk samples used in this analysis of the site. Additionally, specimens that were not obtained in the bulk samples but were collected from the same beds, including the "muffin crab" *Avitelmessus grapsoideus,* gastropod *Volutamorpha valida*, as well as bryozoans, nautiloids, and occasional shark teeth, will be included in the composition list. This list will serve as a reference for researchers interested in the Blue Springs site and the Coon Creek Member in general.

O5.03

10:00 BIODIVERSITY CHANGES IN BATOIDS FROM THE CRETACEOUS ONWARD IN THE MISSISSIPPI EMBAYMENT

Sydney Kennedy[1], *Alyson Brink*[1,2]

[1]*University of Southern Mississippi, Hattiesburg, MS, USA.* [2]*Sam Noble Museum, Department of Vertebrate Paleontology, University of Oklahoma, Norman, OK, USA*

The Cretaceous shallow sea of the Mississippi Embayment contained a diverse assemblage of thriving marine fauna which are now found in southeastern United States deposits. The Tombigbee Sand Member of the Eutaw Formation in northeastern Mississippi is Santonian to early Campanian in age. One of the most fossiliferous localities, Vinton Bluff, along the Tombigbee River in Clay County, Mississippi, was destroyed in the 1980s. The last bulk matrix from the site was sieved by the Mississippi Museum of Natural Science in 1982, and the remaining concentrate is being picked in the Brink lab at the University of Southern Mississippi. Thus far, the assemblage includes teeth, spines, denticles, and vertebrae of fish and sharks such as the Osteichthyes **Anomoeodus sp.** and *Hadrodus priscus*, several lamniformes (*Scapanorhynchus texanus***,** *Cretalamna appendiculata***,** *Cretoxyrhina sp***.,** and *Squalicorax sp***.**), and the orectolobiforme *Cantioscyllium grandis.* A rare *Cretoxyrhina sp. (C. mantelli)* tooth has been identified from the concentrate too. Few publications exist on data collected from the Vinton Bluff locality, and these fossils will shed light on the diversity of late Cretaceous marine fauna from southeast US.

A particular focus of this study is batoid diversity across the K-Pg extinction event at a variety of locations along the Mississippi Embayment. The batoid assemblage collected from the Vinton Bluff locality includes myliobatiformes (*Brachyrhizodus ellipsis***),** rajiformes (*Texatrygon benningensis* ***and*** *Ischyrhiza mira***),** and rhinopristiformes. Exploring the diversity of these batoids and the comparison with modern day populations will perhaps give insight into the impact of the K-Pg extinction event

O5.04

10:20 NEW SPECIES, GENERA AND SUBFAMILY OF MARINE OSTRACODS FROM THE LATE CRETACEOUS (LATE CAMPANIAN-MAASTRICHTIAN) OF THE EASTERN FLANK OF THE MISSISSIPPI EMBAYMENT

Mark Puckett

University of Southern Mississippi, Hattiesburg, MS, USA

This presentation focuses on new species, genera and a subfamily (Anticytherideinae) of ostracods from the Late Cretaceous (mid-late Campanian-Maastrichtian) marine deposits of the eastern flank of the Mississippi Embayment. The type species of the nominal genus, Anticythereis reticulata (Jennings), was described from the latest Campanian of New Jersey in 1936. New taxa assigned to the subfamily include Anticythereis dorsennus and A. slipperi; the new genus Asculdoracythereis, which includes the new species As. asculdora, As. invicta, and As. pseudoalabamensis; the new genus Frodocythereis, which includes the new species F. frodoi; the new genus Laevipellacythereis, which includes the new species L. colossus and L. laevipellis; and the new genus Tumulocythereis, which includes the new species T. incompta, T. tiberti, and T. tumulus. Previously described species assigned to the genus Anticythereis are re-evaluated, some of which are assigned to the new genera. Synapomorphic characters of the new subfamily include a combination of pronounced external post-ocular sulcus with corresponding pair of rimmed, internal inverted platforms and a distinctive "yin-yang" adductor muscle scar pattern.

The taxa display remarkably rapid evolution. The earliest species (Anticythereis sp. 1) occurs in the planktonic foraminiferal Radotruncana calcarata Taxon Range Zone of mid- to late Campanian and by the end of the Maastrichtian there were more than 20 species. Most species have very localized occurrences, including several that occur only at a single outcrop; several species were found at a single outcrop of the Providence Sand of eastern Alabama, whereas others occur only at the type locality of the Owl Creek Formation of northern Mississippi. Although species are found on the eastern flank of the Mississippi Embayment and the Atlantic Coastal Plain, none have been observed on the western flank of the Mississippi Embayment. The species that occur in the Atlantic Coastal Plain are endemic to their respective localities. Species have been assigned to the genus Anticythereis from other continents (South America, Europe, and Africa), but those taxa lack the distinctive features of the Anticytherideinae and should not be assigned to the genus. The group became extinct at the Cretaceous-Paleogene boundary.

O5.05

10:40 IGNEOUS ROCKS OF THE ST. FRANCOIS MOUNTAINS AND PRE-HISTORIC ARTIFACTS IN MISSISSIPPI

James Starnes

MDEQ, Mississippi Office of Geology, Jackson, MS, USA

The closest exposures of bedrock sources for igneous rocks from Mississippi is the ancient volcanic complex of the St. Francois Mountains in southeastern Missouri. During the episode of Kansan glaciation, deep back in the mid-Pleistocene, glaciers plowed through Missouri. Meltwaters and ice-dam breaks carried a flood of igneous rocks from the St. Francois region (along with chert gravel and a host of other materials from the mid-continent) down the ancestral Mississippi River. Subsequent glacial episodes caused the Mississippi River to cut a deeper valley,

abandoning remnants of the old ones courses perched high along the bluffs, leaving behind the Pre-loess Terrace gravels. St. Francois igneous rocks particularly common in the Pre-loess Terrace gravels are rhyolite, trachyte, welded tuff and significantly less common is diabase. Much later on, at the end of the last ice age, the ice sheets receded for the last time into the arctic and the Mississippi River filled its valley with sediment to where it is today. Igneous rocks (typically granite and basalt) were then added all the way from bedrock sources in Canada to the modern Mississippi River's alluvium. These Canadian igneous materials can be seen today along the Mississippi River gravel bars and in irrigation wells drilled into the alluvium, but are curiously absent from the older Pre-loess terrace gravels in the adjacent bluffs. Pre-historic cultures widely exploited the igneous materials from the bedrock of Missouri's St. Francois region far and widely traded throughout mid-continent and across the southeast. Much of the exotic igneous material from the St. Francois region that can be found as artifacts on pre-historic archaeological site here in Mississippi could very well have been trade from the original bedrock source. Though, studying the geologic record tells us that identical material is also available here in the Loess Bluff region and was undoubtedly also exploited. The availability of these resources complicates our understanding of trade in the archaeological record and undoubtedly causes a significant problem interpreting sites here in Mississippi with artifacts made from resources of St. Francois igneous materials.

O5.06

11:00 CANNEL COAL, GEOARCHEOLOGY, AND THE MISSISSIPPI RIVER ALLUVIUM IN THE YAZOO BASIN

James Starnes[1], *Nina Riding*[2], *Carol Hotton*[3,4], *Anna Reginelli*[5], *Jonathan Leard*[6]

[1]*MDEQ, Mississippi Office of Geology, Jackson, MS, USA.* [2]*Delta State University, Cleveland, MS, USA.* [3]*National Institute of Health, National Library of Medicine, National Center of Biotechnology Information, Bethesda, MD, USA.* [4]*National Museum of Natural History, Smithsonian Institution, Washington, DC, USA.* [5]*Independent Researcher, Shaw, MS, USA.* [6]*MDEQ, Mississippi Office of Geology, Jackson, MS, USA*

Cannel coal is a type of type of bituminous coal more accurately classified as a grade of carbonaceous shale. It has been exploited worldwide throughout antiquity for both its ease in carving and in maintaining a black, highly polished surface. In North America, cannel coal comes from Carboniferous age bedrock deposits dominated by the fossil plants Lepidodendron and Calamites. The Mississippi River and its northern tributaries drain this Paleozoic bedrock region; therefore, cannel coal can commonly be found as a resource amongst the Mississippi River gravels. Cannel coal's utilization by Native Americans cultures is evidenced by stunning artwork and some unusual utilitarian artifacts found here in the Mississippi Delta region. Sampling done this year by the MDEQ [CH1] Office of Geology's, geologic & geoarchaeological mapping in the northwest Delta for the USGS cooperative StateMap program has shown the influence of Mississippi River cannel coal to be important on a microscopic scale. Paleoindian and Early Archaic sites have been identified along parts of the ancient, abandoned Mississippi River system. We collected lignite samples below agricultural fields from nearby abandoned oxbow channels and backswamps to better understand the environment the first people to the Delta Region inhabited. Quaternary pollen of Amaranthu**s** ,*Quercus*, *Ulmus*, *Carya*, and Liquidambar, and spores of Osmunda, *Dipteridales*, and Lycopodiaceae have been identified from the cores. Pennsylvanian age reworked spores of Lepidodendron and other unidentified species, once preserved from cannel coal, were positively identified amongst more geologically contemporary plant microfossils in abandoned channels. These undoubtedly were once carried by seasonal river floodwaters into these oxbow lakes and became part of the ancient lake sediment. This is much in the way Paleozoic gravel fossils are washed along the river's gravel bars today. The presence of this more ancient plant microfossil assemblage can help us to understand the environmental influences on the lake sediments. The nearly contemporary pollen and spores found in the lake sediments elucidate the ecology around these ancient lakes when they existed.

O5.07

11:20 THE PALEOCENE-EOCENE BOUNDARY IN MISSISSIPPI

David T. Dockery III

MDEQ Office of Geology, Jackson, MS, USA

The Paleocene-Eocene boundary in Mississippi preserves important events with global occurrence. These events include the Paleocene-Eocene Thermal Maximum (PETM), a time when temperatures rose 5 to 8 degrees C due to a release of some 2000 gigatons of 13C-depleated carbon into the ocean-atmosphere system. This release created a large 3-5% negative carbon isotope excursion found in two test-hole cores in Lauderdale County, Mississippi, the Harrell core and the Walmart core. The PETM occurs in outcrop section at the Red Hot Truck Stop Fossil Locality in Meridian, where it contains the second oldest known fossil primate *Teilhardina magnoliana* as well as 32 other Wasatchian Stage mammal fossils within marine sediments containing the acme-zone of the Apectodinium dinoflagellate complex along with fish, shark, and ray teeth and snake vertebrae. The PETM in the Harrell core is 3.1 meters thick, occurring in glauconitic sand above a clay boundary. In the Walmart core, it is 9.5 meters thick with the initial negative carbon 13 excursion within a glauconitic bed and extending upward some 8 meters.

O5.08

11:40 GEOARCHEOLOGY AND KEOKUK GEODES OF THE WARSAW FORMATION FROM THE PRE-LOESS TERRACE GRAVELS OF MISSISSIPPI

James Starnes

MDEQ, Mississippi Office of Geology, Jackson, MS, USA

"It fits perfectly in my hand"…well, that actually works for Keokuk geode artifacts. These quartz geodes made their way here down the ancestral Mississippi River during mid-Pleistocene glaciation from the Warsaw and Ft. Payne Formations and were deposited along the Loess Bluff region from Memphis to Natchez in the Pre-loess Terrace gravels. Keokuk geodes formed from silica-replacement of anhydrite nodules in Mississippian age Paleozoic limestones. They are typically the shape and size of a baseball or softball (while some are more oval shaped) and have a distinctive brain-like cortex pattern of chalcedony making them an easily identifiable resource. Most of the ones durable enough to make it down this far completely intact are mostly-to almost completely grown solid with quartz and/or chalcedony on the inside and make excellent hammer-stone material. Chalcedony from the core of Keokuk geodes makes for exceptional knapping

material. Others that are not grown together have magical mineral surprises inside of stunning quartz crystals and/or botryoidal chalcedony. Undoubtedly they have been collected also for aesthetic value and have been identified on numerous sites as both utilitarian and curiosity. Identification of these materials on archaeological site outside the Loess Bluff region can clearly demonstrate trade/transport of lithic resources. Their bedrock outcrop region in the upper Mississippi River valley represents the largest concentration of sedimentary quartz geodes in the world and are heavily mined today and prized worldwide as mineral specimens.

12:00 - 1:30 GENERAL SESSIONS

Thursday March 31, 2022

AFTERNOON

ROOM D5

Geochemistry and Geophysics

O5.09

1:00- FLUID PATHWAYS IN MAGMATIC FLUID DOMINATED HYDROTHERMAL SYSTEM: RESURGENT CONE, BROTHERS VOLCANO, NEW ZEALAND.

Esther Goita, Jeremy Deans

University of Southern Mississippi, Hattiesburg, MS, USA

The Tonga-Kermadec Arc is an active volcanic arc located between New Zealand and Fiji. The arc expands over an approximate distance of 2530km. The Kermadec Arc is currently host to over 30 volcanoes, the majority of which are submarine. The magmatic activity along the arc is characterized by the convergence between the Pacific and Australian plates. Brothers volcano is the most active hydrothermal system along the Kermadec arc and hosts two distinct hydrothermal systems, one magmatic fluid dominated, and the other seawater dominated, making the site perfect for studying nascent volcanogenic massive sulfide formation and fluid pathways. The International Ocean Discovery Program (IODP) drilled 5 sites at Brothers volcano in order to understand the process of mineral deposit formation from hydrothermal activity and the relationship between discharge of magmatic fluids and the deep biosphere. This project focused on the data acquired from Site U1528, a resurgent cone hosting the magmatic fluid dominated hydrothermal system. Micro computed X-ray tomography (μCT) was used to determine the 3D pore and secondary mineral structure of seven mini cores from Hole U1528D with varying depth (66.42-297.95 mbsf) and lithology (dacite lapilli tuff to lava flows). The pore characteristics were consistent at this site irrespective of volcanic lithology and depth with the exception of sample 44Z. The total pore volume ranges between 10×micron^3 and 31×micron^3. The average pore volume is approximately 1× micron^3. The variances observed in sample 44Z may be explained by the presence of a vug along a vein in the sample. The data obtained for total number of pores, distribution and volume indicates all rock types in this system have similar characteristics, which may suggest similar eruptive styles and volatile abundance through time. Secondary mineral phase volume and number has a general increase with depth despite alternating alteration intensity and rock types with depth. A general increase in secondary mineral phases with depth is thought to correlate with increased proximity to the magmatic-derived fluid source and therefore solutes that precipitated out of the fluid. These results indicate the resurgent cone hosts a robust hydrothermal system capable of carrying and precipitating heavy metals.

O5.10

1:20- USING AN AUTONOMOUS SURFACE VESSEL TO DETERMINE ALGAE GROWTH CONDITIONS

Emma Tucker, Padmanava Dash

Mississippi State University, Starkville, MS, USA

Due to anthropogenic influence, there has been a significant increase in atmospheric carbon dioxide which is a known factor in climate change as well as causing degradation to water quality that can lead to harmful algal blooms. Recent research endeavors have been focused on better monitoring and prediction of these events. In this study, Seatrac, an autonomous surface vessel (ASV), was used at various fresh and marine water sites in Mississippi to gather water quality measurements. The ASV contains an array of sensors and probes that take continuous water measurements, while being operated; this study particularly focuses on salinity, temperature, pH, partial pressure of carbon dioxide, and dissolved oxygen. Additionally, FlowCam, an automated microscope that captures images on particles (including but limited to algae) within water samples, was used to determine the water quality where algal blooms are more likely to occur and the intensity at which they occur. Water samples were also collected and then processed in the lab to determine the accuracy of ASV probes and FlowCam. Preliminary data indicated that the ASV and lab processed water samples have a significantly strong relationship. Salinity, temperature, and pH had R-values of 0.999, 0.985, and 0.974, respectively. The range for partial pressure of CO_2 across the sites and dissolved oxygen had lower yet still significant R-values of 0.702 to 0.999 and 0.755, respectively. FlowCam data is currently being investigated along with collected water samples to determine the accuracy of ASV in evaluating algal species and their respective quantities. While many species are not harmful, those that are can be detrimental. Knowing the conditions and the types of algal species that are present in them can be useful when predicting harmful algal blooms in the future. Lab data for algal growth and strength is expected to produce similar outcomes when put under the same conditions as the ones observed by the ASV. The ASV has been successful in producing in-situ data that strongly matches with lab data. With more active monitoring of both the chemical parameters and algal content, our capacity to predict harmful algal blooms can be improved.

O5.11

1:40 ENHANCED AQUIFER RECHARGE OF GROUNDWATER-IRRIGATED AGROECOSYSTEMS: A SURVEY OF POTENTIAL TECHNIQUES IN THE MISSISSIPPI DELTA

Andrew M. O'Reilly[1], Daniel G. Wren[1], Kyungwon Kwak[2], Michael C. Gratzer[3], Gregg R. Davidson[4], Martin A. Locke[1], J.R. Rigby[3]

[1]*USDA Agricultural Research Service, Oxford, MS, USA.* [2]*Texas A & M University, College Station, TX, USA.* [3]*U.S. Geological Survey, Oxford, MS, USA.* [4]*University of Mississippi, Oxford, MS, USA*

The Delta region of Mississippi is an intensively cultivated groundwater-irrigated agroecosystem. The Mississippi River Valley Alluvial aquifer (MRVAA) is the dominant source of

irrigation water in the Delta, and long-term declines in groundwater levels over the past 40 years indicate groundwater-use practices are unsustainable. Methods for enhancing recharge to the MRVAA are needed that support irrigated agriculture as well as sustain natural ecosystems. Recharge to an aquifer can be enhanced using an array of techniques collectively called managed aquifer recharge (MAR). MAR systems can be generally classified into three types: surface infiltration, subsurface infiltration, and direct aquifer injection. Surface infiltration techniques include excavated basins or trenches, in-stream weirs, and surface flooding. Subsurface infiltration techniques include infiltration galleries and vadose-zone wells. Direct aquifer injection includes gravity-driven and pressurized wells. Potential sources of recharge water include harvested stormwater, surface water, reclaimed water, and transferred groundwater. Three types of MAR will be discussed to illustrate potential applications in the Delta: surface flooding, vadose-zone wells, and aquifer injection wells. A study completed by the University of Mississippi (UM) of the effects of natural surface flooding at Sky Lake near Belzoni, Mississippi, showed a rise of ~10 ft in MRVAA groundwater level in response to a ~14-ft rise in lake water level. Recharge is attributed to rising water levels caused by flooding in the Yazoo River spreading over relatively coarse-grained deposits and into surrounding forested wetlands where preferential flow pathways are likely to exist from buried and decaying tree remains. A study completed by the U.S. Department of Agriculture Agricultural Research Service (USDA-ARS) and UM demonstrated hydraulic operation of vadose-zone wells at a site near Ruleville, Mississippi. During a 50-hour test, water was pumped continuously into two vadose-zone wells at rates ranging from less than 10 to 30 gal/min. Resulting recharge to the MRVAA caused small water-table rises ranging from 1.6 in. at the nearest monitor well (20-ft distance) to 0.4 in. at the most distant well (115-ft distance). Small rises likely are due to one or more of the following factors: high hydraulic conductivity of the MRVAA, lithologic variations with depth, screen location of the monitor wells, or backpressure from air in the vadose zone being compressed as sediment saturation increases. The USDA-ARS is conducting a pilot project at Shellmound, Mississippi, in which groundwater filtered by passing through sands adjacent to the Tallahatchie River is extracted, transferred, and then injected into a depleted section the MRVAA via two wells. During an 89-day test, the injection rate averaged ~730 gal/min per well during the first 10 weeks, declining slowly to ~600 gal/min, for a total injected volume of ~550 acre-feet. Operation of the system caused an increase in groundwater level of ~6.7 ft at the injection site and a decrease of ~4.7 ft at the extraction site. Overall, results of these studies suggest that a multifaceted approach to enhancing recharge to the MRVAA in the Delta could be effective by employing MAR techniques that are appropriate for local agricultural and environmental conditions.

O5.12

2:00 LITHIUM AND BORON CONCENTRATION AND ISOTOPE SYSTEMATICS OF THE BROTHERS VOLCANO, KERMADEC ARC, IODP EXPEDITION 376: INSIGHT INTO FLUID MOVEMENT AND COMPOSITION

Jeremy Deans

University of Southern Mississippi, Hattiesburg, MS, USA

We investigated B and Li concentrations and isotopic ratios of fresh and altered dacitic lava flows recovered from Brothers volcano during IODP Expedition 376 in order to investigate fluid-rock interactions in an active hydrothermal system. Volcano-hosted hydrothermal thermal systems contain many of the world's Cu, Au, Ag, and Zn deposits, however our understanding of how these systems develop and evolve is limited. Expedition 376 drilled 5 sites at Brothers volcano, the most hydrothermally active system along the Kermadec arc, to test models of fluid and heavy metal movement and concentration. Brothers volcano hosts two distinct hydrothermal systems: one is magmatic-fluid dominated on a resurgent cone (Site U1528), the other is seawater dominated along the caldera wall (Site U1530). B and Li isotope systematics are useful in these systems since seawater has distinct B and Li isotopic ratios ($\delta^{11}B$ of ~40‰ and $\delta^{7}Li$ of ~31‰) compared to fresh dacite lava ($\delta^{11}B$ of ~5‰ and $\delta^{7}Li$ of ~3.5‰), allowing for the ingress and exchange of heated seawater (>150°C) to be identified. All altered rocks at both sites are depleted in B and Li concentrations compared to fresh dacite, indicating rocks at all depths drilled interacted with heated seawater and Li and B were preferentially leached out of the rocks. $\delta^{11}B$ and $\delta^{7}Li$ ratios at Site U1528 show increased $\delta^{11}B$ at shallower depths (<75 mbsf) and near fresh dacite values at all other depths, whereas $\delta^{7}Li$ is elevated at all depths with the highest values at the greatest depth (~330 mbsf). The opposite pattern is seen at Site U1530 with elevated values of $\delta^{11}B$ at all depths and near fresh dacite values of $\delta^{7}Li$ at all depths, except near ~240 mbsf. These patterns are seen irrespective of lithology and/or alteration type or intensity. One explanation could be the enrichment of Li and B due to a lower temperature (<150°C) alteration overprint, however very little enrichment in Li or B is seen at the corresponding depths of lower $\delta^{11}B$ and $\delta^{7}Li$ values. Modeling of B and $\delta^{11}B$ using distribution coefficients between rock and fluid can be used to see how temperature and water/rock ratio will change these values. In general, modelling at temperatures >150°C and water/rock ratios of 1-20 leads to a rapid decrease in B concentration at relatively constant $\delta^{11}B$ values until reaching a point where $\delta^{11}B$ values are rapidly increased at relatively constant B concentration. Variations in $\delta^{11}B$ at Site U1530, and by extension $\delta^{7}Li$ at Site U1528, may be explained by different records of water/rock ratios with higher water/rock ratios leading to greater $\delta^{11}B$ and $\delta^{7}Li$ values. This suggests that different intervals had different volumes and/or rates of fluids moving through the system. Intervals of distinct fluid flow may have been distinguished by secondary porosity like fractures and veins forming the main fluid conduits and not primary porosity (i.e., lithology). This also suggests that the different fluid compositions between sites lead to distinct $\delta^{11}B$ and $\delta^{7}Li$ systematics.

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P5.01

PUBLICATION OF-323 GEOLOGIC MAP OF THE 1:100,000 GREENWOOD QUADRANGLE BOLIVAR, SUNFLOWER, TALLAHATCHIE, LEFLORE, CARROLL, GRENADA, WASHINGTON, AND COAHOMA COUNTIES, MISSISSIPPI BY MDEQ, MISSISSIPPI OFFICE OF GEOLOGY

James Starnes[1], *Jonathan Leard*[1], *Anna Reginelli*[2]

[1]*MDEQ, Mississippi Office of Geology, Jackson, MS, USA.* [2]*Independent Researcher, Shaw, MS, USA*

This project was preceded by a geoarcheology study by the authors on the classification and age of landforms as it relates to Paleoindian and Early Archaic archaeological in the northwest Yazoo Basin region of the Mississippi River Alluvial Plain. Great difficulty was encountered reconciling field observations as interpreted with new bare-earth LIDAR imagery with previous mapping literature interpreted through topographic maps. The findings demonstrating a clear need for updated mapping and reinterpretation of the region were given in 2019 to the Southeastern Archaeological Conference. The authors' previous research also involved conducting mapping along the eastern valley wall and adjacent loess bluffs. This work revealed previously undocumented details of the evolution of the ancestral Mississippi River during episodic glaciation as it cut down to its current entrenchment. Combining these studies under a cooperative grant funded by USGS's StateMap program, the authors' mapped a 1:100,000 scale area which includes 32-individual 7.5 min. quadrangle maps, interpretive photo and figures, geological narrative, and 5 structural cross-sections demonstrating the character and stratigraphic relationships of the Middle to Late Eocene Tertiary subcrop units and Pleistocene to recent sediments. Units mapped at the surface in ascending stratigraphic order include Middle Eocene (Claiborne) Kosciusko Formation, mid-Pleistocene Pre-loess Terrace Deposits, Late Pleistocene (Preorian) Loess, late Pleistocene stream terraces, Pleistocene to Holocene stream alluvium and alluvial fans, and delineated geomorphological features Pleistocene to Holocene Mississippi River Alluvial Plain.

P5.02

EFFECTS OF SOIL TYPE ON BIOCHAR AS A NUTRIENT SOIL AMENDMENT

Benjamin Taylor

Mississippi State University, Starkville, MS, USA

Nutrient loss has been a problem with in the agricultural field for as long as fertilizers have been used. Not only is it cost inefficient, it can be an environmental hazard when these nutrients enter the watershed. Many tactics have been employed to reduce this nutrient loss and runoff, but non-point source pollution has proven difficult to isolate and stop. One of the newest amendment techniques that is being tested is the use of biochar to improve a soils ability to retain nutrients and increase residency time. This biochar can be treated further chemically to enhance its nutrient affecting properties. I used batch reactor and sediment column studies to determine if soil type has any effect on magnesium oxide treated biochar's potency to retain nitrates and phosphates. Each soil type was analyzed using XRD analysis to quantify differences in soil type. Preliminary findings have indicated that the biochar may be much more effective on phosphates than nitrates and that the biochar may increase clayey soils already above average residency time for nutrients.

P5.03

USING STORY MAPS TO SHARE SCIENTIFIC FINDINGS WITH A BROAD AUDIENCE

Claire Babineaux[1] and John Cartwright[2]

[1]Northern Gulf Institute - Mississippi State University, Mississippi State, MS, USA. [2]GRI - Mississippi State University, Mississippi State, MS, USA

Through the NOAA Regional Geospatial Modeling Grant, the Geospatial Education and Outreach (GEO) Project is a collaborative effort between the Northern Gulf Institute and the Mississippi State Extension Service. The GEO Project offers geospatial training opportunities and supports Mississippi agencies in the use and application of geospatial technologies.

The tools available in geographic information systems (GIS) can be used to present results of spatial analyses by telling the story of a place, event, or pattern in both a geographic and geospatial context. Using maps and data in conjunction with interactive tools with the intent to educate, entertain, and involve broad audiences can be used to help non-technical audiences understand complex scientific findings. Originally presented as a means of enhancing reader comprehension, story maps are intended to exist as a companion to written text by adding interactivity, accessibility, and mobility.

The goal of this project is to showcase the benefits and present real-life examples of using story maps when disseminating scientific findings to a non-technical audience.

P5.04

EVIDENCE OF DETERMINISTIC COMMUNITY ASSEMBLY FROM FOSSIL DIATOMS IN ANCIENT LAKE TOWUTI, INDONESIA

Mariam K. Ageli[1]; Paul B. Hamilton[2]; Andrew J. Bramburger[3]; R. Paul Weidman[1]; Zhuoyan Song[1]; James Russell[4]; Hendrik Vogel[5]; G. Doug Haffner[1]

[1]Great Lakes Institute for Environmental Research, University of Windsor, [2]Research Division, Canadian Museum of Nature, [3]Watershed Hydrology and Ecology Research Division, Environment and Climate Change Canada, [4]Department of Earth, Environmental, and Planetary Sciences, Brown University, [5]Institute of Geological Science & Oeschger Center for Climate Change Research, University of Bern

Since Darwin's Origin of Species, we have strived to establish the rules of assembly which determine changes in community composition over multiple generations. Many classical studies viewed diatoms, a group of microscopic algae, as opportunistic and stochastically-distributed species. However, since then, many have demonstrated that diatoms are not randomly distributed, but are in fact tracking changes in their environment, following a deterministic pattern in their community composition. We can track changes in diatom community composition over hundreds of millennia by analyzing the diatom fossil records taken from sediment cores in ancient lakes. One of the most unique and endemic diatom communities to date is located in ancient Lake Towuti, Sulawesi Island, Indonesia (>1 My). Recent studies from this lake uncovered the re-occurrence of a planktonic diatom community which persisted for ~50kyr each. These two growths, known as planktonic maxima, were dominated by taxa of

Aulacoseira. The establishment and re-establishment of a long-term planktonic community after ~100 kyr of absence provides us the opportunity to investigate whether rules of community assembly do exist in diatom communities. In this study, we examine whether *Aulacoseira* taxa were deterministically or stochastically distributed within the planktonic maxima.

We have studied the fossil records of two deep sediment cores from Lake Towuti, (~135 m sediment depth each), and retrieved sediment samples (1-cm thick) from both planktonic maxima in both cores for processing. For our preliminary data set, we processed 43 sediment samples and counted ~5,700 valves of diatoms through light microscopy to calculate relative abundances of the different *Aulacoseira* taxa. We used stratigraphically constrained hierarchal clustering analysis (CONISS) to identify stratigraphic zones with similar diatom assemblages, and nonmetric multidimensional scaling (NMDS) to determine changes in *Aulacoseira* species composition through time. Preliminary results show that the upper layers of each planktonic maxima were dominated by *A. towutiensis* (provisional name) (67.9%±16.9), while lower layers were dominated by *A. pseudomuzzanensis* in the upper planktonic maxima (64.5%±26.7%), and *A. granulata sensu lato* in the lower planktonic maxima (56.0%±14.7). This was confirmed by CONISS and NMDS which showed similar temporal patterns in species composition. This repeated pattern in diatom composition, separated by ~100ky of absence, provides evidence that diatom communities follow deterministic patterns of assemblage. The patterns found in the fossil records of Lake Towuti were established naturally, existing far before the establishment of modern-day humans on the island, further highlighting the potential of diatoms to respond to their environment and be guided by deterministic processes.

Friday, April 1, 2022

MORNING

10:00 Welcome

MAPPING AND GIS

O5.13

10:20 PATTERNS AND PROCESSES OF SANDBAR REVEGETATION ON THE MISSOURI NATIONAL RECREATIONAL RIVER

Amena Begum Ruma[1], *Mark Dixon*[1], *Mark Sweeney*[1], *S M Asger Ali*[2]

[1]*University of South Dakota, Vermillion, SD, USA.* [2]*Mississippi State University, Starkville, MS, USA*

Decades of flow regulation by dams have reduced sandbar area and recruitment of cottonwood and willow along the Missouri River. Conflicts exist between managing sandbars for habitat (removing vegetation) for threatened sandbar-nesting birds (i.e., Piping Plover) and allowing natural recruitment of early successional riparian woodland (set-aside bars) that may support other species and ecological values. Recent changes in topography, geomorphology, and vegetation were examined on sandbars that have been "set aside" from management within seven reaches of the Missouri National Recreational River (MNRR) in southeastern South Dakota, USA. An existing time series of maps of sandbar landcover, derived from satellite imagery, was analyzed using ArcGIS to track vegetation and geomorphic changes from 2008-2016. Digital Elevation Models (DEMs) were used to detect elevational changes from 2012-2014/2016, the years following the 2011 flood. Sandbar area was highest on most reaches in 2012 and declined thereafter, and most areas did not show significant elevation changes from 2012-2014/2016. Cottonwood was the most frequent tree species, followed by Russian olive, while sandbar willow was the most abundant shrub species. Red cedar and sweet clover, were the most frequent woody and herbaceous invasive plant species, respectively. My findings will inform managers from the National Park Service and the US Army Corps of Engineers about how the sandbars have evolved since the 2011 flood. This information is critical for managing the bars in a way that will balance the needs of sandbar-nesting birds and the multiple species of birds and other wildlife that use early successional riparian vegetation.

O5.14

10:40 SPATIAL EXPLORATION OF SOCIAL VULNERABILITY AND COVID-19 RELATED HEALTH OUTCOMES IN MISSISSIPPI

S M Asger Ali, Kathy Sherman-Morris, Shrinidhi Ambinakudige

Mississippi State University, Starkville, MS, USA

SARS-CoV-2, a new SARS virus responsible for the COVID-19 pandemic, has spread to more than 192 countries, with a continuous death toll of more than 5 million (as of December 2, 2021). COVID-19 has caused a massive outbreak in the United States, with more than 48 million cases and 800K deaths. Mississippi (MS) is one of the hardest-hit states with a high incidence and mortality compared to the U.S. national average. This paper explores the relationship of MS county-level COVID-19 related incidence and mortality (through December 2, 2021) with the Center for Disease Control's Social Vulnerability Index (CDC SVI). The CDC SVI index consists of four major subthemes: [1] socio-economic status, [2] household composition and disability, [3] minority status and language, and finally, [4] housing type and transportation. Results of bivariate local Moran's I analysis of COVID-19 related mortality and overall and separate SVI subthemes exhibited clustering of similar values ($I = 0.18$, $p < .01$), meaning areas with high mortality tended to have high CDC SVI percentile ranks. Among the SVI subthemes, subtheme 1 (socio-economic status) and subtheme 2 (household composition and disability) showed a significant relationship with incidence and mortality ($p < .05$). The bivariate regression model results showed that CDC SVI values are spatially linked and statistically significant with MS's cumulative COVID-19 incidence and mortality.

O5.15

11:00 GEOLOGIC MAPPING ALONG THE NATCHEZ TRACE PARKWAY NEAR JACKSON, MISSISSIPPI

Jonathan Leard, James Starnes

Mississippi Office of Geology, Jackson, MS, USA

The Mississippi Office of Geology, with a grant from the National Park Service, undertook mapping of five 7.5-minute quadrangles in Mississippi. Four of these, the Ridgeland, Pocahontas, Clinton, and Raymond quadrangles, are in the Jackson Metro area. These maps were published December of 2021. They illustrate how geology has shaped the history of Mississippi. Pocahontas Mound sits between the north and southbound lanes of Highway 49 on a low terrace. The now Old Capitol of Mississippi was at the heart of a stonemason scandal involving a quarry of Catahoula Sandstone. The alluvium and adjacent uplands of Bakers Creek were the setting for gruesome battles of the Siege of Vicksburg

during the Civil War. At the surface, exposures of Eocene to Oligocene sands, silts, clays, and limestones, capped by Plio-Pleistocene fluvial deposits are mapped. The Eocene unit mapped is the Yazoo Formation. Oligocene units mapped include the Forest Hill Formation, the Vicksburg Group, and the Catahoula Formation. The Pliocene unit mapped is the Brookhaven Terrace Deposit. Pleistocene units mapped include high terraces, low terraces, and Pre-Loess Terrace Deposits. Holocene to Pleistocene stream alluvium is also mapped. Cross Sections were designed for water resources and illustrate significantly deeper units than those mapped at the surface. The structural influences of the Jackson Dome and the Madison-Flora Syncline interrupt the southwesterly dipping monocline. The primary geologic problem answered by these maps is the "unusual sand bodies" identified in Bill Moore's Hinds County Bulletin. On these maps, these unusual sand bodies have been interpreted as Catahoula Channel Sands. In areas where these channel sands occur, they occupy the stratigraphic position of the Vicksburg Group. The Forest Hill Formation also channelized into the underlying clays of the Yazoo Formation. Pre-Loess Terrace deposits mapped in the Hinds County Bulletin are defined as any terrace deposits under the loess not at the level of the incorrectly attributed Citronelle Fm. These have been redefined in this mapping as Pleistocene terrace deposits deposited prior to loessification by the ancestral Mississippi River. Gravels of these terrace deposits are much larger clast size than those of the Brookhaven Terrace or the quartz gravels found in stream alluvium and terraces. Pre-Loess Terrace Deposits contain a suite of gravels not available to the Mississippi River Valley until Quaternary glaciation.

O5.16

11:20 IDENTIFICATION OF STREAM TERRACE DEPOSITS FROM GEOLOGIC MAPPING ALONG THE CRETACEOUS OUTCROP BELT IN NORTHEAST MISSISSIPPI

Darrel Schmitz[1], *Jonathan Leard*[2]

[1]*Mississippi State University, Mississippi State, MS, USA.* [2]*Mississippi Office of Geology, Jackson, MS, USA*

Recent geologic surface mapping at the 1:24000 scale in the Cretaceous outcrop area of northeast Mississippi for the National Park Service resulted in the identification of previously unmapped stream terrace deposits. Some of those terraces show stream piracy, as well as some associated with different streams, were at differing elevations. That results in the same terrace level being separated by a contact line. Up to five successive stream terrace deposits were identified in several areas along and adjacent to the Natchez Trace. The higher and older terrace deposits were more recognizable on the Demopolis and Prairie Bluff Formations but were occasionally recognized on other Cretaceous units as well.

Several of the terraces that were mapped also demonstrated stream piracy. Those with obvious piracy were most recognizable in the lower couple of terraces. Prior surface geological mapping was at a smaller scale and did not have LiDAR as a resource. The higher terrace deposits are thin and eroded often resulting in underlying geologic units being exposed at the base of the terraces. Such exposures and the gently rolling terrain of the eroded terraces led to those areas originally being mapped as a geologic unit, not as a terrace deposit.

Use of geologic material exposed or brought to the surface from several sources was beneficial in identifying the terrace deposits. Occasional excavations exposed the contact between the underlying geologic unit and the terrace material. Also, recent fence post and utility pole installations would bring shallow geologic material to the surface. Of particular use were fire ant mounds and occasional armadillo burrows which also brought shallow geologic material to the surface. Testing of this geologic material brought to the surface with acid and identification of the texture of the material resulted in identification of the terrace alluvial deposits compared to the calcareous deposits of the chalk units. Texture and weathering characteristics could differentiate the alluvial deposits from the sandier geologic units, but not as readily as that of the chalk units. Use of the fire ant mounds and armadillo burrows were not available to the earlier mappers as the ants and armadillos had not yet arrived in northeast Mississippi when those maps were made.

Thus, the use of more detailed topographic base maps, availability of LiDAR, and identification of shallow geologic material, resulted in identification of previously unmapped terraces. Subsequently, the mapping of those terraces led to identification of stream piracy and same level terraces belonging to different streams.

O5.17

11:40 PUBLICATION OF OPEN FILE REPORTS 320, 321, & 322 GEOLOGIC MAPS OF THE YAZOO CITY, SATARTIA, AND TINSLEY 7.5MIN. QUADRANGLE YAZOO COUNTY, MISSISSIPPI BY MDEQ, MISSISSIPPI OFFICE OF GEOLOGY UNDER THE USGS STATEMAP COOPERATIVE GRANT PROGRAM

James Starnes, Jonathan Leard

MDEQ, Mississippi Office of Geology, Jackson, MS, USA

Mississippi's oil boom began in the Tinsley area after one of our own survey geologist, Fredric F. Mellen observed a late Eocene Moody's Branch Fm. outcrop structurally too high while mapping the area in 1938. A bulletin Yazoo County geology was produced from his broader work but lacked a detailed surface geologic map, because of the difficulties produced by the thick loess cover of the area. The Tinsley megafield is a state landmark as it was instrumental in seeing the United States through World War II along with billions in state revenue through the development of this oilfield. These current projects are for a composite county geologic map and include study of the gravel resources and map the extent of this important economic resource buried beneath a thick loess mantle. This detailed gravels study led to a deeper understanding of their geologic significance and has unlocked the glacial history of these Pre-loess Terrace gravels and their placement during the evolution of the lower Mississippi River valley in the mid-Pleistocene. The State Fossil, Zygorhiza kochii was excavated from the Tinsley area by the Mississippi Gem and Mineral Society and reconstructed at the Mississippi Museum of Natural Science. MDEQ's Office of Geology staff has excavated other specimens from the Tinsley area since then, including an excavation by the authors preceding this mapping project. Research conducted on habits in the mapping area in conjunction with the Mississippi Museum of Natural Science includes sampling two separate races of long-ear sunfish (Lepomis megalotis) from distinct stream environments in the Tinsley area. A host of important Pleistocene megafauna fossils have also come to our attention from local residents of the area from such as Duward Pettis, who contributed greatly to the paleontology of this project and collections donated to the Mississippi Museum of Natural Science. Geoarchaeology aspects of this study have shed light on lithic procurement, variety, and availability of the natural materials for prehistoric lithic tool production, and Native American trade going back to

the Paleoindian cultural period at the end of the last ice age.

12:00 - 1:00 GENERAL SESSIONS

Friday, April 1, 2022

AFTERNOON

Room D5

1:00-2:00

Keynote: Dr. Ezat Heydari- Jackson State University

2:00-2:30 Student Awards and Business Meeting

Friday, April 1, 2022

AFTERNOON

Room D5

1:00-2:00

Outreach

O5.18

2:30 USING STORY MAPS TO SHARE SCIENTIFIC FINDINGS WITH A BROAD AUDIENCE

Claire Babineaux[1] and John Cartwright[2]

[1]Northern Gulf Institute - Mississippi State University, Mississippi State, MS, USA. [2]GRI - Mississippi State University, Mississippi State, MS, USA

Through the NOAA Regional Geospatial Modeling Grant, the Geospatial Education and Outreach (GEO) Project is a collaborative effort between the Northern Gulf Institute and the Mississippi State Extension Service. The GEO Project offers geospatial training opportunities and supports Mississippi agencies in the use and application of geospatial technologies.

The tools available in geographic information systems (GIS) can be used to present results of spatial analyses by telling the story of a place, event, or pattern in both a geographic and geospatial context. Using maps and data in conjunction with interactive tools with the intent to educate, entertain, and involve broad audiences can be used to help non-technical audiences understand complex scientific findings. Originally presented as a means of enhancing reader comprehension, story maps are intended to exist as a companion to written text by adding interactivity, accessibility, and mobility.

The goal of this project is to showcase the benefits and present real-life examples of using story maps when disseminating scientific findings to a non-technical audience.

O5.19

2:50 MISSISSIPPI OFFICE OF GEOLOGY: THE CORE LIBRARY

Paul Parrish

Mississippi Office of Geology, Jackson, MS, USA

The Mississippi Core Library is housed by the Mississippi Office of Geology at the North West Street Facility in Jackson, MS. Since 1960 cores and samples have been stored at this facility as it has grown from 5,000 square feet of storage to 20,000 square feet of storage. More physical storage is not the most pressing need at this time. The greatest need is cataloguing new and existing samples in a lasting digital format. Recent endeavors are setting the facility on the right track to meet the needs of the twenty-first century. Three dimensional mapping of the facility, digital scanning and photography techniques, and real time database updates of collection transactions are intended to make future use of the facility easier for industry, academia, and the general public.

O5.20

3:10 MISSISSIPPI MUSEUM OF NATURAL SCIENCE'S HIGH SCHOOL FIELD CAMP'S FIRST ARCHAEOLOGICAL FIELD SCHOOL AT LEFLEUR'S BLUFF STATE PARK IN JACKSON, MISSISSIPPI

James Starnes[1], Sabrina Cummings[2], Jackie Kerr[2], Andrea Falcetto[2]

[1]*MDEQ, Mississippi Office of Geology, Jackson, Mississippi, USA.* [2]*MDWFP, Mississippi Museum of Natural Science, Jackson, Mississippi, USA*

This is the first archaeological field school taught for the Mississippi Museum of Natural Science's (MMNS) high school Field Camp in July of 2021. The MMNS Field camp is a weeklong camp designed to give campers, grades 9-12, "real world" hands-on experiences of occupations in science. This class was designed for the students conducted a 1x1 meter controlled test excavation to depth of 5cm at the primitive camping area in LeFleur's Bluff State Park. The excavation at a modern campsite was to simulate how archaeological excavations are conducted in a professional scientific manner. Proper tools and techniques were used to discover the types of materials, which would typically be encountered in professional investigation and field setting. The following are things The students learned how to do properly, a surface collection, excavate a test unit (including identifying and pedestaling of features), map features and locations of artifacts and soil profiles both on graph paper and digitally with LIDAR, clean and organized artifacts. The student campers were able to ask and answer questions based on the materials encountered and their spatial relationships. They also were instructed how to properly abandon and backfill a test unit for future study. The students were engaged, excited and interested in the experience. Each on expressed their desire to learn more from future events such as this. They also understood and were thrilled to learn this was an experience not typically offered until the latter years of an undergraduate or graduate degree in anthropology, archaeology, paleontology, geology, or forensics.

Health Sciences

Co-Chair: Candance M. Howard
University of Mississippi Medical Center
Co-Chair: Edward Florez
University of Mississippi Medical Center
Co-Vice-Chair: Frank Spradley
University of Mississippi Medical Center
Co-Vice-Chair: David Gordy
University of Mississippi Medical Center
Program Coordinator: Olga McDaniel
University of Mississippi Medical Center

Thursday, March 31, 2022
MORNING 8:20 AM-12:00 Noon
Room: D2
8:20 Welcome

Oral Presentation session A
Moderators: Drs. Candace M. Howard-Claudio, Edward Florez and Amal Mitra
University of Mississippi Medical Center and Jackson State University

Topics:
Population Health/Disease/Social Sciences/Policy

8:30 Welcome
O6.01

8:35 MULTI-INSTITUTIONAL RANDOMIZED PHASE-3 TRIAL COMPARING CANCER STEM CELL-TARGETED VS PHYSICIAN-CHOICE TREATMENTS IN PATIENTS WITH RECURRENT HIGH-GRADE GLIOMAS (NCT03632135) (

Elliot Varney[1] (Presenting), Candace Howard[1], Seth Lirette [1], Jagan Valluri[2], Pier Paolo Claudio[1]

[1]UMMC, Jackson, MS, USA, [2]Marshall University, Huntington, WV, USA

BACKGROUND. Clinical outcomes in patients with recurrent high-grade glioma (HGG) remain poor. Cancer stem cells (CSCs) have been implicated in metastasis, treatment resistance and recurrence of HHGs. We have shown in several clinical studies that anti-CSC-directed therapy provides benefits in many cancer types; however, this is the first report of a randomized clinical trial evaluating it for recurrent HGGs.

OBJECTIVE. Determine whether CSC-targeted cytotoxic agents selected by ChemoID assay-guided therapy improves survival in patients with recurrent HGG.

DESIGN, SETTING, AND PARTICIPANTS. In this parallel-group, randomized, phase-3 clinical trial, patients at 13 clinical sites in the USA with grade-III/IV recurrent glioma (2016 WHO guidelines) were randomized 1:1 to either ChemoID assay-guided therapy or physician-choice therapy, and then treated and followed until unacceptable toxic effects, hospice, or death.

MAIN OUTCOMES AND MEASURES. The primary endpoint was overall survival (OS).

RESULTS. Combined median follow-up was 9 months. Median OS (mOS) was 12.5 months (95% CI, 10.2-14.7) in the ChemoID assay-guided group vs 9 months (95% CI, 4.2-13.8) in the physician-choice group (log-rank P = .010). Risk of death was significantly lower in the ChemoID assay group (HR = 0.44; 95% CI, 0.24-0.81; P = .008). Median progression free survival (PFS) was 10.1 vs 3.5 months (95% CI, 4.8-15.4 vs 1.9-5.1) (HR, 0.25; 95% CI, 0.14-0.44; P < .001).

CONCLUSIONS AND RELEVANCE. Primary endpoint was met in this randomized clinical trial. The mOS was 3.5 months longer in the ChemoID assay-guided group vs the physician-choice.

O6.02

8:45 THE INFLUENCE OF AGE, GENDER, AND RACE ON PEDIATRIC UPPER RESPIRATORY INFECTIONS OF COVID-19 AND RSV IN MISSISSIPPI (graduate oral)

Neha Dhaliwal (Presenting, Hannah Laird Haley Williams Thomas Wichman, Dr. Justin Davis, Dr. Michael Nowicki, Dr. Laura Wright-Sexton, Dr. Natalie Bhesania, Dr. Phyllis Bishop, Dr. Anna Owings, Dr. Tanya Robinson, Yilianys Pride, Dr. Sarah Glover

University of Mississippi Medical Center, Jackson, MS, USA

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) and Respiratory Syncytial Virus (RSV) are significant respiratory viruses that adversely affect pediatric patients in Mississippi. SARS-CoV-2, a positive stranded RNA virus, causes COVID-19, a contagious respiratory disease that carries profound morbidity and mortality. Infection with RSV, a negative stranded RNA virus, has recently experienced increased inter-seasonal activity in the US South, particularly in Mississippi. Symptoms of both COVID-19 and RSV often overlap within pediatric patients and include clinical manifestations of fever, cough, sore throat, and shortness of breath. Both viruses are spread person-to-person via aerosol penetration into the upper respiratory tract and lungs via inhalation. Of the two viruses, RSV has previously been a more common virus that impacts children. However, the emergence of SARS-CoV-2 has led to a resurgence of interest in upper respiratory viruses within pediatric patients. Nasopharyngeal and buccal samples were collected from pediatric patients at the University of Mississippi Medical Center, a large tertiary referral hospital, from May 2021 to November 2021. The cohort was prospectively enrolled and consisted of 84 patients who reported upper respiratory symptoms such as cough, fever, wheezing, dyspnea, and nasal congestion. Ultimately, 52% of these symptomatic patients tested positive for a viral respiratory infection. The data showed three specific trends in: age, gender, and race. First, a higher prevalence of certain respiratory viruses was demonstrated amongst specific age groups. In the age cohort of 0-2 years old, there were a decreased number of cases of SARS-CoV-2 and an increased number of cases of RSV. In the age cohort of 7-12 years old, there were an increased number of cases of both SARS-CoV-2 and RSV. Furthermore, the age cohort of 13-17 years old demonstrated an increased number of cases of SARS-CoV-2 and a reduced number of cases of RSV. A two-tailed t-test indicated a significant difference between the mean age of patients infected with RSV verses SARS-CoV-2 (t=2.05, p=.04). Secondly, while analyzing gender and race, black males were disproportionately represented by increased positive viral results, comprising 36% of the positive viral detection results, while only making up 29%

of the total patient cohort. Conversely, white females comprised 29% of the total patient cohort, but only 14% of the positive viral testing results. This data potentially points to differences in immunologic makeup of different groups within the pediatric population that would protect one age group or racial group from a certain respiratory illness but make them more susceptible to another. Additionally, the collected nasopharyngeal and buccal samples are being further characterized using single cell RNA sequencing. While many efforts to blunt the effects of these viruses in pediatric populations rely on prevention strategies and public awareness, this empirical information could allow scientists to better target the presence of these viruses within high-risk populations.

O6.03

8:55 CARDIOVASCULAR DISEASES PREVALENCE AMONG ADULTS IN USA

Maricica Pacurari

Jackson State University, Jackson, MS, USA

Introduction. Cardiovascular disease (CVD) are the leading cause of death in the US and worldwide. The age-adjusted rate for heart disease in 2018 in the US was 163.3 whereas for 2019 the rate was 161.5 per 100,000 population. Moreover, the prevalence of CVD in the US was much higher than in some countries of the European Union (EU). The purpose of this study was to identify the prevalence of some of the CVD in the USA alone.

METHODOLOGY. The data was extracted from the data sets for population of 18 yrs of age and older using data sets from the National Health Interview Survey from 2018. The survey included categories such as, all types of heart disease including coronary heart disease (CHD/CAD), hypertension, (HTN) or stroke, whereas CHD/CAD included heart attack (MI) and angina pectoris. A total of 249,456 adults aged 18 yrs or older were surveyed and the data was analyzed for characteristics such as sex (M, F), age (18-44, 45-64, 65-74, and over 75 yrs old), race (White, AA, AI, Asian or Hispanic), geographical region (NE, MW, S, W), and place of residence (Metropolitan area (MA) large, small or not in a MA).

RESULTS. Of those that been surveyed, an overall of 12.1% reported to have had one or more of the CVD. CAD and HTN were the most common CVD with 6.3 and 27.3%, respectively. Overall, CVD were more prevalent in male than female (13.3% vs 11.1%). By age, the prevalence of CAD and HTN increased with increasing age and were more prevalent in the 75 yrs and older groups. By race, CAD was more prevalent in AI or Alaska Native followed by White. HTN and stroke were more prevalent in AA followed by White. By region, South and Midwest were the regions where CAD, HTN, and stroke were the most prevalent, whereas West had the lowest prevalence of the CVD.

CONCLUSION. HTN and CAD are the most common CVD and were more prevalent in men than women for the year 2018 in the US. Also, the prevalence of HTN, CAD, and stroke increased with increasing age. Therefore, since there is a trend of increasing aging population, the prevalence of CVD will most likely increase.

Key words. Cardiovascular disease, hypertension, coronary artery disease, heart disease, stroke

Acknowledgement. This work was supported by NIHMD Grant U54MD015929-6611.

O6.04

9.05 PREVENTION OF LEAD POISONING: A COMMUNITY-BASED PARTICIPATORY RESEARCH IN MISSISSIPPI

Amal Krishna Mitra[1], *Charkarra Anderson-Lewis* [2]

[1]*Jackson State University, Jackson, MS, USA.* [2]*University of Southern Mississippi, Hattiesburg, MS, USA*

The objectives of the project were to encourage health promotion thro, ugh education, outreach, and community-based training and to support infrastructure development for the sustainability of lead prevention efforts. Methods: CLAP staff distributed material and spoke at a number of avenues including over 50 public appearances at health fairs, schools, neighborhood meetings, community events and the local park. The number of participants were health fairs (n = 467), community events (n = 469), and Kindergarten classes (n = 241). Hands-on training was offered at homebuilding retail stores (n = 25). EPA/HUD's online visual training was given to realtors (n = 220), and inspectors, contractors, and Do-It-Yourself (DIY) workers (n = 75). Training workshops were attended by homebuyers and rental homeowners at the Neighborhood Association Meetings (n = 91). Impact of training was evaluated by pre- and posttests. Results: Hands-on Training: Nearly 90% of the participants (n = 25) reported the hands-on training was useful. EPA/HUD Online Training: At posttest, 59.4%, 67.9%, 65.1% of the participants (n = 220) identified soil, car batteries and paint as sources of lead in the environment, respectively. Nearly, 70% identified lead as a poison in the environment while 77.5% and 47.2% demonstrated two behaviors which help prevent lead poisoning. A total of 62.3%, 48.1% and 58.5%, at posttest, identified three complications, respectively. The mean posttest score was significantly higher than the pretest scores (7.47 ± 2.07 vs. 6.60 ± 1.68, respectively). All the participants at a 2-month follow-up reported that that they used information obtained during the training on EPA-HUD curriculum on lead. The outcome measurements of home-buyer workshops were not significantly different from those of the online training. Conclusion: This training activities were successful in improving knowledge of the community people on lead poisoning prevention. Community programs ensure prevention of lead poisoning.

9:25 BREAK

O6.05

9:30 INTRANASAL ADMINISTRATION OF NICOTINAMIDE ADENINE DINUCLEOTIDE ALLEVIATES HEADACHES ASSOCIATED WITH MIGRAINE PAIN: A CASE REPORT

Abby Thompson[1] *(Presenting), Dr. Patty DiBlasio*[2,3]*, Garrett Dyess*[1]*, Dr. Susan Gibson1, Dr. Richard Mestayer, III*[2,3]

[1]*Dept. of Psychol., William Carey Univ., Hattiesburg, MS,* [2]*Speranza San Clemente, San Clemente, CA,* [3]*NAD Research, Inc., Springfield, LA, USA*

Introduction: Nicotinamide Adenine Dinucleotide (NAD+) is present in all cells serving a vital role in cell function. Disruption or depletion of NAD+ is associated with aging-associated disease states such as cognitive decline, frailty, and Alzheimer's. Clinicians around the U.S. affiliated with NAD Research, Inc. have developed administration protocols using NAD+ for treatment of clinical conditions such

as mood disorders, withdrawal symptoms associated with SUDs, and neurodegenerative diseases. We present a case report of a patient treated with intranasal (IN) NAD+ for pain associated with migraine headache. Methods: Patient described as an 87-year-old female with no other medical conditions besides hypertension, (controlled on Amlodipine) sought treatment at Speranza San Clemente for a procedure on July 9, 2020. The patient reported >50-year history of migraine headaches without aura including light sensitivity. Her migraines occurred about once monthly, lasting for one to two days each month, during which time she was unable to perform daily activities. The patient received BR+NAD/Lidocaine 100 mg/mL, 0.5% per protocol of 0.5 mL administered into each nostril via a sphenocath. The patient was prescribed Real NAD+ melts (150 mg/day), to take over a three-month maintenance period. Follow-up interviews were conducted at one week, six weeks, three months, and one year. Findings: The patient's migraine improved 50% within one hour from 7-8/10 to 3-4/10 on the pain scale, and completely resolved in two hours. The patient tolerated the procedure well and reported no return of migraine headaches in addition to improved cognitive functioning since the initial procedure. Discussion: The mechanism of action of the BR+NAD Intranasal application for migraine headaches is not fully understood, but it appears to have a potential ability to reset the neurological patterns in the brain that contribute to chronic migraines. While it is unusual for a patient to see significant improvement in one treatment, several patients report experiencing improved cognition and decreased frequency and severity of migraines with repeated applications, with some finding complete resolution. Conclusion: These results suggest that further studies with larger sample sizes are warranted to understand more about utilization of NAD+ treatment protocols for migraine headaches, specifically in aging populations.

O6.06

9:40 ENDURING ECOLOGIES: YELLOW FEVER AND THE NEW YORK CITY GRID (*Graduate student oral*)

Parker Gregg, Cynthia Kierner

George Mason University, Fairfax, Virginia, USA

The city of New York is a fascinating fit in the puzzle of the American narrative. At once, it serves as the largest metropolitan area in the world by urban area, the economic and financial engine of the United States, and an unprecedented producer of the arts, entertainment, and culture abound. Yet, one of the cities' most outstanding features is its' spatial geography, built environment, and population density which have influenced the functioning of the economy. In this review, we present a summary of pandemics and public health measures in New York City. The genesis of the grid project was a fundamental response to the yellow fever pandemic that swept the city in 1795 and took the lives of thousands of New Yorkers in the later years of 1830-1866. Such diseases usually affect overcrowded housing cities where sanitation, water lines, and health care system are poor. Before the revolution of germ theory, it was assumed that disease was transmitted through foul air, commonly known as "miasma." In 1807, with the help of the New York State legislature, three New Yorkers known as the Commissioners lead the Plan of 1811. During the plan's initial conception, it was stated by the commission that laying out streets in such a manner as to unite regularity and order with the public convenience and benefit and in particular to promote the health of the city by allowing free and abundant circulation of air to stave off disease. The commission assumed that restructuring the city's physical environment would lead to a dramatic change in public health and eliminate the spread of yellow fever. The sanitation/environmental conditions were evaluated by the "citizen's Association, Council of Hygiene and Public Health" (reported 1866, cited by Plunz R., and Alvares-Devila A. 2020). The goal was to uplift the City's economy and health care system. They understood that a correlation between disease and spatial morphology or distancing was required to maintain healthy and safe conditions. In conclusion, the swirling intersection of disease, public health, and urbanism allows us to reimagine our built environment and search for sustainable solutions in the wake of the COVID-19 pandemic.

O6.07

9:50 ROLE OF BIOLOGICAL MARKERS IN KIDNEY TRANSPLANTATION: ROLE OF BIOLOGICAL MARKERS IN KIDNEY TRANSPLANTATION

McDaniel, D.O.[1,2], Neill, J.[2], Sivils[2], C., Butt, F.[1,2], Bangale A.[1], Cousin, J.[2], Anderson, C.[1,2], Hawxby, A.[1,2] 1Department of Surgery, 2 School of Medicine, University of Mississippi Medical Center, Jackson MS.

Introduction: Although recipient survival and kidney allograft have increased during the last decade, allograft survival rate beyond one year has not significantly improved. Particularly in African Americans, late kidney allograft dysfunction remains a significant problem and more patients returning to dialysis as a choice for treatment. Risk factors linked with 1-year graft loss are associated with recipient's age, donor age, living vs. deceased donor, Human leukocyte antigen (HLA) mismatch, cold ischemia time and delayed graft function. The effect of each factor although is small suggesting the need for predictive system that incorporates multiple features. Biological markers are essential components of clinical outcomes after transplantation. Thus, graft dysfunction should be identified early on before irreversible damage occurs. Current diagnostics for assessing allograft function/rejection through biopsy is invasive and may carry risk of significant complications. Our goal was to investigate immunological parameters pertaining to rejection or good graft function and further stratify biological markers based on their relation to innate immune system.

Methods: A total of 390 renal transplant patients were evaluated. Clinical data were stratified including: delayed graft function (DGF), stable graft function (SGF), and rejection episode (RE) on the basis of antibody mediated or cellular rejection. RE time points were <6 months, 6-12 months, 13-36 months and >36 months. Gene series H19k and H8k used with patient's mRNA isolated from peripheral blood mononuclear cells. Patients with SGF vs. RE were significantly different ($P<0.01$).

Results: Majority of genes were associated with immunologic parameters causing allograft dysfunction and rejection episodes. Overall 66 out of 390 patients (16.92%) experienced episodes of rejection. Twenty-seven recipients returned to dialysis (7%). mRNA transcript levels for IL-18 and IL-10 were significantly increased on day 6 as compared with pre-transplantation (RTx) or day 3 post-RTx in the group with high GFR. Whereas, allograft inflammatory factor-1 and Toll-like receptor 4 were elevated significantly on day 6 in the group with low GFR. Changes in cytokine and TLR levels agreed with the expression profiles of patients with DGF vs. those who returned to dialysis (RD).

Conclusions: Variations in the levels of biomarkers presented here were generally correlated with clinical outcome of post

transplantation. Indicating that biomarkers are the cornerstone of precision medicine, and integrating with traditional clinical parameters we may achieve a better outcome for an individual patient, thus reducing health disparities among the population.

10:00 Break 10 minutes

10:10 AM Symposium I:

Theme: TELEHEALTH

Moderators:

Drs. D. Olga McDaniel and Candace M. Howard-Claudio

(Speakers information can be found in the section on Divisional symposia and Workshop)

10:15 -12:00 PM Speakers and Topics

10:15-10:40 AM Telehealth in the post-pandemic era

Dr. Chandra Saurabh

Chief Telehealth Officer, Univ. of Mississippi Medical Center

Dr. Chandra's presentation will explore the impact of telehealth in the post pandemic era, the contribution to science and research, and how the population may benefit from such system.

10:45-11:10 AM Ethics in Telehealth/Telemedicine

Dr. Elizabeth Heitman

University of Texas Southwestern

Dr. Heitman's presentation on "Ethical Issues in Telehealth" will look at the longstanding promises of telehealth, and how COVID-19 both realized many of its long-awaited benefits and highlighted important ethical challenges for patient care and privacy.

11:15-11:40 AM Telenutrition

Dr. Jennifer Lemacks

Mississippi Telenutrition Center,

University of Southern Mississippi

Dr. Lemacks presentation will describe application of telenurition through behavioral therapy targeting nutrition and physical activity behaviors

11:45-12:00 Symposium I Questions and Discussions

12:00 -1:15 PM General Session

Thursday March 31, 2022

AFTERNOON

1:30 -3:00 PM Interactive Workshop

Open Arms Health Center"

Moderators: Drs. D. Olga McDaniel, Candace M. Howard-Claudio, UMMC

Speaker: Dr. Jennifer Lemacks, Associate Director at the University of Southern Mississippi School of Kinesiology and Nutrition.

Dr. Lemacks presentation on "Open Arms Healthcare Center" will introduce the State of Art clinical space where communities are provided affordable, quality healthcare free of judgment and discrimination, creating a healthier Mississippi.

Room D2

3:05-3:15 PM HSD Business Meeting

Thursday, March 31, 2022

EVENING

3:30-5:00 PM Awards Ceremony/Dodgen Lecture

Room Hall B

5:00-7:00 PM General Poster Session

Room Hall C

Coordinators for General Posters:

Drs. D. Olga McDaniel, Michelle Tucci **Coordinators for HSD Posters:**

Drs. Edward Florez and David Gordy

Topics: <u>Population health/Diversity and Policy</u>

P6.01

EXPERIENCES OF COMMUNITY COLLEGE HEALTH PROFESSIONS GRADUATES THAT AFFECT CAREER PREPAREDNESS FOR MIDDLE-SKILLED HEALTHCARE OCCUPATIONS (Faculty poster)

Joseph A. Cameron, Jr.

The Chicago School of Professional Psychology, Richardson, TX, USA

The global shortage of middle-skilled health workers is compounded by the changing conditions of the healthcare industry. The impact of this strain contributes to the struggle of providing quality care. Middle-skilled occupations in healthcare fields typically require postsecondary education training. It is critical that leaders of health science and nursing programs have the support necessary to ensure the career preparation of new graduates is sufficiently aligned with employer needs and changing conditions of the workforce before they graduate. Future research may demonstrate feedback from new workers is key to safeguarding the alignment of workforce skills and workforce expectations. Leaders of Health Sciences and Nursing programs must use this knowledge to properly coordinate with advisory councils in the areas of enrollment strategies and career readiness. The purpose of this study was to explore the

impressions of community college health science nursing graduates on their career preparation experiences for middle-skilled healthcare occupations in North Texas. Graduates of community college Health Professions programs in Nursing were interviewed to ascertain their impression of their career preparedness after working in their field for various periods of time. The impressions of the Nursing graduates on their total career preparation varied based upon personal experiences, backgrounds, and other factors, however, the general consensus was that workforce needs of employment varied according to changing conditions, e.g., COVID 19, that did not correspond with career preparation and training. Consequently, these factors affected their overall potential for success in their chosen career. In conclusion, the need for incorporating community college new graduate work experiences as additional sufficient indicators of career readiness is necessary and by interviewing former community college health science nursing program students, policymakers and educational administrators can assess whether current and incoming students are provided with sufficient curriculum to support success in healthcare occupations. Future research may demonstrate that work experiences of new Health Science graduates currently employed in Allied Health occupations, such as Radiologic Technology, Physical Therapist Assistants, and Home Health Aides in nursing homes, may also provide information that affects their career preparedness curriculum.

P6.02

AGE AS A PREDICTOR OF GUNSHOT VIOLENCE IN THE STATE OF MISSISSIPPI (Faculty/Staff Poster)

Namrata Bhanat[1] (Presenting), Rinkuben Parmar[2], Eldrin Bhanat[2]

[1]University of Rochester, Rochester, NY, [2] University of Mississippi Medical Center, Jackson, MS, USA

Introduction: Mississippi has one of the worst rates of gun violence in the nation. Young age has often been linked to rash behavior and decisions. Thus, the purpose of this study was to evaluate age as a predictor of the violence related to guns in victims in Mississippi.

Material and Methods: We reviewed 191 patients that presented to the UMMC Emergency room (ER) with the diagnosis Trauma/Violence for December 2019. Data was obtained from the Patient Cohort Explorer at UMMC. There were 87 patients between ages 18-34 (45.5%) and 104 patients aging >35 (54.5%). 78 patients (41%) came in to the ER with non-gun related assault and 113 patients (59.2%) came in with Gunshot wounds. We analyzed the data using SPSS version 26. Chi-square, Pearson's Correlation and Odds ratio were calculated to find out the association between age and gunshot violence.

Results: Age was significantly associated with gunshot violence (p=0.00). Increasing age was negatively correlated (-0.546) to gunshot violence (p=0.00). Patients aging >35 had 2.557 times higher odds of being victims of non-gun related violence. Patients aging < 35 had significantly higher likelihood of being victims of gunshot violence. Patients aging > 35 were significantly less likely to be victims of gunshot violence but were more likely to be victims of other forms of violence.

Conclusions: Age is significantly associated with Gunshot violence in Mississippi. Young age has often been linked to rash behavior and decisions. Proper education and outreach are needed in this age group to prevent gunshot related injuries that pose to be a huge burden on the country's economy and infrastructure.

P6.03

IMPACT OF COVID-19 ON PATIENTS WITH CLINICAL DEPRESSION *(Faculty/Staff Poster)*

Rinkuben Parmar (Presenting), Namrata Bhanat, Eldrin Bhanat

University of Mississippi Medical Center, Jackson, MS, USA

Purpose: To evaluate the impact of COVID-19 on patients with clinical depression.

Material and Methods: We reviewed 383 patients that presented to the UMMC Hospital with the diagnosis of COVID-19 infection from 03/01/2020 to 12/31/2021. All these patients had a previous diagnosis of clinical depression. Data was obtained from the COVID-19 Research Registry at UMMC. There were two patients less than 18 years, 64 patients between ages 18-45 and 317 patients aging >45. Hundred and ninety-nine (52%) of the patients were African American (AA), 182 (47.5%) of the patients were Caucasian Americans (CA). Two hundred and seven (54%) were females and 176 (46%) were males. Hundred and fifty-two (39.7%) of the patients died in hospital due to COVID-19. We analyzed the data using SPSS version 26. Chi-square, Pearson's Correlation and Odds ratio were calculated to find out the association between death due to COVID-19 and gender.

Results: Overall, 39.4% of depressed patients died in hospital due to COVID-19. Eighty-three (54.6%) males vs 69 (45.4%) females died due to COVID-19. Gender was significantly associated with death due to COVID-19 (p=0.06). Depressed Females had 1.8 times higher odds of surviving COVID-19 compared to depressed males (p=0.06).

Conclusions: Overall, higher death rate due to COVID-19 was observed in depressed patients.

Gender is significantly associated with death due to COVID-19 in depressed patients seen in UMMC.

Depressed Males had significantly higher likelihood of dying due to COVID-19 in hospital compared to depressed females. Increase in the morbidity and mortality due to COVID-19 is seen in patients with depression. An extra effort and an effective method of counselling is needed in this patient group. Males generally known to be more prone to aggressive COVID-19 disease have even worse outcomes when they also have depression. The importance of vaccination and prevention for COVID-19 disease needs to carefully explained to these individuals. Once diagnosed with COVID-19, these patients need to be monitored and treated aggressively compared to the general population.

P6.04

THE MEDIATING EFFECTS OF VACCINE HESITANCY ON THE RELATIONSHIP BETWEEN PERCEIVED DISEASE SEVERITY AND LIKELIHOOD OF VACCINATION *(Graduate poster)*

Skyler Hoover (Presenting), Sermin Aras, Jennifer Lemacks, Tammy Greer, Michael Madson,

Mississippi INBRE Telenutrition Center, Hattiesburg, MS, USA

Vaccination rates are of particular interest given the new availability and efficacy of the COVID-19 vaccine. Currently, Mississippi has the lowest rate (30%) of fully vaccinated individuals in the nation. Perhaps this is reflective of an individual's vaccine hesitancy (i.e., uncertainty toward vaccines). Individual perception of disease severity has been shown to negatively predict vaccine hesitancy. Additionally, the current infodemic causes concern over the influence COVID-19

information may have on vaccine uptake. As such, the purpose of this study was to investigate the mediating effects of vaccine hesitancy on the relationship between perceived disease severity and the likelihood of receiving the vaccine, and examine if this relationship was invariant between individuals who do and do not consume media on COVID-19. An electronically administered vaccine hesitancy survey was completed by (N = 483) respondents in July 2021.

Demographics indicated the sample was 50.9% white and majority female (63.8%). Perceived disease severity was positively associated with likelihood of vaccine receival and was partially mediated by vaccine hesitancy. Perceived disease severity negatively predicted vaccine hesitancy (β = -0.51, 95% CI [-0.754, -0.635]), and vaccine hesitancy negatively predicted likelihood of vaccine receival (β = -0.70, 95% CI [-0.638, -0.353]). Invariance testing indicated the relationship between perceived disease severity and likelihood of vaccine receival was only significant for those who do not consume COVID-19 media (β = 0.34, p < .001). Further investigation is needed on the factors that impact vaccine receival for individuals who consume COVID-19 news.

P6.05

NATIONAL HEALTHCARE DELIVERY TRENDS IN EMERGENCY DEPARTMENTS ACROSS UNITED STATES *(Graduate Poster)*

Priyanka Nehete (Presenting), Tapan Rajguru

University of Mississippi Medical Center, Jackson, Mississippi, USA

Introduction: Mississippi being a rural state has a shortage of physicians, particularly in the emergency department (ED). Thus, the objective of this study is to evaluate the healthcare delivery trends in emergency departments across the country for the years 2014 and 2019.

Methods: Retrospective observational study using a database of 43325 visits to ED for the years 2014 and 2019 collected through the National Hospital Ambulatory Medical Care Survey public use linkage file. Among these visits, patients seen by the physicians, nurse practitioners and physician assistant are compared.

Results: In the years 2014 and 2019 there were 19481 and 23844 emergency department visits respectively. Comparing the two years, the rate of emergency department visits with solo nurse practitioners increased from 3.2% for the year 2014 and 5.9% for the year 2019. For solo physician assistant the rate of emergency department visits increased from 4.7% for the year 2014 to 7.6% for the year 2014. Visits handled by solo physician reduced from 84.3% to 76.6% for the years 2014 and 2019 respectively. This shows that most of the tasks performed by the physician are also being performed by the nurse practitioners and physician assistants in the emergency departments across the country.

Conclusion: The national healthcare delivery in the emergency departments across the country shows a growing trend in 2019 compared to 2014 in solo care delivery by nurse practitioners and physician assistant. The rate of visits handled by physicians' shows reduction in 2019 compared to 2014. This result can prove to be useful for healthcare delivery in the state of Mississippi by educating and hiring more of nurse practitioners and physician assistants.

P6.06

EFFECTS OF B.1.617.2 DELTA VARIANT OF SARS-COV-2 IN MISSISSIPPI *(Graduate Poster)*

Neha Dhaliwal (Presenting), Sai Kota, Thomas Wichman, Spurthi Tarugu, Anna Owings, Michael Senitko, Yilianys Pride, Tanya Robinson, Sarah Glover

University of Mississippi Medical Center, Jackson, MS, USA

COVID-19, a disease caused by the virus SARS-CoV-2, was first reported as originating in Wuhan, China in December of 2019. Emerging as novel and unknown, SARS-CoV-2 led to a global pandemic that has impacted a countless number of lives across the world. Spread by aerosol droplets, this virus is highly transmissible and capable of morbidity and, at times, mortality. Common symptoms of COVID-19 include rhinorrhea, fever, shortness of breath, and fatigue. The delta variant, B.1.617.2, of SARS-CoV-2 was first identified in Mississippi in June of 2021. In order to analyze the presence of the delta variant in Mississippi, samples were collected from adult patients at the University of Mississippi Medical Center, a large tertiary referral hospital. These samples consisted of a nasopharyngeal swab, buccal swab, blood, and urine. The cohort was prospectively enrolled from July 2021 to September 2021 and consisted of 75 patients who had tested positive for SARS-CoV-2. Males comprised 51% of the cohort while females comprised 49%. Caucasians comprised 44%, and blacks comprised 53% of the cohort. 30% of the cohort were within the age range of 40-49 while 17% and 21% were respectively within the age ranges of 50-59 and 60-69. This indicates a high prevalence of the disease amongst elderly patients. Of the 75 patients, 23, or 31%, of patients ultimately passed due to their illness. 70% of the deceased patients were unvaccinated against SARS-CoV-2, indicating that vaccination is a critical prevention measure. Currently, plasma samples of the cohort are being further characterized using antibody titer testing. While many efforts to blunt the effects of the virus SARS-CoV-2 in communities rely on prevention strategies and public awareness, this empirical information could allow scientists to better target the presence of this virus within high-risk populations.

P6.07

IS LESS MORE? A PATH FROM CONVENIENCE TO ANTIBIOTIC RESISTANCE (*Graduate Poster*)

Brandon McDaniel (Presenting), Jonathan O'Neal, Patrick Hopkins

University of Mississippi Medical Center, Jackson Mississippi and School of Pharmacy, University, MS, USA

With the expansion of Online Medical Clinics (OMCs), it has become easier for patients to receive online medical care. With OMCs, patients can seek care through online medical professionals for illnesses that may be deemed too private or embarrassing for an in-person medical consultation. Specifically, patients can be treated for STIs and UTIs online with the approval of a licensed prescriber. However, with this added convenience, patients may be receiving medications that are not the drug of choice for their acute illnesses. Wisp, a popular website devoted to online healthcare including UTI and STI treatment, is a contributor to online antibiotic prescribing. Their website is designed for patients to select medication based on a self-diagnosis of bacterial vaginosis, yeast infections, or UTIs. After purchasing an antibiotic regimen for bacterial vaginosis, a comparison was conducted between Wisp's online medical care and current clinical guidelines for STI diagnosis and treatment

plans. Incongruencies were found in the following areas: the ability to accurately diagnose STI or UTI cause, the ability to receive excess antibiotics to treat future infections, and the ability to choose potentially inappropriate/ less than optimal antibiotic regimens. Wisp's online healthcare was not able to definitively diagnose the STI causative agent due to lack of laboratory testing and physical examination. Furthermore, inappropriate antibiotic dispensing through excess medication and inappropriate antibiotic regimens are against core elements of antibiotic stewardship. It was concluded that the risks of online patient care for STIs and UTIs through Wisp are greater than patients receiving traditional in-person care.

P6.08

A SYSTEMATIC REVIEW OF THE SUCCESS RATES OF CULTURALLY INFORMED INTERVENTIONS AMONG NATIVE AMERICANS IN THE UNITED STATES *(Graduate poster)*

Samuel Mingo[1,2] (Presenting), Skyler Hoover, Jennifer Lemacks, Tammy Greer, Holly Huye,

[1] The University of Southern Mississippi, Hattiesburg, MS, USA, [2]Tiffin University, Tiffin, Ohio, USA

Native American and Alaskan Native populations are devastated by type 2 diabetes on a national scale. Culturally informed interventions may be the key to improving upon standard lifestyle management programs. The intent of this work was to evaluate peer-reviewed literature explicit to culturally informed type 2 diabetes (T2DM) prevention and management interventions in Native American populations in the US. This research used the Preferred Reporting Items for Systematic and Meta-Analysis (PRISMA) guidelines, and established criteria were used to locate articles in PUBMED databases. Post search resulted in a total of 205 articles, with five studies identified for inclusion after performing an exclusionary process. These studies included culturally informed interventions with a focus on type 2 diabetes and Native American/Alaskan Native populations. The success rate of culturally informed interventions is not yet supported in the literature, and more vigorous research is needed to determine the added benefit of cultural components to standard lifestyle interventions. Considering the limited literature available in this disparate population and with Indian Health Services recognizing T2DM as an "epidemic" in Indian Country, it is imperative that future research document interventions in a way that can be translated to tribal nations to implement the most effective interventions in their tribes to address T2DM disparities.

P6.09

RADIOACTIVITY STUDIES ON SELECTED FISH NATIVE TO LOWER MISSISSIPPI RIVER *(Graduate poster)*

Felecia Shoulders (Presenting) Jermiah Billa Steve Adzanu, Michael Atkins, John Adjaye,

Alcorn State University, Lorman, MS, USA

Being part of surface water- based resources, fish tend to uptake various elements/pollutants (if present) that may have been naturally or artificially (due to man-made activities) present in soils and water bodies. Levels of these pollutants could be impacted by factors such as size of the fish, naturally present elements in soils and water, and more importantly presence of man-made activities in the vicinity of water bodies. In this context, five different kinds (and at least 10 per kind) of fish native to lower Mississippi region – Channel catfish (Ictalurus punctatus), Garfish (Belone belone), Small Mouth Buffalo/Gaspagoo (Ictiobus bubalus), Small Mouth Buffalo (Ictiobus bubalus), and Breams (Abramis brama) are collected and analyzed using a 35% efficient solid-state detector for man-made and naturally occurring isotopes. Doses resulted from consumption of these fish is estimated considering the levels of experimental radioactivity values. The overall goal is to assess the dose from consumption of local fish and compare the obtained doses to the Nuclear Regulatory Commission's (NRC) recommended safety dose levels for the public.

P6.10

BLIND LEADING THE BLIND: LEADERS' PERCEIVED PERCEPTIONS OF COVID-19 AND ITS EFFECT ON VACCINE HESITANCY AMONG RELIGIOUS INDIVIDUALS *(Graduate poster)*

Ozzie Willis (Presenting)

University of Southern California, Los Angeles, CA, USA

With an abundance of vaccines being produced and distributed, it would seem that COVID-19's end is on the horizon. However, even with vaccine distribution being held throughout Mississippi finds itself on the tail end of those with 36.3% of the population having received at least one dose.[1] I believe that this is due to perceived perceptions from leaders that have led to an increase in vaccine hesitancy amongst religious individuals in the state. The reason for religious individuals is because it has been noted that religious individuals tend to listen to community leaders, i.e., religious leaders with regards to health decisions.[2] We used a survey aimed at answering reasons why people wanted to receive or not receive the vaccine as well as factors that influenced these decisions in Mississippians. With my study, I focused primarily on people who knew leaders with a negative perceived perception of the vaccine and saw themselves as mostly religious. My hypothesis for this was that those who agreed heavily with the perceptions of their leaders saw their intentions of getting the vaccine within the next 3 months drop. Along with my dependent variable of Intention to Receive the Vaccine and my independent variable of Agreement with Leader's Perception, I also accounted for other variables asking the respondent if they agreed with COVID-19 Being Serious, The Vaccine Being Safe, or Having Enough Information to decide. The results saw my hypothesis correct that agreement led to the least intent, however, those who it safe still had intent.

P6.11

WEIGHING THE RISK: THE ASSOCIATION BETWEEN BODY MASS INDEX AND SEXUAL RISK *(Undergraduate poster)*

Seth Johnson (Presenting)[1] INBRE Program, Fremeckia Carter[2], My Brother's Keeper,

[1.] Tougaloo College, Tougaloo, MS, and [2.] MBK Ridgeland, MS, USA

Sexually transmitted disease rates have reached an all-time high in the United States of America. The most common STIs include genital shingles (genital herpes), chlamydia, and the human immunodeficiency virus (HIV). The Center for Disease Control, CDC, estimates that youth ages 15-24 account for almost half of the twenty-six million new sexually transmitted infections that occurred in the United States in 2018. Along with sexually transmitted diseases, obesity has been a long-time public health topic and has been linked to several diseases and chronic illnesses. According to the CDC, 73.6% of adults aged 20 and over are overweight or obese. The purpose of this study aims to examine the relationship between body mass index, or BMI, and

risky sexual behaviors. The relationship between BMI and risky sexual behaviors is important because individuals who engage in risky sexual behaviors are more likely to contract sexually transmitted infections than individuals who practice safe sexual behaviors. In regard to body mass index and its relation to sexual risk behaviors, the National Institute of Allergy and Infectious Disease, states that "individuals with higher BMIs are more likely to engage in risky sexual behaviors." The identified risky sexual behaviors include having multiple sexual partners within 6 months, participating in intercourse without protective barriers, engaging in anal sex, and using drugs and/or alcohol surrounding sexual encounters. All in all, these behaviors increase the risk of STI contraction and current secondary data from previous studies support that BMI and STI conception are correlated due to sexual risk behaviors. **Acknowledgement:** This work was supported by the Mississippi INBRE, funded by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103476.

P6.12

THE RELATIONSHIP BETWEEN GENDER AND RACE AND BODY IMAGE DISSATISFACTION IN MISSISSIPPI *(Undergraduate poster)*

Amy Pham (Presenting)[1,2], Mahali Henry[2] , Skyler Hoover[2] , Sermin Aras[2], Jennifer Lemacks[2], Tammy Greer[2], Holly Huye[2],

[1]Mississippi State University, Starkville, MS, [2] University of Southern Mississippi, Hattiesburg, MS, USA

Obesity has been a significant public health issue, which could lead to increased health risks such as nerve damage, stroke or developing chronic diseases such as diabetes. Mississippi is the leading state in the nation with an obesity prevalence of 40.8%. There are several factors that influence obesity such as diet, physical activity and body image. Acceptance of heavier body ideals might limit motivation for weight management among some racial groups as differences in body dissatisfaction have been noted at higher body sizes in African American and Hispanic women compared to white women. The purpose of this research was to examine how gender and race affect individuals' perceptions of their current versus ideal body image (or body image dissatisfaction, BID). This study was a secondary analysis of survey data, which was previously collected at various community outreach events in 2018 and 2019 summer in Mississippi. Perceptions of current and ideal body weight were assessed using the Pulver's Figure Rating Scale and the difference was calculated to determine BID. There were 189 respondents (34% White, 33.6% Black, 32.4% American Indian; 20.3% Male, 79.7% Female). A Chi-Square analysis indicated there was a significant relationship between race and BID ($X2$ ($df = 4$, $N = 189$) $= 12.960$, $p=0.011$). However, there was no significant relationship between gender and BID. Further research is needed to explore this phenomenon in this population to understand implications for weight management practice and intervention.

P6.13

WHAT'S AGE GOT TO DO WITH IT: A STUDY OF RISING STD AND STI RATES IN THE OLDER ADULT POPULATION IN MISSISSIPPI *(Undergraduate poster)*

Joshua Lewis[1,2] (Presenting), Dr. Krystal Logan[2],

[1.] MS INBRE Service Scholars, University of Mississippi, Oxford, MS, [2.] My Brother's Keeper, Ridgeland, MS, USA

Many people are shocked to learn that persons aged 50 and older continue to contribute to the ever-rising number of sexually transmitted diseases (STDs) and sexually transmitted infections (STIs). Adults over the age of 50 who have not had sexual education were more likely to contract an STI or STD than adults over the age of 50 who have had sexual education. Data was collected from the Mississippi State Department of Health (MSDH) and the CDC. For this experiment, an anonymous survey was distributed via social media platforms via a survey automation software and analyzed in SPSS. After analyzing survey data, it was found that 35.7% of participants did not know how to correctly place a condom. Of the population surveyed, 23% had been treated for an STD in the past, and 33% reported never having some form of sexual education. In Conclusion, "Adults over the age of 50 who had not received sexual education were more likely to contract an STI or STD than adults over the age of 50 who had sexual education." Older adults were, in fact, at increased risk for contracting STD's when lacking crucial information.

P6.14

INVESTIGATING SOCIAL SUPPORT AND LEVEL OF FOOD SECURITY AS PREDICTORS OF DIET SELF-EFFICACY IN MISSISSIPPI ADULTS *(Undergraduate poster)*

Emily Durr[1] (Presenting), Katie Howell[2]

[1]Mississippi State University, Starkville, MS , [2]The University of Tennessee at Chattanooga, Chattanooga, TN, USA

Mississippians face disproportionate rates of preventable chronic illness including diabetes, hypertension, and high cholesterol, among others. These diseases are closely related to diet behaviors, and evidence shows that improvements in diet reduce the risks of these illnesses; however, understanding the factors that affect diet behaviors are complex. Low food security (FS) in Mississippi, the capacity of social support (SS) on influencing health, and the significance of self-efficacy for diet (SE) on advancing health outcomes present themselves as relevant variables for an investigation of Mississippi health. Further, existing literature lacks evidence on these variables among Mississippians. The objective of this study was to determine if social support or level of food security predict self-efficacy for improving diet. This study was a secondary analysis of data that were collected at various community outreach events in Mississippi using a paper-pencil and online survey. The data set consisted of 398 respondents. Multiple regression models were run to determine if FS and SS were predictors of SE. Results indicated FS was a predictor of SE ($P=0.001$) but SS was not. Findings of this study suggested FS may play a significant part in influencing health behaviors that would affect chronic disease rates. Given the statistically significant relationship between FS and SE, it is likely that food insecure individuals need improvements in their food environment and economic access to increase self-efficacy for improving their diet. Future research is needed to understand socioeconomic factors affecting health to better inform health promotion policies and interventions in Mississippi.

P6.15

EXAMINING PERCEIVED INDIVIDUAL HEALTH AND VACCINE HESITANCY IN MISSISSIPPI COUNTIES *(Undergraduate poster)*

Shawna Everman (Presenting, Chrysten Broome, Skyler Hoover, Jennifer Lemacks, Tammy Greer, Sermin Aras

The University of Southern Mississippi, Hattiesburg, MS, USA

Coronavirus-19 (COVID-19) vaccinations have become a crucial but controversial health response to combat the devastating COVID-19 pandemic. Vaccine hesitancy may be related to several factors including an individual's perception of their own health and whether individuals live in a rural or urban environment. The vaccination rate in Mississippi (MS) is below the national average (48.5%) being 33.5%. The purpose of this research was to determine if being in an urban or rural county in MS predicts one's vaccine hesitancy, and if this relationship is moderated by one's perception of individual health. Data was collected through an online vaccine hesitancy survey from 524 adult (≥18) MS residents. A moderated multiple regression analysis showed being a resident of a rural or urban county did not predict COVID-19 vaccine rates in MS, and perceived physical health did not moderate this relationship. Results indicated perceived health had no effect on the relationship between rural and urban counties on vaccine hesitancy. The generalizability of the results is limited due to the sample being predominantly female, white, young, and of lower income participants.

P6.16

EXAMINING VACCINE HESITANCY THROUGH THE RELATIONSHIP OF RELIGION AND PREFERRED NEWS SOURCE AMONG MISSISSIPPIANS *(Undergraduate poster)*

Delaney Anderson[1] (Presenting), Kaitlyn Taylor[1], Ozzie Willis[2], Jennifer Lemacks[1], Tammy Greer[1], Sermin Aras[1], Michael Madson[1]

[1]The University of Southern Mississippi, Hattiesburg, MS, [2]University of Oklahoma, Norman, OK, USA

Mississippi has the lowest vaccination rate in the United States, and vaccine hesitancy may be to blame. Factors that may influence vaccination could include susceptibility to believing fake news and high religiosity. Fake news about COVID-19 has become so prolific that the World Health Organization (WHO) has warned of an ongoing "infodemic." An individual's preferred news source may determine the misinformation they are exposed to and personal bias may influence which source individuals prefer. Religious authority is often cited as a most trusted news source and since Mississippi is a largely religious state, the objective of this research was to examine if there was a relationship that existed between religiosity and preferred news source and how that relationship influenced vaccine decisions. Data was collected in June 2021 using an online survey distributed among Mississippi adults. A Pearson's correlation revealed no correlation between religiosity and preferred news source ($r = 0.03$, $p = 0.68$). Religiosity and vaccine likelihood were not correlated ($r = -0.08$, $p = 0.21$), but primary news source was positively correlated with vaccination likelihood ($r = 0.15$, $p < 0.05$). Regression analyses determined that religiosity ($p = .31$) and primary news source ($p = 0.09$) were not predictive of vaccination likelihood. Education was found to be the most powerful predictor of vaccination likelihood ($p < 0.01$). Although a relationship between religiosity and preferred news source was not found and did not influence vaccination decisions, education was a predictor and should be explored as an option to combat vaccine hesitancy.

P6.17

POTENTIAL MISTRUST OF THE COVID-19 VACCINE AMONG AFRICAN AMERICANS IN MISSISSIPPI *(Undergraduate poster)*

Sydney Burks (Presenting), Shantoni Holbrook[2],

[1]MS INBRE Service Scholars, Hinds Community College, Utica, MS , [2]My Brother's Keeper, Inc., Jackson, MS, USA

As of June 15, 2021, there have been 1,953,532 total vaccinations administered in Mississippi, according to the Mississippi State Department of Health's (MSDH) COVID-19 Vaccination Report. Of these nearly 2 million vaccinations, 1,064,643 first doses have been administered. Mississippi's African American population makes up only 33.3% of people who have received one dose. The United States 2020 Census estimates Mississippi's population at approximately 2,961,279 citizens. African Americans make up 37.8% of this population; that is 1,119,363 people. Among this 37.8%, only 31.7% of Black Mississippians have received at least one dose of the COVID-19 vaccine, leaving 764,525 unvaccinated African American Mississippi residents. This study aims to determine if these numbers reflect a mistrust of the COVID-19 vaccine among African Americans in Mississippi. According to the New England Journal of Medicine (NEJM), a November survey found that only 18% of Black respondents would get the vaccine. Many analysts attribute this gap to historical medical controversies such as the Tuskegee Study and J. Marion Sims' experiments. The correlation between past medical practices and low vaccination numbers in the African American community poses the question, "Do African Americans mistrust the COVID-19 vaccine?" This is a qualitative study that will be conducted among African Americans in Mississippi. An electronic survey will be administered to residents across the state to get a general overview of individual perspectives of the COVID-19 vaccine. The survey results determined that mistrust is a prominent factor in the low vaccination rate among African American Mississippians. One limitation of this study is the small sample size of 148 individuals, of which 96.6% were Mississippians, and 87.8% were African Americans. This sample may not provide accurate representation for the entire population of Black residents. However, this study suggests that research and proper education about the makings, contents, and function of the COVID-19 vaccine may increase overall comfortability with the vaccine. Thorough research and adequate education could prove beneficial in improving the vaccination rate.

P6.18

WHAT IS THE PERSONAL USE OR NON-USE OF HEALTH APPS AMONGST MISSISSIPPIANS WITH HYPERTENSION AND DIABETES? *(Undergraduate poster)*

Jada Henderson (Presenting)

Hinds Community College-Utica, Utica, MS, USA

Mississippi is the second leading state in the nation with a hypertension rate of 43.6%, and a diabetes rate of 14.8% of the Mississippian population. Research has shown mobile health interventions that include the use of a health app were effective strategies for individuals with chronic diseases. Moreover, health apps could help users perform a variety of tasks such as health tracking, exercise, or providing reminders to take medication or go on a walk. Despite the high rates of chronic diseases in Mississippi, there are very few studies that explore the reasons for

mobile health apps use. Therefore, the purpose of this study is to describe the personal reasons for health app use and non-use among Mississippians with diabetes and hypertension. Data were collected via in-person surveys at various outreach events in the summer of 2018 and 2019. Results showed Mississippians diagnosed with diabetes and hypertension reported three main reasons for health app use, including: to track exercise, improve dietary habits, and health tracking (e.g., heart rate, hours of sleep). In contrast, the three main reasons for non-use were data entry burden (e.g., such as logging daily task, tracking symptoms etc.), hidden costs, and loss of interest. These results provide a better understanding as to why Mississippians who suffer from hypertension and/or diabetes tend to use or not use health apps that could promote a healthy lifestyle. Future research should explore the role of mobile applications in the prevention and management of hypertension and diabetes.

P6.19

CESSATION EDUCATION: REDUCING TOBACCO ADDICTION RATES AMONG YOUNG BLACK ADULTS IN MISSISSIPPI *(Undergraduate poster)*

Britney Young[1,2] (Presenting), Tiarra McMillian[2],

[1]MS INBRE Service Scholars, Mississippi College, Clinton, MS , USA,[2]My Brorther's Keeper, Inc., Ridgeland, MS, USA

Tobacco cessation requires education through many steps. Tobacco use is a preventable cause of disease and death in the U.S. In Mississippi, 5,400 adults die each year from smoking. According to The Mississippi State Department of Health, 192,000 children are exposed to secondhand smoke at home. Every year over 500 non-smokers in MS die from exposure to secondhand smoke. Big Tobacco companies change to appeal to a larger and younger crowd. Youth who use multiple tobacco products (cigarettes, cigars, hookah, etc.) are at a higher risk for developing nicotine dependence and might be more likely to continue using tobacco into adulthood. Smoking tobacco could lead to individuals using hardcore drugs. New research suggests that young men, aged 18-25, have an increased risk of becoming addicted to a chemical substance. Data was retrieved via a survey to conduct and gather information from participants (African American aged 18-25) regarding their general knowledge of tobacco and their usage of any tobacco products. The survey will also determine if the participants want to cease tobacco usage. The aim of this research is to determine whether spreading knowledge on tobacco addiction among black people aged 18-25 will decrease tobacco usage or stop it. Survey results concluded that of the 49 participants, 44% of the individuals do use a tobacco product. According to the results from the survey, 60.4% of tobacco users would stop using tobacco when they learned more about tobacco products and the health risks.

P6.20

THE IMPACT OF DEPRESSION ON AFRICAN AMERICAN WOMEN IN MISSISSIPPI COLLEGES *(Undergraduate poster)*

Nyla Wansley (Presenting) , Brandon Holmes

[1]MS INBRE Service Scholars, Tougaloo College, Jackson, MS , USA, [2]My Brother's Keeper, Inc, Ridgeland, MS, USA

A discussion of mental health in the Black community, women is often overlooked because the standards of health are mostly situated on the wellbeing of males. Studies indicate that Black women are one of the most undertreated groups of people for depression (Nelson). Moreover, it means that other harmful and damaging issues affecting Black women goes unchecked. Research also shows that, "young adults aged 18 to 25 are less likely to receive mental health services"(SAMHSA). It is important that those experiencing mental health issues have access to resources. Due to stigma and cultural mistrust many minorities might be the reasoning for college aged students not receiving mental health services (Primm, 2018). Certain stereotypes like Black women supposedly being mentally stronger than other races also contributes Black women's lack of use in mental health resources. Stereotypes like this perpetuate the stigma of mental health and lead to low levels of self-compassion and collective coping (Lioa). Breaking these stereotypes would be important in making mental health treatment feel more accessible to these women. This study is an attempt to close the gap in the lagging research centering Black women's mental health. I hypothesize that black women will exhibit symptoms of depression, but will be less likely to seek treatment due to fear of judgement. In this study, I surveyed 50 Black women between the ages of 18 and 23 who are students at various Mississippi institutions of higher education. Using quantitative data, I assessed their possible levels of depression as well as their likelihood of getting treatment for it. The survey consisted of questions about age, gender, college institution, feelings over the last month, and thoughts on therapy. Presented questions allowed them to rate their feelings on a topic from strongly agree, agree, neutral, disagree and strongly disagree. I also asked open response questions. I collected data from a total of 50 people. This data allowed me to get a clear understanding of the participants' thought process. Based on their responses, I found that 31 people either strongly agreed/agreed to having feelings of depression/and or hopelessness in the last 4 weeks; however, when asked if they are not motivated to do the things they loved, 42.6% felt neutral. When participants were asked if they believed that mental health resources were important and accessible, those being surveyed primarily responded yes. Although the participants responded yes to mental health resources being accessible and important, they overwhelmingly think that mental health resources are too expensive. From my findings, I concluded that while Black college aged women do experience feelings of depression, feelings of judgement are not one of the main things to cause them to put off treatment. Also, they are receptive to receiving mental health services. Many of the participants claimed that even though mental health resources are available and important to them, the services are too costly. In sum, unaffordable rates for services like therapy might be deterring some women from seeking the help that they need.

P6.21

THE EFFECT OF STD/STI DIAGNOSIS ON THE MENTAL HEALTH OF YOUNG ADOLESCENTS IN JACKSON, MS *(Undergraduate poster)*

Latimoris White[1,2] (Presenting), Byron Buck[2]

[1]MS INBRE Service Scholars, Jackson State University, Jackson, MS, US, [2]My Brother's Keeper, Inc./ Open Arms Healthcare Center, Jackson, MS, USA

According to Jenkins (2016), young individuals around the ages of 15-24 are diagnosed with some form of STD/STI, like Chlamydia or Gonorrhea, at an early age. STD/STI treatment and receiving results for young individuals can be costly and traumatic on their mental health (Jenkins, 2016). Currently, little is known about the connection between impacts of STD/STI diagnosis in mental health which makes young people more susceptible to these circumstances.

This research project will identify the most common mental health concerns impacting young individuals ages 16-25 and their experience with STD diagnoses after receiving the results. The research will describe common solutions to help support young individuals with access to mental health services. This research hypothesizes that young individuals experience high amount of STD/STI diagnoses; mental health trauma after receiving their results; and they need common solutions to gain access to mental health resources to obtain proper care.

Primary data was used to develop a questionnaire to assess experiences of STD/STI and Mental health among young individuals ages 16-25. A Formsite survey using questions asking about demographic questions (i.e., gender, age, race/ethical, sexual orientation, and school classification) were used. Questions concerning sexual activity and mental health issues were also included.

The STD/STI question, "where do you to get tested for STD/STI testing?", resulted with eight (8) responses to a personal healthcare provider; five (5) to the health department; one (1) to an urgent care clinic; two (2) responses for "no medical assistance", and (9) responses for "not applicable" or N/A. The mental health question, "How would you feel if others knew about your STDs/STIs Results?", resulted that (52%) of participants felt "a mix of every emotion", (16%) felt regretful, (12%) felt Angry and Numb; and (8%) felt sad

According to the data collected from the survey, there is a connection to how the participants felt during or when receiving STD/STI results. Many participants experienced "a mix of every emotion", if others knew about their results. This was significant because many of the participants identified with traumatic or negative emotions. There was positive connection that participants have access to receiving STD/STI testing and treatment. Many participants responded to going to their personal healthcare provider or going to their local health department or urgent care. For the mental health questions, "Where do you go to get tested for STDs/STISs" and "How did you feel when you received your results", many participants responded with "N/A" as their answer. It is possible that many of the participants did not want to answer the questions because they perceived how others would probably view them and suffered quietly internally. The study hypothesis stated is believed to be proven.

P6.22

PREVENTION ON THE YARD: PERCEPTION OF HIV PREVENTION AMONG STUDENTS AT SELECT SOUTHERN HISTORICALLY BLACK COLLEGES AND UNIVERSITIES *(Undergraduate poster)*

Kalani Washington[1,2] (Presenting), Deja Abdull-Haqq[2]

[1]MS INBRE Service Scholars, Alcorn State University, Lorman, MS, USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA

According to the Centers for Disease Control and Prevention (CDC), approximately 34,800 new HIV infections occurred in the U. S. in 2019. During that same year, though African American people accounted for 13% of the US population, they represented 44% of new HIV diagnoses in the U. S. Additionally, from 2015 – 2019, HIV diagnoses increased among persons aged 13-24 with the South accounting for more than half of all new infections nationwide the year before (CDC, 2018) although HIV is 100% preventable by utilizing methods and tools including abstinence, HIV testing, condoms and pre-exposure prophylaxis (PrEP).This study sought to identify factors associated with the perceived lack of interest, knowledge, or use of HIV prevention tools including HIV screenings, condoms and PrEP among Black youth aged 18-24. To test my hypothesis, I developed a 19-item online descriptive research survey, which I disseminated among college students in Mississippi utilizing social media outlets such as Facebook, Snapchat, etc. Overall, 41 students responded to the survey. Among participants, (55%) were women and a majority of the respondents (67.5%) self-reported as "straight." A majority of the respondents (25%) were having unprotected sex weekly (Fig.2). A majority of the respondents (28%) also reported that they only receive an STI screening test once a year and reported not using a condom due to their monogamous sexual activity. (Fig.3). More importantly, the majority of the participants (55%) answered "no" when asked if they have ever had an HIV test (Fig.5) with some responses reflecting a "fear" of the knowledge of HIV exposure. The survey revealed that most respondents are afraid of getting an HIV test because of the associated stigma. Additionally, those surveyed reported a lack of knowledge about and ability to access PrEP. Due to the number persons that stereotype HIV as a disease that impacts the "gay" community only (e.g. "I don't have sex with gay men.") and PrEP as a pharmaceutical for same-gender loving people (e.g., "I heard [PrEP was] for gay men."), it is recommended that HIV prevention awareness opportunities increase on HBCU campuses and area high schools. An increase in public awareness regarding HIV screening, condoms, and PrEP could also work to alleviate public stigma associated with HIV prevention tools.

P6.23

THE RELATIONSHIP BETWEEN HOUSEHOLD CHILD PRESENCE AND PROCESSED MEAT AND ADDED SUGAR CONSUMPTION AMONG MISSISSIPPI ADULTS *(Undergraduate poster)*

Derrick McNealy[1] (Presenting), Joshua Gallagher[2], Ozzie Willis[3], Jennifer Lemacks[2] Austin Graybeal[2], Tammy Greer[2], Sermin Aras[2],

[1]Mississippi Gulf Coast Community College, Madison, MS, USA, [2]University of Southern Mississippi, Hattiesburg, MS, USA, [3] University of Oklahoma, Norman, OK, USA

The United States is currently experiencing a chronic disease epidemic as chronic disease affects 50% of the total US population. Seven out of the top ten causes of death in the United States are from some form of chronic disease and Mississippi populations rank within the highest number of cases for all seven diseases. Current research evidence suggests chronic disease can be linked to poor dietary habits such as processed meat and sugar consumption. The purpose of this research was to examine the relationship between child presence and self-reported chronic disease in parents as it relates to sugar and processed meat consumption. Joshua and I utilized data collected in June of 2020 through an electronic survey targeted at Mississippi adult populations. The collected data was analyzed using descriptive statistical analysis and linear regression to better examine the relationships between child presence and processed meat and sugar consumption. Our aim was to discover the role child presence played in altering dietary behaviors that may affect chronic disease. We found no statistical significance between child presence and processed meat and sugar consumption and we found no significant correlations. Age, gender, and household income were inversely associated with sugar consumption but not education level or race. Regression analyses showed household child presence was not a predictor of processed meat or added sugar consumption, after controlling for respective demographics. Future research should evaluate the

causal mechanisms resulting in a lack of relationships between child presence and other variables impacting dietary behaviors. This work was supported by the Mississippi INBRE through the NIH. Thank you for viewing our presentation.

P6.24

THE DIAGNOSIS OF DIABETES ON MENTAL HEALTH AMONG AFRICAN AMERICANS IN MISSISSIPPI *(Undergraduate)*

Micaiah McDonald[1,2] (Presenting), LaQuita Hatcher[2],

[1]MS INBRE Service Scholars, Alcorn State University, Lorman, MS, USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA

Diabetes, also known as diabetes mellitus, is a chronic condition that affects how the body turns food into energy. A person living with diabetes has a greater risk of suffering from mental health issues such as anxiety, depression, eating disorders or mood swings. The objective of the study was to determine if a diabetes diagnosis affected mental health among African Americans in Mississippi. This was a quantitative study in which participants were asked to complete a survey that discussed various factors such as the type of diabetes, affecting other pre-existing conditions, and other health disparities associated with diabetes. The effects of diabetes specifically on participants' mental health were quantified by the number of reported changes in the following behaviors: thoughts, actions, stress management, decision making, expression of feelings, and relating to others. It is important to note that these reported behavioral changes occurred post diabetes diagnosis and directly affected the participant or people around them. Based on the results of this study, 23% of those participants had pre-existing conditions of anxiety or depression. According to the CDC, people who live with diabetes are two to three times more likely to have depression than people who do not live with diabetes. It is important for people to understand that diabetes is not something that can be looked over or completely ignored. It is a condition that should be treated just like any other health disparity, but with a special focus on its direct correlation with negative impacts on mental health.

P6.25

THE RELATIONSHIP BETWEEN SELF-EFFICACY FOR PHYSICAL ACTIVITY AND HIGH BLOOD PRESSURE STATUS VARIES BY AGE *(Undergraduate poster)*

Emily Taylor[1] (Presenting), Renedra Thompson[2]

[1]University of Southern Mississippi, Hattiesburg, MS, USA, [2.] Meridian Community College, Meridian, MS, USA

In 2011, 39.3% of Mississippi adults were diagnosed with hypertension. Hypertension over time damages blood vessels and causes tears in arterial walls leading to an increase in the workload of the circulatory system while decreasing its efficiency. It is an age-related risk factor for many chronic diseases, such as kidney and heart disease, and can be prevented by a variety of different behavioral changes, including increased physical activity. It has been shown that higher self-efficacy, the perceived ability to carry out a behavior, was associated with a greater likelihood of positive behavior change. The purpose of this research was to determine if there was a relationship between self-efficacy for physical activity and high blood pressure that varies by age. This study was a secondary analysis of data, which was previously collected using a survey from adult Mississippians at various community outreach events. Of 398 individuals included in the study, 120 participants self-reported a hypertension diagnosis. Independent variables included self-efficacy for physical activity and age, and the dependent variable was hypertension status. Logistic regression analyses determined the association between hypertension and the independent and demographic variables. Analyses showed that older aged individuals were more likely to self-report a hypertension diagnosis whereas self-efficacy for physical activity was unrelated. Findings also indicated that older individuals differed in the probability of having hypertension depending on levels of self-efficacy with higher levels of self-efficacy associated with lower probabilities of hypertension. Further research is needed to explore how self-efficacy may mitigate hypertension risk in older adults.

P6.26

HOW DOES LIVING IN A RURAL AREA AFFECT ONE'S PHYSICAL HEALTH? *(Undergraduate poster)*

Taylor Lampkin (Presenting), Genetra Robinson

[1]MS INBRE Service Scholars, University of Mississippi, Oxford, MS, USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA

According to the Centers for Diseases Control and Prevention (CDC), more than 46 million Americans, or 15 percent of the U.S. population, live in rural areas. Studies from the CDC conclude that there is a significant gap in health between rural and urban Americans. The disparities that rural residents face put them at a higher risk for poor health outcomes than rural residents. Rural residents have higher rates of poverty, less access to healthcare, less income, less education, and are less likely to have health insurance than urban residents. Also, these disparities may lead to rural communities having a higher rates of chronic health problems and obesity and overweight people. Specifically, in the 18 counties in the Mississippi Delta, the average poverty rate is 33% and the region has the lowest health rankings in the state. Because many rural residents do not have direct support, health resources, or information, they are less likely to make the right decisions about health issues or get tested when needed. Having more primary care physicians in rural areas will promote great physical health because residents will have more access to care and address the challenge of the healthcare crisis. According to Healthy People 2020, access to healthcare is important for overall physical, social, and mental health status, disease prevention, detection, diagnosis, and treatment of illness, quality of life, preventable death, and life expectancy. Educating rural residents about the importance of good physical health and increasing the resources in those areas can help fix the health gap that we see in America.

P6.27

DISPARITIES IN MATERNAL OUTCOMES FOR AFRICAN AMERICAN WOMEN IN THE UNITED STATES *(Undergraduate poster)*

Chadrick McKnight[1,2] (Presenting), Dr. Edna Lampkin[2]

[1]MS INBRE Service Scholars, Tougaloo College, Jackson, MS, USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA

Since the 1890s, maternal outcomes relating to pregnancy have become a major health problem. Racial and ethnic disparities in obstetric care have shown that African American women experience high rates of pregnancy related mortality and morbidity compared with other racial and ethnic groups. According to CDC.org, between 2011-2013, white women had a maternal mortality rate of 12.7 percent of deaths per 100,000 live births, while black women had 43.5 percent of deaths per 100,000 live births. Given the aforementioned statistic, Black women are

also 2-3 times as likely to die as white women. According to Americanprogress.com, “Racism in healthcare has manifested in many structural forms. This can include the concentration of women of color in communities that lack quality health facilities and providers; harsh environmental factors and toxins in predominantly African American neighborhoods; inequality in the workplace; highly concentrated food insecurity within communities of color; or harsh policy changes to health care programs that disproportionately serve people of color, such as Medicaid.” Social determinants factors such as education level, income, sexual orientation, and disabilities may also negatively affect patients’ experiences in health care settings as well as their health outcomes. In a YouTube Video, U.S. Maternal Mortality is Much Higher for African-Americans, Dr. Aaron Campbell stated in the year of 2016 there was a study that showed how college educated black women had a higher risk of severe maternal morbidity than a white woman without a high school diploma. The aim of this study is to illustrate how racial disparities, social determinants, and prenatal care affects maternal outcomes.

P6.28

PUBLIC HEALTH DISPARITIES IN THE BISEXUAL AND TRANSGENDER COMMUNITIES *(Undergraduate poster)*

Breunna McCann[1,2] (Presenting) , Isaiah Gore[2,3], Marcus Johnson [2],

[1]MS INBRE Service Scholars, Alcorn State University, Lorman, MS, USA, [2]My Brother's Keeper, Inc., Hattiesburg, MS, USA, .[3]MS INBRE Service Scholars , MS Gulf Coast Community College, Perkinston, MS, USA

Public health disparities highlight the differences in public health outcomes and the causes amongst different groups of individuals. As there are several public health disparities that prevail within the bisexual and transgender communities due to discrimination, the major goal of increasing the overall wellness of public health includes decreasing these health disparities. By conducting a detailed survey analyzing the various disparities that the bisexual and transgender communities face as well as conducting research that adequately conveys some of the negative effects on their public health, we aim to highlight the key areas that are affected by discrimination of these communities. For this deeper look into the several health disparities, we hypothesized that being a part of either of these communities would have a negative impact on the amount of healthcare and/or health insurance that is accessed. Statistics from surveys and studies show that there are higher percentages for heterosexuals reporting having good overall health, seeking, or receiving medical care, as well as seeking or receiving prescription medication than compared to the percentages for the bisexual and transgender communities. With the results of the surveys and studies, the highlighting of these issues will hopefully get public health a step closer to eliminating community public health disparities.

P6.29

HOW HAS THE ABSENCE OF MEDICAID EXPANSION LIMITED LOW-INCOME AFRICAN AMERICAN FAMILIES IN MISSISSIPPI? *(Undergraduate poster)*

Sedonia Logan[1,2] (Presenting), Dr. Edna Lampkin[2],

[1]MS INBRE Service Scholars, Alcorn State University, Lorman, MS , USA, [2]My Brother's Keeper, Inc/ Open Arms Healthcare Center, Jackson, MS, USA

Medicaid expansion will take care of gaps in health disparities such as the “Medicaid coverage gap”. This refers to the uninsured individuals in the 11 states that have not adopted Medicaid expansion. Those individuals both ineligible for Medicaid and do not meet the guidelines to qualify for the Affordable Care Act. Currently a total of 39 states have adopted Medicaid expansion and they have seen outstanding results. However, Mississippi is one of the 11 states that decided not to expand Medicaid at this time. The aim of this research is to understand how the decision to not expand in MS has affected African Americans low-income families. I plan to explore how expanding Medicaid might help to eliminate some health care disparities among low-income African American families in MS. My hope is that this research will provide valuable information for policymakers to make an informed decision and to reexamine their decision to not expand in MS.

P6.30

A NEW SYNDEMIC: WHY HIV AND COVID-19 REMAIN PERSISTENT IN COMMUNITIES OF COLOR *(Undergraduate poster)*

David Miles[1,2] (Presenting), Joseph Lindsey[3]

[1]MS INBRE Service Scholars, Mississippi State University, Starkville, MS, USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA, [3]My Brother's Keeper, Inc., Gulfport, MS, USA

The COVID-19 pandemic has had tremendously negative effects of countries around the globe. Much progress has been made to defeat this virus and create the potential for healthier lives. Some experts claim that we are in the "final stretch" of the virus. However, many communities in the U.S. still suffer from the effects of this virus. The primary demographic is communities of color, particularly African Americans. Not only are they still suffering from COVID-19, but they are also still suffering from the HIV endemic. Communities of color have long been struggling with HIV, and now with COVID-19, they are dealing with the syndemic of both these viruses’ attacks. Our study focuses on the question "Why HIV and COVID-19 are remaining prevalent in communities of color". We proceeded with this study by conducting an extensive cross-referenced literature review on the reasons why COVID-19 and HIV are still significant problems in communities of color. We found that 42% of individuals diagnosed with HIV in 2018 were African American. Regarding COVID-19, research has highlighted that medical distrust persists among communities of color. The recent COVID-19 pandemic caused these communities mainly to experience severe disruption to health care services and pharmacies.

Overall, we aim to identify why COVID-19 and HIV are still significant problems in communities of color. We believe that the findings of this research can help shed light on the medical problems listed that plague communities of color today so we can work and improve the future.

P6.31

THE EFFECTS OF STIGMA ON PEOPLE LIVING WITH HIV/AIDS IN MISSISSIPPI *(Undergraduate poster)*

Jaslyn Young[1,3] (Presenting), Rollin Young[2,3], Marcus Johnson

[1]MS INBRE Service Scholars, Southwest Community College, Summit, MS, USA, [2]MS INBRE Service Scholars, The University of Southern Mississippi, Hattiesburg, MS, USA, [3]My Brother's Keeper, Inc., Hattiesburg, MS, USA

HIV-related stigma and discrimination refers to prejudice, negative attitudes and abuse directed towards people living with HIV and AIDS. Stigma is often cited as a major barrier to

accessing prevention, care and treatment services. Although stigma can occur in any setting, most experience it first-hand within their family, social, work and health care settings. Thus, resulting in major psychological damage. Our primary data was conducted via form site survey which contained questions about stigma, working environment stigmas, and demographics articles. Our secondary research which consisted of Google research, Avert.org, and MSDH.MS.GOV also helped assist us in gathering more information on the many stigmas surrounding HIV. By conducting this research, it shows many do not understand that they are being discriminated against which opens the door to an improved survey. The surveys should contain specific questions and a detailed definition on what stigma is.

P6.32

THE IMPACT OF HIV ON MENTAL HEALTH OF AFRICAN AMERICAN MEN WHO HAVE SEX WITH MEN'S CONTINUED ENGAGEMENT IN HIGH-RISK BEHAVIORS *(Undergraduate poster)*

Eryka Greene[1,2] (Presenting), Melissa Coleman[2],

MS INBRE Service Scholars, The University of Southern Mississippi, Hattiesburg, MS, USA, [2]My Brother's Keeper, Inc./ Open Arms Healthcare Center, Jackson, MS, USA

African American gay and bisexual men are impacted by HIV/AIDs at an alarming rate. Mental wellness plays a significant role in the engagement in high-risk behaviors. This population is disproportionately affected by various psychological problems, such as depression, trauma, and substance use. Studies have shown that due to increased levels of racial segregation in the United States, African American Men Who Have Sex with Men (MSM) have an elevated likelihood of living in environments that contain psychosocial stressors, influencing the behaviors promoting HIV. Communities and environments play a significant role in behaviors that contribute to an increase in HIV rates among this population. African American MSM are sometimes victims of unreported abuse, including sexual and emotional. This remains an issue within this community and is associated with multiple negative outcomes, such as poor mental health, substance misuse, and high-risk sexual behaviors.

P6.33

INVESTIGATING FATALISM AS A MODERATOR BETWEEN LEVELS OF INCOME AND EDUCATION AND HEALTH OUTCOMES IN MISSISSIPPI AND LOUISIANA RESIDENTS *(Undergraduate poster)*

Jalen Payton[1], Caleb Whatley (Presenting), Jennifer Lemacks, Tammy Greer, Sermin Aras, Austin Graybeal,

[1]The University of Southern Mississippi, Hattiesburg, MS, USA, [2]Mississippi State University, Starkville, MS, USA

Mississippi and Louisiana rank in the top 10 for chronic disease prevalence while simultaneously ranking 1st and 2nd for poverty rates in the United States, respectively. Numerous studies demonstrated the relationship between socioeconomic status (SES) and health, as well as fatalistic beliefs and adherence to cancer screening. However, the magnitude of these relationships is unclear in groups that suffer from severely low SES and chronic disease prevalence such as MS and LA adults. The purpose of this research is to investigate fatalism as a moderator of the relationship between SES (measured as levels of income and education) and health outcomes in Mississippi and Louisiana residents. Survey data was collected from Mississippi and Louisiana residents (18 years of age or older) via social media posts and direct text messages. Variables included number of chronic diseases, disease fatalism, income and education. Results from a moderated multiple regression indicated that fatalism moderated the relationship between income and disease status ($p<0.01$) but not the relationship between education and disease status. Moreover, our results show that fatalism has an effect on disease status, but having more income might alleviate the effects. These findings suggest health programs or interventions in Mississippi and Louisiana should address fatalistic ideals in low-income communities to achieve higher success.

Topics:
Clinicall/Diagnostics/Molecular/Technology/Therapeutics

P6.34

ORGAN REPAIR THROUGH TISSUE ENGINEERING AND REGENERATION (

D. Olga McDaniel (Presenting)

University of Mississippi Medical Center, Jackson, MS, USA

Introduction: Tissue repair in response to penetrating trauma/injury and damage occurs as an overlapping- sequence of common biologic events. This includes a multiphasic immune response that promotes hemostasis, inflammation, re-epithelialization, activation of local biological molecules and fibrotic response. However, in mammals a complex tissue regeneration is associated with reduced inflammatory cytokines and influx of macrophages and T cells. The concept of tissue engineering is an in-situ novel approach to repair tissue damage using biomaterial, cells and signaling molecules. Organ or tissue chip development following tissue engineering criteria has been proposed as the next-generation drug testing and therapeutic models. Methods: Current approaches in regenerative medicine includes cell-based therapies; scaffolds (natural or synthetic); combination of cells and scaffolds to stimulate tissue repair in vivo and building of tissues ex vivo for implantation. In this review presentation, a general strategy for generating tissue chips was applied. Human emulation system provides culture module, which delivers culture conditions for organ chips. The system allows a range of automated flow and cyclic stretch parameters for each study requirement. Results: the system is set to generate cell-derived organoids, and multi-tissue biological systems for disease modeling and has potential in the emerging area of personalized precision medicine. A wide variety of tissue types have been generated by organoids-on-a chip to study human physiology and human disease models. This includes brain chip to evaluate the effects of therapeutics and neuroinflammation; colon-intestine chip to evaluate inflammation and anti-inflammatory drugs; duodenum-intestine chip to evaluate drug absorption, drug-drug interaction; kidney-chip to evaluate drug toxicity; lungs-chip to evaluate physiology of the organ and disease and liver-chip for drug toxicity and preclinical trials. Conclusions: Organ or tissue chip development has great potential as the next-generation therapeutic models. Particularly, applications of organ repair with an emphasis on tumor modeling, drug screening, as it may allow more personalized and person-specific method of modeling genetic disease and immunotherapy.

P6.35

ASSOCIATION BETWEEN OBESITY AND THE CLOTTING CASCADE IN TRAUMA PATIENTS

Zachary Wilson (Presenting), Jon-Michael Stork, Yousef Dawoud, Lora Nason, Juliana Sitta, Emily Green, Edward Florez, Mathew Kutcher, Candace Howard,

University of Mississippi Medical Center, Jackson, MS, USA

Obese patients are known to have high rates of thrombosis after injury; however, the role of obesity in coagulation after trauma is unknown. The goal of this study was to determine the correlation between body composition and BMI with the clotting cascade in the setting of trauma.

This is an HIPPA-compliant, IRB-approved retrospective analysis of prospectively acquired data from consented adult trauma patients with contrast-enhanced CT images of the abdomen. Injured trauma patients presenting from the scene of injury to the UMMC Emergency Department were included (N = 81). Patients with age <18, pregnancy, incarceration, known or reported pre-injury antiplatelet or anticoagulant use, known bleeding or clotting disorder, excessive image artifact, excessive obstruction from blood or foreign body, or inability to access necessary image files were excluded (n = 32).

Demographic information from emergency department records including age, race, and ethnicity was collected alongside thromboelastography (TEG) markers and body mass index (BMI). Then, anthropometric measures such as waist circumference (WC) and sagittal abdominal diameter (SAD) were measured on CT images at the level of the posterior superior iliac spines using a DICOM viewer software (OsiriX MD v.9.0.2). In addition, paravertebral, abdominal wall, and psoas muscles volumes and regional abdominal fat volumes such as subcutaneous (sSAT and dSAT) and visceral adipose tissue (VAT) were measured using a multi-layer segmentation software (slice-O-matic, TomoVision v.5.0). Statistical analysis was performed using linear regression, and the coefficient of determination (r) was calculated using 95% Confidence Interval.

49 patients were included in the study. A heatmap showing the various correlations between the body measurements (in both cm^3 and Hounsfield Units (HU)) and the clinical TEG data was generated. The correlation scale ranges from -1 (strong negative correlation) to 1 (strong positive correlation). Fat depots (sSAT, dSAT and VAT) showed a good correlation between them ($r=0.846$, $p<0.001$). Obesity and VAT demonstrated a significant inverse association with reaction time for first fibrin clot formation (CK-R) at the time of hospital admission ($r=-0.477$ and $r=-0.516$, $p<.001$, respectively). This suggests an association of obesity and visceral fat depots with hypercoagulability in the trauma setting.

P6.36

THE PROGRESSION OF RENAL DISEASE IN OBESE DAHL SALT-SENSITIVE RATS IS ASSOCIATED WITH INCREASED RENAL NLRP3 EXPRESSION (*Undergraduate Poster*)

Olive Cooper[1] (Presenting), Denise Cornelius[2], Jan Williams[2]

[1]Tougaloo College, Tougaloo, MS, USA, [2]University of Mississippi Medical Center, Jackson, MS, USA

The prevalence of obesity and chronic kidney disease (CKD) is increasing at alarming rates in the United States. Previous studies have demonstrated that obesity-induced renal disease is associated with increased reactive oxygen species (ROS) and pro-inflammatory cytokines. The NOD-like receptor family pyrin domain containing 3 (NLRP3) inflammasome is a molecular complex that becomes activated by danger signals such as ROS and is involved in the pathogenesis of CKD. However, studies examining whether NLRP3 is implicated during the progression of obesity-induced renal disease are limited. Therefore, in the current study, we compared the renal expression of NLRP3 in lean Dahl salt-sensitive (SS) rats and obese SS (ob-SS) rats, which develop CKD. At 12 weeks of age, body weight, plasma insulin, and total cholesterol levels were significantly higher in ob-SS rats than SS rats. Both strains' blood glucose levels were in the normal physiological range (<120 mg/dL). MAP was significantly higher in ob-SS rats than SS rats (189±5 and 124±7 mmHg, respectively). Proteinuria was markedly elevated in ob-SS rats versus their SS littermates (872±147 and 127±13 mg/day, respectively). We conducted a ROS assay to measure the renal mitochondrial H_2O_2, markedly higher in ob-SS rats than SS rats. To determine the gene and protein expression of NLRP3 in the kidneys from both strains, we performed PCR and western blot analyses, respectively. In conclusion, these data indicate that the progression of obesity-induced renal injury is associated with increases in NLRP3 expression. Future studies will focus on the role of NLRP3 in obesity-induced renal injury.

P6.37

GERIATRIC TELEHEALTH IN RURAL MISSISSIPPI: PROVIDER'S PERCEPTION OF ACCESS TO BROADBAND *(Undergraduate poster)*

Rikki Garcia[1,2] (Presenting), Kendra Wright[2],

[1]MS INBRE Service Scholars, Mississippi University for Women, Columbus, MS , USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA

Telehealth is a technological advancement in healthcare, there are also limitations for certain populations, like the geriatric age group and individuals in rural communities. The objective was to understand the provider's perception of the limitations that prevented geriatric patients from using telehealth services in rural areas. This case study targeted groups of geriatric patients living in rural Mississippi assisted living facilities. Surveys were used to acquire both qualitative and quantitative data about the healthcare providers' perception of the limitations of telehealth in their communities. Once all 68 responses were received, the data was analyzed and commonalities and trends were observed. Most respondents also stated that current telehealth services in the rural, geriatric population experienced a fair amount of issues due to the poor internet access. Although, the majority of respondents recommended these services, they suggested that these services focus on the middle aged or teen and young adult populations, because they were already technologically advanced. Nearly, 70% of participants stated permanent installation of telehealth services into their facilities or clinics after COVID-19 restrictions had diminished. Based upon the data analysis it was inferred that many of the respondents favored telehealth, although technological advancement was required in order to target all populations. Along with internet issues that arose during telehealth visits, many rural facilities lacked the proper funding to provide the services. Information gathered during this study implied that once leaders addressed the issues in the rural community, the geriatric community who suffered the most from inadequate healthcare would be targeted.

P6.38

INTRAUTERINE GROWTH RESTRICTION ENHANCES SUSCEPTIBILITY TO ISCHEMIC STROKE-INDUCED BRAIN INJURY IN RATS *(Undergraduate poster)*

Valerie Quach (Presenting)(SURE Program), Jonathan Lee, Adrianna Cooper, Nathaniel Lee, Emily Turbeville, Irene Arguello, Lir-Wan Fan, Norma Ojeda,

Department of Pediatrics, Division of Newborn Medicine,Department of Pediatrics, Division of Infectious Disease, University of Mississippi Medical Center, Jackson, MS, USA

Epidemiological and experimental studies suggest a link between intrauterine growth restriction (IUGR) and an increased risk to develop diseases later in life. Experimental studies have reported that IUGR rats have increased susceptibility to ischemic renal injury. However, susceptibility to ischemic brain injury in IUGR individuals is still poorly investigated. This study aims to test the hypothesis that IUGR rats have greater ischemic brain injury compared to control rats. IUGR was induced in rat offspring using the reduced uterine perfusion (RUP) procedure during late gestation. At 5 months, IUGR and control animals were exposed to middle cerebral artery occlusion (MCAO) to induce stroke. Motor skills and sensory tests were assessed 24 hours post-stroke followed by euthanasia to collect brain tissue for assessment of ischemic damage. Our results show that offspring from dams exposed to RUP showed significant hypomotor activity, hyperalgesia, allodynia, and less brain volume compared to offspring from control dams. IUGR rats showed greater motor and sensory deficits compared to control rats as assessed with the modified neurological severity score after the MCAO procedure. RUP-induced IUGR enhanced adult susceptibility to MCAO-induced ischemic brain injury in adult rats, including increases in total brain volume and damage volume as indicated by Nissl staining. IUGR-increased susceptibility to MCAO-induced ischemic brain injury may be associated with the brain dysfunction. The current study suggests that RUP-induced brain dysfunction in IUGR rats may enhance adult susceptibility to ischemic brain injury. Our model may be useful for studying mechanisms involved in ischemic brain injury and the development of potential therapeutic strategies.

P6.39

PROGESTERONE REDUCES BLOOD PRESSURE AND PROLONGS TIME TO DELIVERY ASSOCIATED WITH REDUCED INFLAMMATION AND CYTOLYTIC NK CELLS IN RESPONSE TO PREECLAMPSIA (*Undergraduate poster*)

Morgan McCray (Presenting), Kymberlee Evans, Tarek Ibrahim, Frances Lawson, Ty Turner, Babbette Lamarca, Lorena Amaral

University of Mississippi Medical Center, Jackson, MS, USA

With the expansion of Online Medical Clinics (OMCs), it has become easier for patients to receive online medical care. With OMCs, patients can seek care through online medical professionals for illnesses that may be deemed too private or embarrassing for an in-person medical consultation. Specifically, patients can be treated for STIs and UTIs online with the approval of a licensed prescriber. However, with this added convenience, patients may be receiving medications that are not the drug of choice for their acute illnesses. Wisp, a popular website devoted to online healthcare including UTI and STI treatment, is a contributor to online antibiotic prescribing. Their website is designed for patients to select medication based on a self-diagnosis of bacterial vaginosis, yeast infections, or UTIs. After purchasing an antibiotic regimen for bacterial vaginosis, a comparison was conducted between Wisp's online medical care and current clinical guidelines for STI diagnosis and treatment plans. Incongruencies were found in the following areas: the ability to accurately diagnose STI or UTI cause, the ability to receive excess antibiotics to treat future infections, and the ability to choose potentially inappropriate/ less than optimal antibiotic regimens. Wisp's online healthcare was not able to definitively diagnose the STI causative agent due to lack of laboratory testing and physical examination. Furthermore, inappropriate antibiotic dispensing through excess medication and inappropriate antibiotic regimens are against core elements of antibiotic stewardship. It was concluded that the risks of online patient care for STIs and UTIs through Wisp are greater than patients receiving traditional in-person care.

P6.40

FINDING GULF WAR VETERANS ON TWITTER: LESSONS LEARNED *(Undergraduate poster)*

Leanna Pittman (Presenting), Ben Porter

Mississippi State University, Starkville, MS, USA

Introduction: Twitter is a social networking, microblogging app used by millions across the world. Users post a plethora of open text data that can reveal insight into almost any aspect of the user base. Specifically, Twitter has been used in the public health literature to track influenza cases across time and identify novel symptoms of COVID-19. This research has a non-existent participant burden and can be conducted at large scales which lends itself to understanding population level phenomena and populations with high survey burden. However, prior to studying such over-burdened populations, they first must be identified.

One such population is Gulf War Veterans. The Gulf War occurred between August 1990 and March1991. Approximately 800,000 U.S. service members deployed to this conflict, and many began to show physiological symptoms that are thought to be connected to toxic and environmental exposures occurring during the war. This has come to be known as Gulf War illness. However, there is no clear etiology or biomarkers for Gulf War illness and the presentation is heterogeneous. As such, there remains a high level of research interest in this population leading to a high degree of survey burden.

The current study details the initial steps for identifying a cohort of Gulf War Veterans who use Twitter. Specifically, the "lessons learned" in identifying Gulf War Veterans on Twitter such that an algorithm could be built to automatically identify such veterans automatically. These methods are general and can be expanded to other populations in the future.

Method: To identify Gulf War Veterans with nonprivate accounts, we manually searched using hashtags, biographies on their profile, searching through highly followed Gulf War/Desert Storm pages, advocacy accounts, and lastly, their usernames. Participants were invited to answer a single question: "Are you a Gulf War Veteran?"

Results: Initial efforts were to direct message potential participants through the Twitter platform to answer the above question. We direct messaged 114 potential participants with 26 responses (23% response rate) of which 23 participants indicating they were a Gulf War Veteran (88%). However, an issue emerged in that the message application was not allowed for certain accounts. The second method used to try to establish the veteran's authenticity was to "at" the users. This means that their username

was "tagged" in a tweet so they would be notified and could confirm or deny. To date, only 20 participants have been "at'ed" with one potentially indicating their involvement in the war (through liking).

Discussion: While data collection is still ongoing, the current study highlights two issues with using Twitter for direct research. First, it is difficult to have potential participants respond to solicitations, including those that require minimal effort. Second, that while it is time consuming, manually identifying nonprivate accounts of individuals in a particular population can be a successful method as demonstrated by 88% of responding individuals indicating that they were in the Gulf War. If optimized, these methodologies could be used to create specific cohorts of many sought after populations.

P6.41

ANTI-PROLIFERATIVE EFFECT OF SYZYGIUM AROMATICUM IN OVARIAN CANCER *(Undergraduate)*

Amaje Williams[1] (Presenting), Shawnell Handy[1] , Michael-Ryan Lowe[2], Ariane T Mbemi[2]

[1]Hinds Community College-Utica, Utica, MS, USA, [2]Jackson State University, Jackson, MS, USA

Ovarian cancer (OVC) is ranked as the fifth causes of cancer deaths among women and the leading causes of death among gynecological cancers. Older age, poor diagnosis, poor differentiation of tumor, and smoking have been associated with poor prognosis of the disease. Even though, progress has been made in treatment of patient with OVC, survival rate has not improved considerably over the past decades. Furthermore, African American are disproportionality affected in term of access to health care quality, early diagnosis, and treatment. There is an urgent need for novel therapies to treat and prevent this life threating disease. Plants contains bioactive compound which are being studying for their anti-ovarian cancer activities to the development of new clinical drug. *Syzygium Aromaticum* (SA) commonly known as cloves possess metabolic properties that may affect cancer development. Therefore, it was hypothesis that SA may cause cytoxicity to OVC. The goal was to examine the inhibitory effect (SA) in ovarian cancer cells using OVCAR-3 cells as test model. The OVCAR-3 cells were treated with various concentration of SA for 48 hrs. AO/PI dyes staining were used to evaluate cells morphogical changes and apoptosis process under bright field and fluorescence microscope. The images analysis demonstrated that SL causes cellular shrinkage, nuclei fragmentation, plate detachment, and significant growth inhibition in treated group compared to control. SA causes anti-proliferation of OVC in concentration depend manner and may be considerate as a potential anti-cancer drug. However, further bio-assay need to be done to examine the pathways of cells death.

P6.42

NLR3 INHIBITION IMPROVES PE PATHOPHYSIOLOGY IN RESPONSE TO PLACENTAL ISCHEMIA (*Undergraduate Poster*)

Rashauna Thomas (Presenting), Olivia Travis, Ann Tardo, Chelsea Giachelli, Chris Nutter, Hannah Glenn, Tatiana Davis, Olive Cooper, Jan Williams, Denise Cornelius

University of Mississippi Medical Center, Jackson, MS, Tougaloo Colledge, Jackson MS and United States Minor Outlying Islands

Preeclampsia (PE) is a complication in pregnant women that is characterized by hypertension, intrauterine growth restriction, vascular and organ dysfunction. Immune activation and oxidative stress are known to mediate PE pathophysiology. NLRP3 inflammasome is an immune modulating complex that has been linked to the immune activation and was recently shown to be increased in preeclamptic women. In this study, we hypothesized that inhibiting NLRP3 directly would improve PE pathophysiology in the Reduced Uterine Perfusion Pressure (RUPP) model of placental ischemia. RUPP or Sham procedure was performed on gestational day (GD)14 in pregnant Sprague Dawley rats. Rats received daily i.p injections of either saline vehicle or MCC950 (20 mg/kg/day), a direct inhibitor of NLRP3, for 5 days. Vascular function was assessed on GD18 and MAP, pup and placental weights were measured, and blood and tissues were collected on GD19. Placenta expression of NLRP3 is higher in RUPP vs Sham. Treatment with MCC950 decreased NLRP3 expression in placenta of RUPP rats. MAP was increased in RUPP compared to Sham and MCC950 significantly improved MAP in treated RUPPs. Pup and placental weights were significantly lower in RUPP vs Sham. NLRP3 inhibition did not improve pup and placental weights in treated RUPP rats. Uterine artery resistance index (UARI) in RUPP rats was increased compared to Sham. MCC950 decreased UARI in treated RUPP rats. Placental and renal oxidative stress was significantly higher in RUPP vs Sham and inhibition of NLRP3 decreased oxidative stress in placental and kidney of treated animals. These data show that NLRP3 mediates immune activation and oxidative stress as mechanisms of PE pathophysiology in response to placental ischemia.

P6.43.

COVID-19, PREECLAMPSIA, AND ENDOTHELIN (*Undergraduate Poster*)

Kedra Wallace[1], Makenzie Herron[2] (Presenting)

[1]University of Mississippi Medical Center, Jackson MS, USA, [2]Alcorn State University, Lorman, MS, USA

Preeclampsia is a disease that affects 5-10% of pregnant women and is characterized by high blood pressure as well as organ damage mainly in the kidney and liver. Women with Preeclampsia also have endothelial dysfunction. Research has found that women who had COVID-19 during pregnancy were at a higher risk to develop preeclampsia as well. This study was started to determine whether pregnant women having COVID leads to endothelial dysfunction and whether the endothelin is higher in those women who had covid and preeclampsia versus women who did not have COVID but also had preeclampsia. Women chosen for this study were 18-45 years old, had COVID during or six months before pregnancy, and can speak and understand Spanish or English. The method of this study was determining if the circulating markers of endothelial cells were higher in women with COVID by extracting endothelin from plasma samples. The extraction method used were Sep-Pak plasma columns. The second method were the HUVEC essays to determine whether circulating factors from. Women with COVID lead to endothelial damage. Human Umbilical Vein Endothelial Cells were grown until 75-80% confluence. After 24 Hours, the control media used was replaced with the experimental media. Finally, the cells were collected and saved into TriZol for future use. The results from these experiments show that there was an increase in markers for endothelial damage in women who had COVID versus women without COVID. The future studies include completing sVCAM, ELISAs, and Endothelin ELISAs to acquire more data.

P6.44

THE IMPACTS OF THE COVID-19 PANDEMIC ON THE MENTAL AND SEXUAL HEALTH AMONGST UNDERGRADUATES IN MISSISSIPPI *(Undergraduate poster)*

KriShunda Joiner[1,2] (Presenting), Byron Buck[2,3]

[1]MS INBRE Service Scholars, University of Mississippi, Oxford, MS, USA, [2]My Brother's Keeper, Inc., Ridgeland, MS, USA [3]Open Arms Healthcare Center, Jackson, MS, USA

Sars-Cov-2 or the Coronavirus, first appeared in 2019. Within a few months, it became the COVID-19 pandemic, and by March of 2020, it was nearly worldwide. The pandemic tremendously changed everyone's lives in a big way. Sexually transmitted infections along with various mental health issues increased drastically during the pandemic. The goal of this research is to identify the correlating factor between sexual and mental health during the COVID-19 pandemic among undergraduates in Mississippi. We hypothesized that the increases of COVID-19 correlated with the rise in STIs will result in the increase of mental health issues amongst undergraduates in Mississippi. Primary data, which consisted of a survey, was sent out to a number of survey respondents (n=45). The questionnaire consisted of demographic and specific questions that dealt with the participant's sexual and mental health during the pandemic. All data gathered from the survey was analyzed and used to interpret the results and conclusion. Primary data was correlated and compared with secondary data. The hypothesis was supported because there was a positive correlation between the COVID-19 pandemic and the mental health rates. However, the STI rates was not a result of the virus. Rather the effects of the pandemic lead to higher rates of one experiencing feelings of isolation and depression, which was found to be more prevalent in females. Based on the data collected, this research can continue to investigate ways to decrease mental and sexual health rates. Solutions can be found to accommodate the problems that caused these issues.

P6.45

HOW THE COVID-19 PANDEMIC IMPACTED THE MENTAL HEALTH OF HEALTHCARE PROVIDERS *(Undergraduate poster)*

Sabrina Pendleton[1,3] (Presenting), Tyriney Marshalll[2,3], Marcus Johnson[3]

[1]MS INBRE Service Scholars, University of Southern Mississippi, Hattiesburg, MS, USA, [2]MS INBRE Service Scholars, Alcorn State University, Lorman, MS, USA, [3]My Brother's Keeper, Inc., Hattiesburg, MS, USA

Coronavirus (COVID-19) is the third documented spillover of an animal coronavirus to humans in only two decades that has resulted in a major pandemic. On January 31, 2020 the WHO (World Health Organization) documented the first case of COVID-19 in the United States of America. On March 11, 2020, the World Health Organization (WHO) declared COVID-19 as a global pandemic and health crisis. As of June 24, 2021, this pandemic still ongoing with over 33.6 million confirmed cases of COVID-19 in the United States of America along with over 603,000 COVID-19 related deaths. COVID-19 has impacted the mental health of healthcare providers various ways. The majority of hospitals in United States of America were overpopulated and short of staff. Many healthcare providers were overwhelmed with COVID-19 patients as well non-covid-19 patients. Many healthcare providers were inconvenienced by having to stay in the hospitals over night or having go back home to their families daily with no surety if they are diagnosed with the virus or not. Some healthcare providers were not mentally prepared for experiences that the coronavirus pandemic brought forth. The pandemic impacted everyone; however, it impacted our healthcare providers on a larger scale. Mental health of healthcare providers is very important because they have to have a sound mind in order to take care of people who require their help and people who are in no way shape or form able to help themselves. In this research, we will conduct a survey for healthcare providers to provide honest experiences of their mental states during the pandemic.

Friday, April 1st 2022

MORNING 8:30 -9:30 AM

Room: D2

Oral Presentation session B1

Moderators:

Drs. Pier Paolo Claudio, Larry S. McDaniel, & Lance Keller

University of Mississippi Medical Center

Topics: Clinical Modeling/Diagnostics/Therapeutics

O6.08

8:30 IMAGING A RADIOMICS APPROACH TO NANO-PARTICLE DRIVEN KNOWLEDGE-BASED PREDICTIVE INFORMATICS

Mohan Pauliah (Presenting), Candace Howard

Department of Radiology, University of Mississippi Medical Center, Jackson, MS, USA

Translational Imaging research blending clinical studies with developments of advanced computational modeling of radiologic imaging-based Artificial Intelligence (AI) and Deep Learning (DL) research by incorporating quantitative multi-dimensional data generated from structural, functional, and metabolic imaging in conjunction with nanoparticle-based hybrid imaging probes opened up new avenues for precision image-driven applications in the field of Radio diagnosis and therapeutics. Furthermore, the development of novel technologies through newer molecularly targeting imaging probe designs coupled with state-of-art technologies allows real-time image guidance techniques with the potential of leading to first-hand more efficient approaches for early-stage detection and image-based treatment assessment and therapy. Unparalleled understanding of the Hybrid Imaging Modalities and Multi-parametric technologies particularly MRI/PET offer greater insights into the disease process. Besides, the accurate detection and physiological image quantification of diseases remain a vital prognosis predictor for disease staging and clinical outcomes. This study outlines the data workflow and pipeline for precision imaging metrics from these tools and the reporting needs of clinical centers, radiologists, and trial sponsors.

Conclusion: Data Imaging pipelines and workflow informatics afforded from these tools offers greater potential to not only improve the accuracy of targeted disease and its image-guided surgical or radio therapeutic intervention but to transform decision-making for personalized patient treatment through Image-driven applications and patient safety.

O6.09

8:40 MORPHOLOGICAL VARIATIONS OF *STREPTOCOCCUS PNEUMONIAE* AND THE IMPACT ON VIRULENCE IN A LARVAL MODEL OF INFECTION

Lance Keller (Presenting) Kenyatta Poe, Courtney Daley , Larry McDaniel

Department of Microbiology and Immunology, University of Mississippi Medical Center, Jackson, MS, USA

Streptococcus pneumoniae, the pneumococcus, naturally resides as a commensal organism in the human nasopharynx, with the majority of the population being colonized at least once by the age of two. The pneumococcus is also an opportunistic pathogen that is responsible for several diseases. Typically disease occurs in individuals with compromised or underdeveloped immune systems, but can occur in healthy populations. Certain virulence factors are known to be required during infection, but does not entirely explain the strain to strain variability in virulence. In other bacterial species variations in cell shape and morphology has been shown to be important in immune evasion and disease, but this has not been examined in the pneumococcus. Previous work indicates that chain length of the pneumococcus is important in determining virulence, but morphology was not examined. Therefore, to examine the effect of morphological variations on pneumococcal disease microscopic examination, sequence variation, and virulence in a larva model of infection was tested. Individual cells from a diverse set of clinical isolates were analyzed for differences in morphology; area, length, width, aspect ratio, and chain length. Three distinct groups were found and used in an infection model to determine changes in LD_{50} based on morphological variations. Targeted sequencing of genes known to be important in cell morphology were analyzed for single nucleotide polymorphisms between the different groups. Increased understanding of basic morphological variations that lead to increased disease prevalence with an underlying genetic cause will aid in determining potential pathogenic strains of pneumococcus with a simple screening method. This will aid in the overall health of immune compromised patients through sampling the commensal flora and determining risk factors for serious pneumococcal disease.

O6.10

8:50 RESPONSE ASSESSMENT IN RECURRENT GLIOBLASTOMA BASED ON THE RANO CRITERIA IMPLEMENTATION (undergraduate oral)

Edward Florez, Tanner Nielson (Presenting), Candace Howard

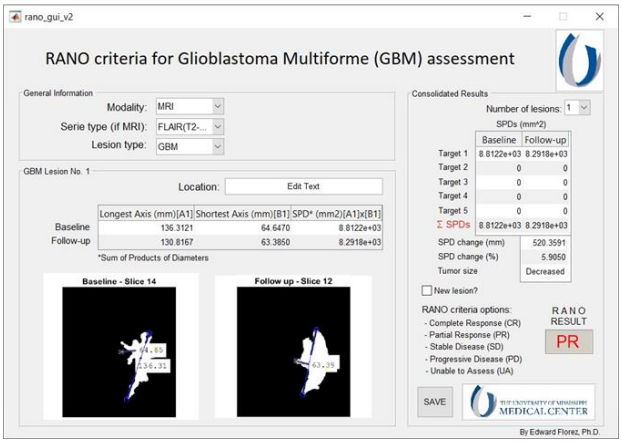
University of Mississippi Medical Center, Jackson, MS, USA

INTRODUCTION: Glioblastoma multiforme (GBM) is one of the most common and aggressive primary tumors in the central nervous system with a 5 year survival of less than 10%. The primary method of monitoring GBM is with MRI though it can be difficult to differentiate between treatment responses.

PURPOSE: To evaluate the true enhancement burden of tumors following immediate post-operative changes as well as following sequential MR imaging using an in-house developed tool which utilizes the RANO criteria as well as the iRANO and mRANO.

MATERIALS AND METHODS: HIPPA-compliant, IRB-approved retrospective posthoc analysis of 65 de-identified patients with GBM treated with bevacizumab who reported to have a residual disease on MRI data acquired in 1 to 3 month interval. MRI series including T2-FLAIR, unenhanced T1-weighted sequence (T1-W), and the identical sequence performed after contrast (T1-W+C) were assessed in MRI series in initial post-op, and follow-up series. MRI data were transferred to a DICOM viewer (MIM v6.9.2). Next, a neuroradiologist segmented the tumors in various sequences for each study performed using MIM. Finally, the tumor axes measurement was performed through the Feret algorithm using a single slice with the best FLAIR signal representation which was exported to a decision environment where the response characterization was automatically computed according to the RANO criteria (Figure 1).

CONCLUSION: Using our in-house tool, we can determine tumor progression with RANO and its derivatives using sequential FLAIR studies.



O6.11

9:00 ADVANCED AI METHODS IN THE TIMELY AND ACCURATE ASSESSMENT OF ACUTE APPENDICITIS IN CHILDREN (undergraduate oral)

Edward Florez[1], Jessie Smith[1] (Presenting), Amy Farkas[2], Seth Lirette[1], Candace Howard[1]

[1]University of Mississippi Medical Center, Jackson, MS, USA, [2]EVMS, Norfolk, VA, USA

INTRODUCTION: According to national recommendations, ultrasound (US) is the first-line imaging modality for diagnosing pediatric abdominal pain in emergency room visitors, often confirmed as appendicitis. However, the clinical diagnosis of acute appendicitis in children can be challenging due to limitations in the physical examination, mainly in overweight or obese pediatric patients. Thus, the use of radiation-based imaging such as computed tomography (CT) is performed after US but still with many safety concerns.

PURPOSE: This study will attempt to select the most accurate and timely modality (US vs CT) for this illness based on artificial intelligence (AI) classification models in order to avoid additional imaging assessment, potentially delaying management, increasing cost, and risk of complications in the initial evaluation of suspected pediatric appendicitis.

MATERIALS AND METHODS: This is an IRB-approval retrospective study of 1111 pediatric patients with a history of appendicitis-like symptoms admitted to the emergency room between 2015 and 2019. Patients that underwent both CT and US were included in the study (N=396, 203 females and 193 males, 9.11 ± 4.14 years old at US and/or CT scan). Demographic and clinical information such as age, BMI, gender, Alvarado score were collected from the electronic medical record. Additionally, anthropometric measurements such as

waist circumference (WC) and the sagittal abdominal diameter (SAD) were measured. Different approaches were implemented using in-house algorithms written in Python to select the best modality to diagnose appendicitis using two different analyses types: (1) bivariate analysis which involved two independent variables such as body mass index (BMI) and SAD and, (2) multivariate analysis which included parameters such as age, gender, BMI, PMNs(%), ANC, Alvarado Score, WC and, SAD. The models tested were logistic regression (LR), K-nearest neighbors (K-NN), support vector machine (SVM), Naïve Bayes (NB), decision tree (DT) and, random forest (RF). The full cohort was split into training set and test set before running the algorithms. Diverse training set to test set ratios were tested and compared: 80/20, 85/15, 90/10, and 95/05. Statistical analysis was performed using IBM® SPSS® statistics software version 25. Comparisons between the models were based on their prediction accuracy (acc) to select the modality that had a correct diagnosis of appendicitis.

RESULTS: Our previous predictor model was based on BMI interactions (AUC=0.65, p<0.001). In this study, all AI classification models (except NB) had moderate to good predictive accuracy (acc>0.60) in the bivariate analysis when were used train/test ratios equal to 0.90/0.10 and 0.95/0.05. In addition, DT and RF had a strong predictive accuracy (acc=1.0 and 0.80, respectively) in the multivariate analysis for train/test ratio equal to 0.95/0.05 (Table 1).

CONCLUSION: Advanced AI classification methods are able to select the most accurate and timely modality to diagnose appendicitis in children, avoiding additional procedures, delays, increased costs, and complications.

		Classification Models Accuracy						
Analyses type	Train/Test ratio	LR	K-NN	SVM	Kernel SVM	NB	DT	RF
Bivariate*	0.75/0.25	0.52	0.64	0.52	0.52	0.52	0.56	0.56
	0.80/0.20	0.45	0.60	0.50	0.55	0.50	0.50	0.40
	0.85/0.25	0.47	0.60	0.47	0.47	0.40	0.53	0.60
	0.90/0.10	0.50	**0.60**	0.50	0.50	0.50	0.60	**0.70**
	0.95/0.05	**0.80**	0.40	**0.80**	**0.60**	0.40	**0.60**	0.60
Multivariate§	0.75/0.25	0.39	0.56	0.43	0.58	0.43	0.61	0.61
	0.80/0.20	0.42	0.58	0.47	0.58	0.42	0.53	0.63
	0.85/0.25	0.57	0.57	0.64	0.57	0.57	0.50	0.50
	0.90/0.10	0.50	0.50	0.60	0.60	0.60	0.70	0.50
	0.95/0.05	0.60	0.40	0.60	0.60	0.60	**1.00**	**0.80**

Abbreviations: Logistic Regression (LR), K-Nearest Neighbors (K-NN), Support Vector Machine (SVM), Naive Bayes (NB), Decision Tree (DT), Random Forest (RF).
*The bivariate analysis included two parameters: Body Mass Index (BMI) and, Sagittal Abdominal Diameter (SAD).
§The multivariate analysis involved parameters such as age, gender, BMI, PMNs(%), ANC, Alvarado score, WC and, SAD.

9:10 BREAK

O6.12

9:15 THE ASSOCIATION BETWEEN MENTAL HEALTH AND PREVENTIVE REGULATION OVER COVID-19 (undergraduate oral)

Mary Margaret Mitchell (Presenting) , Ben Porter

Mississippi State University, Starkville, MS, USA

Introduction: COVID-19 is a worldwide pandemic that has caused wide-spread preventive actions by governments all around the world to slow the spread. During COVID-19, mask mandates, gathering bans, closing of bars, and stay-at-home orders were all government regulations in the United States that differed by location and time. Additionally, anxiety and depression have already been shown to increase during COVID-19 although emotional reaction to the COVID-19 pandemic have differed. Government regulation could have caused a rise or decrease in anxiety and depression throughout the pandemic, and research relating to government regulation and mental health could provide valuable insights to those in government positions. Furthermore, more fine-grained temporal and geographic research concerning COVID-19 would be valuable in mental health research, because not everyone will be impacted in the same way at the same time by COVID-19 or government regulations. The current research used publicly available data to examine the association between reports of depression and anxiety in relation to

Methods: Depression and anxiety were assessed with the COVID cast dataset. Each variable represents the proportion of individuals in a particular county endorsing depression or anxiety, respectively. Preventive measures were obtained from CDC datasets which contain relevant orders for each county in the US at each day across the pandemic. Cross-classified mixed models were used to evaluate depression and anxiety separately. Given that each observation was nested within county and day, these models contained random intercepts for both factors. Fixed effects for bar restrictions, gathering bans, mask mandates, and stay-at-home orders were entered simultaneously in each model.

Results: Models estimated 12.5% depression prevalence and 16.8% anxiety prevalence in the absence of protective measures. Bar closures were not related to depression (p=.34), but gathering bans, mask mandates, and stay-at-home orders were (p's<.001). Specifically, restricted (b=.11, p=.003) and total (b=.46, p<.001) gathering bans, mask mandates (b=.18, p=.01), and restricted stay-at-home orders (b=.18, p<.001) were associated with higher depression; however, complete stay-at-home orders were associated with lower depression (b=-.59, p<.001).

Neither mask mandates (p=.20) or stay-at-home orders were associated with anxiety (p=.90), but bar closures and gathering bans were (p's<.001) Specifically, reduced (b=.30, p<.001) and complete bar closures (b=.33, p=.02) and partial (b=.32, p<.001) and complete gathering bans (b=.70, p<.001) were associated with higher anxiety.

Conclusion: Increased levels of preventive measures were generally associated with increased reports of depression and anxiety, except for complete stay-at-home orders being associated with lower levels of depression. These data are cross-sectional, and the causal mechanisms of these associations cannot be determined from these data. Increased reporting of symptoms may result from the increased salience of COVID as burdens exist but may also reflect the direct impact that these restrictions have on individuals' personal finance and well-being. However, these results suggest that preventive measures may also play a role in the increased prevalence of mental health issues during the pandemic.

O6.13

9:25 SEGMENTATION OF ROUTINE CT IMAGES THROUGH DEEP LEARNING FOR BODY COMPOSITION ASSESSMENT (undergraduate oral)

Edward Florez, Baylor Obert (Presenting), Candace Howard

University of Mississippi Medical Center, Jackson, MS

Introduction: Obesity is a leading cause of multiple metabolic disorders as well as chronic inflammation. Obesity-related conditions such as cardiovascular disease, diabetes mellitus, some types of malignancy, and hepatic steatosis are associated with systemic pathologies that increase risk of death in these

individuals. Methods to measure body composition, an individual's configuration of muscle mass and fat deposits, are important assessment tools to quantify the risk of development of cardiovascular disease and other obesity-related diseases. The current gold standard for measuring body composition requires an expert reader manually segmenting muscle and fat depot volumes on CT abdominal images using a validated software like Slice-O-matic. However, segmentation of a patient's CT images takes 35 minutes even with experts of imaging anatomy, making it tedious, expensive, and time-consuming. The goal of the study was to perform a fast and accurate segmentation of the muscle and fat depots from CT abdominal images.

Methods: Deep learning (DL) is a type of machine learning in which a model learns to perform classification tasks directly from images. A deep neural network architecture was implemented in Keras to classify each pixel in an image from a predicted set of classes or semantic labels. The labels were chosen based on Hounsfield Unit (HU) values: adipose tissue from -190 to -30 HU, and skeletal muscle tissue from -29 to 150 HU. Adipose tissue was divided into two anatomical compartments with different labels, subcutaneous adipose tissue (SAT) outside the abdominal wall and visceral adipose tissue (VAT) as the intra-abdominal fat surrounding and within organs. A training stage of the DL algorithm was executed using the data of four patients with 96 CT abdominal images contoured by an experienced reader through the initially established semantic labels.

Results: Several convolutional layers, non-linear activations, batch normalization, upsampling layers, and pooling layers constitute the model with a symmetrical encoder-decoder framework. This complete pipeline allows the automatic segmentation of a single slice or a set of slices with an accuracy of 0.713 and a standard deviation of 0.065. The average inference time to segment a slice was 0.097 minutes.

Conclusion: The fully automated body composition analysis is accurate and dramatically reduced body composition analysis time by other validated techniques and softwares, making this a feasible biomarker to explore risk stratification of obesity-related diseases on routine CT exams.

O6.14

9:35 RELATIONSHIP BETWEEN MUSCLE AND BONE MASS WITH RISK OF LIVER FIBROSIS IN NAFLD

Juliana Sitta, William Varner (Presenting), Zachary Wilson, Jon-Michael Stork, Yousef Dawoud, Lora Nason, Edward Florez, Candace Howard

University of Mississippi Medical Center, Jackson, MS

To assess the relationship between bone mineral density (vBMD) and body composition with risk of liver fibrosis across races in patients with non-alcoholic fatty liver disease (NAFLD).

For this retrospective study, adult patients diagnosed with NAFLD on abdominal CTs performed between 2004 and 2016 were selected (N=681). Patients with CT artifacts and relevant comorbidities were excluded (N=116). vBMD was measured using a validated quantitative CT software (QCT-Pro). Segmentation of fat and muscle was performed on twenty-four CT slices using a multi-layer segmentation software (Slice-o-matic). Liver surface nodularity (LSN) scores were obtained using a validated quantitative software. Linear regression and logistic models were used to analyze the relationship between parameters.

Muscle attenuation and vBMD were greater in African Americans (AAs) compared to Whites ($p<0.001$). There was an inverse correlation between muscle attenuation and risk of liver fibrosis by NAFLD score in the overall population ($R= -0.41$, $p<0.001$); this correlation was higher in AAs ($R= -0.51$, $p<0.001$) compared to Whites ($R= -0.41$, $p<0.001$). VAT showed a greater correlation with LSN scores in Whites ($R=0.31$, $p<0.001$) compared to AAs ($R=0.17$, $p=0.02$). Males showed increased SAD and risk of liver fibrosis compared to females, while there was no significant difference in vBMD between genders.

In conclusion, there were significant differences between races in body fat distribution, muscle composition, vBMD, and risk of advanced liver disease. Opportunistic assessment of vBMD and body composition may be beneficial in patients at risk for metabolic disorders.

Friday, April 1, 2022

MORNING

Room: D12

Oral Presentation session B2

Moderators:

Drs. David Gordy, Ritesh Tandon, & Kenneth Butler

University of Mississippi Medical Center

Topics:

Molecular Diagnostics/Cell Biology/Material Sciences

O6.15

8:30 USE OF MACHINE LEARNING TO DIFFERENTIATE RESIDUAL TUMOR FROM RADIATION CHANGES IN HEAD AND NECK CANCER PATIENTS TREATED WITH DEFINITIVE CHEMO RADIOTHERAPY (undergraduate oral)

Edward Florez[1], Aubrey Smyly[1] (Presenting) Toms Thomas[1], Seth Lirette[1], Ali Fatemi[2], Candace Howard[1],

[1]University of Mississippi Medical Center, Jackson, MS, USA, [2.] Jackson State University.

INTRODUCTION: Surveillance imaging for head and neck cancer patients treated with definitive chemo radiotherapy has difficulty in differentiating residual disease from radiation changes or inflammation. Early detection of the residual disease is particularly crucial as those patients have poor outcomes if not treated aggressively. On the other hand, these shortcomings in the imaging might lead to unnecessary interventions, including salvage surgery in patients without residual disease.

PURPOSE: The purpose of this study is to assess the use of machine learning models to differentiate residual disease from radiation changes using radiomic features extracted from surveillance CT scans.

MATERIALS AND METHODS: A HIPPA-compliant, IRB-approved retrospective post hoc analysis of patients with squamous cell carcinoma of the head and neck (HNSCC) treated with definitive chemo radiotherapy at our institution was performed. From them, 36 patients reported having a residual disease on the first surveillance CT soft tissue of the neck (at two months after chemo radiation) were selected. The information regarding further follow up imaging, salvage surgery with pathology, and long-term outcomes were collected. All gross

tumor volumes (GTVs) were transferred from the treatment planning CT scan (CT1) to a DICOM viewer (MIM Software Inc., v6.7.10). Then, a radiologist contoured the residual lesions in the two months follow-up CT (CT2) and three months follow-up PET/CT scan (CT3) through MIM's tools. Next, GTVs were exported to MatLab using an extension written in Java, which was incorporated into MIM. Then, radiomic features were extracted from ROIs (2D) and VOIs (3D) lesion contours through quantitative in-house MatLab algorithms using different approaches. Finally, machine learning models were used to identify the radiomic features that predict changes and progression in HNSCC patients treated with chemo radiotherapy.

RESULTS: Support vector machine models using 2D radiomic features, extracted from CT2, were associated with residual disease on PET/CT exams (AUC = 0.702). 2D radiomic features extracted from PET/CT had moderate predictive ability to predict positive pathology for residual tumor (AUC = 0.667). Neural network and random forest models of 3D radiomic features extracted from CT2 and PET/CT had good and moderate predictive ability to predict positive pathology for residual tumor (AUC = 0.720 and 0.678, respectively).

CONCLUSION: ML models using 2D and 3D radiomic features derived from pre- and post-treatment CT data show promise for predicting residual tumor from radiation changes and inflammation in a small group of HNSCC cancer patients treated with chemo radiotherapy.

O6.16

8:40 -AUTOMATED EVALUATION OF MR LIVER ELASTOGRAPHY (graduate oral)

Lance Jaynes (Presenting, Elliot Varney, Judd Storrs, Manohar Roda, Candace Howard,

University of Mississippi Medical Center, Jackson, MS, USA

Object or Purpose of Study : Magnetic Resonance Elastography (MRE) is an emerging noninvasive clinical technique for quantifying liver stiffness. Evaluation requires selection of complex regions-of-interest (ROI) that integrate multiple image series. This can be difficult for readers particularly given limitations of clinical PACS. The goal of this work was to develop a semi-automated system to assist and facilitate evaluation of liver MRE.

Materials, Methods, and Procedures : Four-slice MRE was obtained at 1.5T prior to biopsy as part of an IRB-approved study of noninvasive tests for staging chronic liver disease. MRE acquisition and analysis conformed to the QIBA stage 2 consensus profile for MRE of the Liver. ROI were selected within the 95% confidence region, avoiding major blood vessels, and staying 1cm from the liver surface. Whole-liver stiffness measurements were obtained by weighted average of the ROI. A prototype for simplifying ROI selection was implemented in Matlab. Whole-liver stiffness is computed by eroding the liver surface ROI by 1cm and combining it with the 95% confidence map. A report and images depicting ROI outlines superimposed on MRE magnitude, wave and stiffness images are produced and stored in PACS for review.

Results : MRE was obtained for 17 subjects enrolled in the study (12 female;mean age 54). Average liver stiffness on manual evaluation was 5.7 kPa (range:2.43-15.4 kPa). ROIs produced using the semi-automatic method were 8.4 cm2 larger on average than manual (-91.4 to +151.0 cm2). Whole-liver stiffness for both methods had strong agreement (R2=0.998). Paired T-test of liver stiffness was not statistically significant ?=-0.03 kPa (P=0.661; 0.25 kPa stdev; -0.65 to +0.45 kPa).

Significance: With the aid of an offline-computer algorithm to accurately outline the liver and avoid wave interference on the liver edge, the reader could make a sufficiently large, adequate quality ROIs, with less effort. We have shown that we could potentially reduce inter-reader variability, expedite image processing, and maintain diagnostic accuracy using QIBA MRE protocols for liver stiffness with the use of this software system.

O6.17

8:50 INHIBITION OF SARS-COV-2 WUHAN STRAIN AND DELTA VARIANT ENTRY INTO THE HOST CELLS USING HUMAN HOST DEFENSE PEPTIDES CONJUGATED GRAPHENE QUANTUM DOTS (graduate oral)

Avijit Pramanik[1], Poonam Sharma[2] (Presenting),Shamily Patibandla[1], Ye Gao[1], Vinod Ruppa-Kasani[1], Jagruti Goli[1], Animesh Kumar[1], Abhirup Chatterjee, Sudarson Sekhar[1] Sinha John Bates[2], Michael Bierdeman[2], Ritesh Tandon[2], Paresh Chandra Ray[1]

[1]Jackson State University, Jackson, MS, USA, [2] University of Mississippi Medical Center, Jackson, MS, USA

Coronavirus Disease 2019 (COVID-19) is a significant health problem worldwide now as a result of the pandemic caused by severe acute respiratory syndrome coronavirus (SARS-CoV-2). COVID-19 infection is initiated by SARS-CoV-2 spike glycoproteins (S-protein) attaching to the angiotensin-converting enzyme 2 (ACE2) receptor on the host cell surface. The emergence of novel SARS-CoV-2 variants with mutations in the S-protein receptor-binding domain (RBD) may result in a stronger attachment to the ACE2 receptor, resulting in greater infectivity and transmissibility. The Delta (B.1.617.2) variant shows increased transmissibility along with the potential reduction in neutralization by monoclonal antibody therapy and by post-vaccination sera. Therefore, there is a crucial need for potential anti-SARS-CoV-2 drug candidates.

In this study, we demonstrate for the first time that human host defense neutrophil α-defensin HNP1 and human cathelicidin LL-37 peptide conjugated graphene quantum dots (GQDs) can prevent the SARS-CoV-2 entry into the host cells by inhibiting the binding of S-protein RBD to the host cells ACE2. We used green fluorescent protein tagged baculovirus pseudotyped with SARS-CoV-2 wild-type S-protein and luciferase murine leukemia virus pseudotyped with SARS-CoV-2 Delta variant S-protein to screen for the SARS-CoV-2 entry inhibition into human ACE2 expressing HEK293T cells. We found that the LL-37 peptide and HNP1 peptide attached GQDs exhibited a significantly higher inhibition than only one type of peptide attached GQDs. These findings have implications for developing a new antiviral therapeutic agent against SARS-CoV-2 that block the S-protein binding to the ACE2 receptor.

O6.18

9:00 INTER-OBSERVER AGREEMENT OF A SOFTWARE-BASED LIVER SURFACE NODULARITY SCORE FOR USE AS A QUANTITATIVE CT IMAGING BIOMARKER FOR CHRONIC LIVER DISEASE (graduate oral)

Richard Covington (Presenting), Elliot Varney, Edward Florez, Candace Howard,

University of Mississippi Medical Center, Jackson, MS, USA

PURPOSE: To evaluate repeatability of a software-based liver surface nodularity (LSN) score derived from CT images.

METHODS: For the IRB-approved HIPAA-compliant retrospective single center observational study, abdominal CT images from 68 patients with various stages of chronic liver disease were gathered. Inter/intra observer agreement and test-retest repeatability among 12 readers of various experience assessing LSN by software-based versus visual scoring systems were evaluated by ICC. The cohort included adult patients who had undergone two abdominal CT scans within a 60-day period. Of included scans, 51 of the 68 total were multiphasic contrast enhanced, with the remaining scans non-contrasted. Patient scans were de-identified and randomized into 7 unique subsets for evaluation - time point one (TP1) visual, TP1 software, repeat TP1 visual, repeat TP1 software, time point two (TP2) visual, TP2 software, multiphasic. Each reader received a cumulative 1 hour of video training for both visual and software scoring and performed 12 training cases for the LSN software. Each of the 4 reading sessions (TP1, repeat TP1, TP2 and multiphasic) consisted of first visually assessing the indicated time point followed by the software assessment of that time point. The multiphasic session included only software assessment of the 51 scans including non-contrast and portal venous phase. Training sessions were a minimum of 2 weeks apart to preclude recall bias. Visual and software scores and time spent assessing each scan were recorded by one of the study investigators for each session.

RESULTS: Inter-observer analysis for software-based LSN scores for all time points was highly correlative, and LSN software was significantly superior to visual assessment. when compared to visual assessment. LSN showed very good inter-observer agreement in TP1 (ICC:0.82; 95%CI: 0.76-0.86), repeat TP1 (ICC:0.81; 95%CI: 0.74-0.85), and TP2 (ICC:0.85; 95%CI: 0.80-0.89) when compared to visual TP1, repeat TP1 (ICC:0.61, ICC:0.64, and ICC:0.62 respectively). LSN analysis of test-retest between TP1 and TP2 (ICC: 0.XX) and test repeatability between TP1 and repeat TP1 (ICC:0.XX) were also superior to that of visual (ICC: 0.XX and ICC: 0.XX, respectively).

CONCLUSION: The software-based LSN score is a precise quantitative CT imaging biomarker with high inter-observer, intra-observer, and test-retest agreement.

CLINICAL RELEVANCE STATEMENT: Quantification of chronic liver disease with liver surface nodularity has very good intra-observer agreement and test-retest repeatability, making it widely applicable and suitable for multi-institutional utilization.

9:10 BREAK

O6.19

9:15 ALIC AND ALID OF NONENCAPSULATED STREPTOCOCCUS *PNEUMONIAE* REGULATE CBPAC EXPRESSION AND REDUCE COMPLEMENT MEDIATED CLEARANCE (graduate oral)

Courtney D. Thompson (Presenting), Wes S. Miller , Jessica L. Bradshaw, Larry S. McDaniel, Lance E. Keller

University of Mississippi Medical Center, Jackson, MS, USA

Nonencapsulated *Streptococcus pneumoniae* (NESp) is an emerging human pathogen that colonizes the nasopharynx and is associated with noninvasive diseases such as otitis media, conjunctivitis, and nonbacteremic pneumonia. One way NESp is cleared from the nasopharynx and during disease is through opsonophagocytosis activated by the classical pathway of the complement system. The classical pathway can be activated by C-Reactive Protein (CRP) binding to phosphocholine on the bacterial surface. NESp proteins AliC and AliD, unique oligopeptide transporters, regulate downstream gene expression and are required for virulence. One gene regulated by AliC and AliD is Choline binding protein AC (CbpAC), whose homologs have been shown to reduce CRP binding. We hypothesize that CbpAC dysregulation in AliC and AliD mutants leads to increased CRP binding, increasing C1q deposition and decreasing systemic survival. Binding of CRP is determined through flow cytometry, fluorescent microscopy, and ELISA to determine deposition of human CRP on whole bacterial cells. NESp and isogenic mutants of AliC, AliD, CbpAC, and other proteins regulated by AliC and AliD will be tested for CRP binding. Previous results indicate increased phagocytosis and C1q deposition in the AliC and AliD isogenic mutants and an increase in the C3b opsonin in the CbpAC mutant. Understanding the mechanism for immune evasion is an important aspect in developing novel methods to control bacterial infections. Through regulation of CbpAC expression, NESp alter CRP deposition and hinder an important step in targeting bacteria for opsonophagocytosis.

O6.20

9:25 ANTI-NECROPTOTIC FUNCTION OF HCMV UL45 (graduate oral)

Christian Yu[1] (Presenting), Lisa Daley-Bauer[2], Ritesh Tandon[1]

[1]University of Mississippi Medical Center, Jackson, MS, USA, [2] Emory University School of Medicine, Atlanta, GA, USA

The human cytomegalovirus (HCMV) UL45 gene encodes an HCMV tegument protein that is likely involved in the prevention of necroptosis in virus infected cells. HCMV has been recently shown to sequester and degrade key proteins involved in necroptosis; however, which viral proteins are involved in this sequestration are still unknown. Recent studies with M45, the murine cytomegalovirus homolog of pUL45, show that M45 prevents necroptosis in virus infected cells by interactions between M45 and host receptor interacting protein 1 (RIP1) and receptor interacting protein 3 (RIP3). These interactions have not yet been explored in the HCMV infection setting and are the aim of our research.

In order to study pUL45's possible roles in necroptosis prevention, we created a mutant strain of HCMV with a stop-frameshift deletion in UL45 using bacterial artificial chromosome (BAC) mutagenesis. This virus is being characterized by viral growth curves and is being used in our necroptosis prevention studies. In addition, we cloned UL45 into a plasmid for protein-protein interaction studies. We have performed multiple co-

immunoprecipitations with pUL45 and host proteins involved with necroptosis. Finally, to study necroptosis prevention in the HCMV infection setting, we developed a novel cell culture model to induce necroptosis in fibroblasts. This model is being optimized and verified since fibroblasts have not been known to undergo necroptosis.

O6.21

9:35 PROPER GLYCOSYLATION OF IGA1 IS REQUIRED FOR CLEAVAGE BY Streptococcus pneumoniae IgA1 PROTEASE

Mary Carr (presenting), Kevin Lovell, Mary Marquart, University of Mississippi Medical Center, Jackson, MS, USA

O6.22

9:45 EVALUATION OF OXIDATIVE STRESS FACTORS AND INSULIN SYNTHESIS USING PANC-1 CELL LINE EXPOSED TO VARIOUS GLUCOSE CONCENTRATIONS AS A MODEL

Gary Lamar Hamil[1], Michelle Tucci[1], Ham Benghuzzi[2], Kenneth Butler, Jr.[1]
[1]University of Mississippi Medical Center, Jackson, MS, USA,
[2]Global Training Institute, Flowood, MS, USA

The incidence of diabetes has continued to rise among the US population and can have devastating effects on patients. An assessment of an alternative innovative method to minimize the hyperglycemic condition, mandates the evaluation of biochemical markers (Oxidative radical generation namely Glutathione and Malondialdehyde (MDA)) and structural changes through cell proliferation or cell count. Previous experiments conducted in our labs provided promising results that PANC-1 cells can be manipulated to produce insulin by increasing the amount of glucose in culture medium. This study aimed to provide more evaluation of PANC-1 cells in order to determine the cell proliferation, insulin synthesis, glutathione and MDA levels in response to increasing amounts of glucose (0, 1%, 2.5%, and 5%) incubated in three phases for 24, 48 and 72 hours, respectively. Initially, cells were grown in flasks with a control medium and then split into four separate groups containing control media or media containing an extra 1%, 2.5%, or 5% extra glucose. Cells from the three cultures were plated (1 x 105 cells/well) and treated with control, 1%, 2.5%, or 5% glucose for 24, 48, and 72 hours. Cells and supernatants were harvested, and cell counts, insulin secretion, glutathione and malondialdehyde production were compared across all three phases within groups. Data were analyzed using parametric statistics to compare changes within all four groups using the ANOVA statistic and Bonferoni post-hoc testing. There were statistically significant differences within groups at 24-, 48-, and 72-hours ($p<0.05$). Although cell numbers declined, insulin production increased with rising glucose media. And, as insulin secretion increased both MDA and glutathione levels also rose. As cell counts decreased with rising glucose media, MDA levels rose showing an increase in free radical formation and oxidative stress. Glutathione levels also increased as MDA increased in order to couteract increased oxidative degradation on PANC-1 cells. This study contributes valuable quantitative data regarding cellular secretions of PANC-1 cells over 72-hours with increasing glucose challenge and further demonstrates that PANC-1 cells adapt to increasing glucose concentrations by increasing insulin production and increasing glutathione production to counteract MDA and lowering cell counts. PANC-1 cells continue to show they can be engineered into useful components in drug delivery applications for the treatment of diabetes.

Friday, April 1st 2022

MORNING

Room: **D2**

10:10 AM **Symposium II**

Theme: OMICs APPLIED IN THE DISEASE DIAGNOSTICS

Moderators: Drs. D. Olga McDaniel, Edward Florez and Maricica Pacurari

University of Mississippi Medical Center and Jackson State University

10:10 -12:00 Noon Speakers and Topics

(Speakers information can be found in the section on Divisional symposia and Workshop)

10:15-10:40 AM Dr. Errol C. Crook,

Chair and Abraham A. Mitchell Professor, Internal Medicine, University of South Alabama College of Medicine, Mobil Alabama

Kidney disease and Therapeutics

Dr. Crook will discuss cause of diabetic kidney disease and prevalence in population diversity.

10:45-11:10 AM **Dr. Michael E. Hall**

Associate Professor of Medicine, and Interim Chair

University of Mississippi Medical Center

Hypertension and Transition to Heart Failure

Dr. Michael Hall will discuss potential mechanisms in the transition from hypertension to heart failure, including studies of cardiac imaging, circulating biomarkers, inflammation, and kidney dysfunction.

11:15-11:40 AM **Dr. Paul Byers,**

State Epidemiologist, Mississippi Department of Health

COVID-19 Pandemic Update- Mississippi, 2022

Dr. Byers will provide review of current epidemiology of COVID-19 in Mississippi, the disproportionate racial impacts of cases/deaths, and current vaccination data for Mississippi and how vaccinations have impacted transmission and deaths, especially among the most vulnerable populations.

11:45-12:00 Noon

Symposium II Questions and Discussions

12:00-1:00 PM

Poster session II (MAS High School Posters)

P6.46

A BACTERIOPHAGE-BASED METHOD FOR ASSESSING CONTAMINATION RISK IN DENTAL AND RESEARCH LABORATORY PROCEDURES *(High School poster)*

Lucas Morrisey (Presenting)[1], BasePair Program, Murrah High School, Casey Park[2], Niping Wang[2], Jennifer Bain[2], Stephen Stray[1],

[1]Department of Microbiology and Immunology, University of Mississippi Medical Center, Jackson, MS, USA, [2]School of Dentistry, University of Mississippi Medical Center, Jackson, MS, USA

The ongoing COVID-19 pandemic has incited worries over whether dental, medical, and research laboratory procedures could spread infectious materials. In particular, dental and laboratory procedures may generate splashes, droplets, and aerosols containing virus particles due to the use of sonication and high-powered water sprays for cleaning teeth. We have developed a method to investigate the risks associated with such activities, using the *Escherichia coli* bacteriophage ϕX174. ϕX174 does not infect eukaryotic cells, and its *E. coli* host can be grown at biosafety level-1 (BSL-1). As a surrogate for dental procedures, bacteriophage stocks were mixed with fluorescein and subjected to sonication for varying lengths of time in vessels of different wall heights. The aerosols and droplets produced by the sonication were caught on filters placed at various locations in the room and on the operator of the sonicator. Aerosols were also measured using filters placed on a vacuum manifold located behind a partition to prevent splashes. Materials caught on the filters were assayed for the presence of fluorescein by measuring fluorescence. The presence of bacteriophage was assayed in a liquid phase growth assay, rather than the more labor intense plaque assay. The greatest contamination was found closest to the sonicator and the amount was affected by the height of the vessel wall. Preliminary data suggests that aerosol production also varied with vessel wall height. This procedure will allow us to experimentally evaluate the potential contamination risks of laboratory and medical procedures suspected of producing biological contamination.

P6.47

AZITHROMYCIN REDUCES LIPOPOLYSACCHARIDE-INDUCED BRAIN AND SPINAL CORD INFLAMMATION AND NEUROBEHAVIORAL IMPAIRMENTS IN NEONATAL RATS *(Base Pair Neuroscience)*

Jakota McMillan[1,2] (presenting), Jonathan Lee[2], Malachi Morris[1,2,] Nathaniel Lee[2], Ashton Castle[2], Valerie Quach[2], Michelle Tucci[3], Khushboo Patel[3], Norma Ojeda[2], Yi Pang[2], Lir-Wan Fan[2]

[1]Base Pair Program, University of Mississippi Medical Center/Murrah High Schoo, Jackson, MS, USA, [2]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS, USA, [3] Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS, USA

Inflammation plays an important role in brain injury in neonatal human and animal models. Our previous studies have shown that systemic administration of endotoxin lipopolysaccharide (LPS) induces sensorimotor neurobehavioral dysfunction and brain inflammation in neonatal rats, which is associated with the production of pro-inflammatory cytokines by activated microglia. The objective of the current study was to determine whether azithromycin, a putative suppressor of microglial activation, ameliorates LPS-induced brain inflammation and neurobehavioral dysfunction. Intraperitoneal (i.p.) injection of LPS (2 mg/kg) was performed in P5 rat pups and azithromycin (40 mg/kg) or vehicle was administered (i.p.) 5 min after LPS injection. Control rats were injected (i.p.) with sterile saline. Neurobehavioral tests were performed and brain inflammation was examined on P6, 24 hours after LPS exposure. Our results showed that neonatal systemic LPS exposure results in hypothermia, allodynia, hyperalgesia, reduction in pre-social interaction (ultrasonic vocalization), and sensorimotor neurobehavioral deficits in righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension tests in P6 rats. LPS exposure also increased levels of microglia activation-related pro-inflammatory cytokines including interleukin-1β (IL-1β) in the P6 rat serum, brain and spinal cord. Azithromycin treatment significantly reduced LPS-induced neurobehavioral deficits and the increase in levels of pro-inflammatory cytokines in the P6 rat serum, brain and spinal cord. These results suggest that azithromycin may provide protection against systemic LPS exposure-induced brain inflammation and neurobehavioral disturbances, and that the protective effects are associated with its ability to attenuate LPS-induced microglia activation-related pro-inflammatory cytokines.

P6.48

INTRANASAL INSULIN ATTENUATES BRAIN INFLAMMATION AND LIPID PEROXIDATION AND IMPAIRED NEUROBEHAVIORAL PERFORMANCE FOLLOWING LIPOPOLYSACCHARIDE EXPOSURE IN NEONATAL RATS *(Base Pair Neuroscience)*

Malachi Morris[1](presenting), Jonathan Lee[2], Elizabeth White[2], Jakota McMillian[1,2], Jhanel Greene[2], Michelle Tucci[3], Khushboo Patel[3], Bryan Fan[3], Gene Bidwell III[4], Norma Ojeda[2], Yi Pang[2], Lir-Wan Fan[2]

[1]Base Pair Program, University of Mississippi Medical Center/Murrah High School, Jackson, Mississippi, USA.[2]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, Mississippi, USA.[3]Department of Anesthesiology, University of Mississippi Medical Center, Jackson, Mississippi, USA.[4]Department of Neurology, University of Mississippi Medical Center, Jackson, Mississippi, USA

Inflammation and oxidative stress play important roles in neonatal brain damage. Previous studies from our lab showed that systemic administration of lipopolysaccharide (LPS) induces brain damage and neurobehavioral dysfunction in neonatal rats, which is associated with the production of pro-inflammatory cytokines and oxidative stress. Recent studies suggest that intranasal insulin treatment could be a neuroprotective agent in adult animals. Therefore, the objective of this study was to determine whether intranasal insulin treatment reduces LPS-induced brain inflammation and oxidative stress, as well as neurobehavioral dysfunction in neonatal rats. LPS (2 mg/kg) or sterile saline was administered via intraperitoneal (i.p.) injection in postnatal day 5 (P5) Sprague Dawley rat pups, and recombinant human insulin (25 μg) or vehicle was administered to each nostril 5 min after LPS injection. Sensorimotor behavioral tests were carried out 24 hours (P6) after LPS exposure and brain tissues were collected to determine pro-inflammatory cytokine

interleukin-1β (IL-1β) and lipid peroxidation. Our results showed that intranasal insulin reduced LPS-induced sensorimotor disturbances, as indicated by improvement in righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension tests at P6. Intranasal insulin also reduced LPS-induced increase in levels of IL-1β and thiobarbituric acid reactive substances (TBARS) contents, suggesting anti-inflammatory and anti-oxidative effects. Our study suggests that intranasal insulin affords a broad neuroprotection by targeting multiple signaling pathways including inflammation and oxidative stress.

P6.49/ P2.44

MoWa: A DISINFECTANT FOR HOSPITAL SURFACES CONTAMINATED WITH METHICILLIN RESISTANT Staphylococcus aureus (MRSA) AND OTHER NOSOCOMIAL PATHOGENS *(Cell and Molecular)*

Landon Murin [1,2](presenting), Tyler Gregory[2], Jorge Vidal[2], Ana Vidal[2], Babek Alibayov[2]

[1]Base Pair Program – Murrah High, Jackson, Mississippi, USA, [2]University of Mississippi Medical Center, Jackson, Mississippi, USA

Introduction. Staphylococcus aureus strains, including methicillin-resistant S. aureus (MRSA) and methicillin-sensitive S. aureus (MSSA), are a main cause of nosocomial infection in the world. The majority of nosocomial S. aureus-infection are traced back to a source of contaminated surfaces including surgery tables. We assessed the efficacy of a mixture of levulinic acid (LA) and sodium dodecyl sulfate (SDS), hereafter called MoWa, to eradicate nosocomial pathogens from contaminated surfaces.

Methods and Results. A dose response study demonstrated that MoWa killed 24 h planktonic cultures of S. aureus strains starting at a concentration of (LA) 8.2/(SDS) 0.3 mM while 24 h preformed biofilms were eradicated with 32/1.3 mM. A time course study further showed that attached MRSA bacteria were eradicated within 4 h of incubation with 65/2 mM MoWa. Staphylococci were killed as confirmed by bacterial counts and fluorescence micrographs stained with the live/dead bacterial assay. We then simulated contamination of hospital surfaces by inoculating bacteria on a surface prone to contamination. Once dried, contaminated surfaces were sprayed with MoWa, or mock-treated, and treated contaminated surfaces were swabbed and bacteria counted. While bacteria in the mock-treated samples grew at a density of ~104 cfu/cm2, those treated for ~1 min with MoWa (1.0/0.04 M) had been eradicated below the detection limit. A similar eradication efficacy was obtained when surfaces were contaminated with other nosocomial pathogens such as Klebsiella pneumoniae, Pseudomonas aeruginosa, Acinetobacter baumannii, or Staphylococcus epidermidis.

Conclusions. MoWa kills planktonic and biofilms made by MRSA and MSSA strains and showed great efficacy to disinfect MRSA-, and MSSA-contaminated, surfaces and surfaces contaminated with other important nosocomial pathogens.

P6.50

EXPOSURE TO REDUCED UTERO-PLACENTAL PERFUSION INDUCES MODEST SPATIAL MEMORY IMPAIRMENT IN ADULT MOUSE OFFSPRING *(Base Pair Neuroscience)*

Kennedi Stancil[1,2] (presenting), Maria Jones-Muhammad[1], Qingmei Shao[1], Junie Warrington[1]

[1]University of Mississippi Medical Center, Jackson, MS, USA.[2]Murrah High School, Jackson, MS, USA

Introduction: Offspring born to women with preeclampsia, a hypertensive pregnancy disorder, have increased risk of cognitive impairment during childhood and adulthood. The underlying mechanisms are not fully understood. **Hypothesis:** We hypothesized that offspring of mice subjected to reduced utero-placental perfusion (RUPP), used to model preeclampsia, will have impaired learning and memory function in adulthood compared to offspring from normal pregnancy.

Methods: Timed pregnant female SMA-GFP mice (n=1/ group) were subjected to normal pregnancy (no intervention) or surgical RUPP on gestational day 13.5. Mice were allowed to deliver and pups (n=7-8/ group) were weaned on postnatal day 21. At 6 months of age, offspring (males and females) were trained on the 20-hole Barnes maze task (4 trials/day over 4 days). The escape box was removed and memory was tested 24h (short-term) and 12 days (long-term) after the last training trial. The frequency of visits to each hole was recorded over a period of 90s.

Results: No significant difference in body weight or learning acquisition on the Barnes maze was noted between groups ($p>0.05$). However, offspring exposed to RUPP had short-term memory (day 5) impairment as they made more errors visiting the holes adjacent to the target hole compared to the normal pregnancy-exposed offspring ($p<0.05$). No difference in long-term (day 12) memory impairment was noted between groups.

Conclusions: Our results indicate that **in utero** exposure to RUPP results in short-term memory impairment with no significant effect on learning in adult mouse offspring. This is a preliminary study and more mice are being added to increase the sample size. The underlying mechanisms and whether there are sex differences in learning and memory function are ongoing studies.

P6.51/P3.34

THEORETICAL AND EXPERIMENTAL MEASUREMENT OF RADIOACTIVE POTASSIUM (K-40) IN SELECTED FERTILIZERS (0-0-60) (Chemistry)

Benjamin Billa[1] (presenting), Steve Adzanu[2], Michael Atkins[2], John Adjaye[2]

[1]Porter Chapel Academy, Vicksburg, MS, USA.[2]Alcorn State University, Lorman, MS, USA

Fertilizers are part of farming industry and play a major role in improvement of plants growth and enhancement of crop yields. One of the essential elements, potassium, helps in root growth and drought resistance of plants. Depending on soils fertility, farmers tend to provide potassium in the form of potash fertilizer which is derived from potash rock cored from earth's crust. Rocks derived from the earth's crust consist of trace quantities of Naturally Occurring Radioactive Materials (NORM) and their concentrations significantly vary based on rock type, geographical location, and the depth. Potash is a commonly used fertilizer derived from potash rock and to increase concentration of potassium, manufacturers increase percentage of potash which can eventually enhance radioactive concentrations (specifically K-40) in fertilizers. To exactly estimate and experimentally verify the levels of radioactive K-40 in selected fertilizers (0-0-60), a study was performed on fertilizers available in local market. K-40 was theoretically estimated by considering the half-life; molar mass; and decay constant while experimental studies were carried out by performing gamma-spectroscopy. Results suggest that the radioactivity concentrations of K-40 from theoretical estimation

and gamma spectroscopy are 15, 162 and 15, 242 Bq kg^{-1}, respectively. Results suggest that both experimental and theoretical K-40 values are compatible. Further, obtained results are compared to average K-40 concentration in soils within the US. Results indicated that K-40 concentration in potassium enhanced fertilizers considered in this study is significantly higher to the average K-40 concentration in US soils.

12:00 Noon. HSD Students Awards, Certificates and group photo

Friday, April 1st 2022

AFTERNOON

Room D2

1:30- 4:00 PM

The L.C. Dorsey Research Honor Society

Chair: JSU/UMMC-GTEC

The LC Dorsey Research Society Presentations

1:30-1:45 PM "Welcome and Opening"
Dr. April Carson

1:45-1:55 PM "Introduction"
Dr. Elizabeth Heitman, UT Southwestern

The L.C. Dorsey Research Honor Society is a regional, multidisciplinary network of social, behavioral, health, and citizen scientists created to recognize excellence in research contributing to the effort to improve health among vulnerable populations.

This is a new multidisciplinary network of social, health and citizen scientists. The society have contributed to the production of exceptional minority health disparities and education research. This honor society is comprised of graduate students, faculty and citizen scientist, who honor the life and legacy of Dr. L.C. Dorsey through a pursuit of research excellent, a focus on marginalized population and a willingness to invest in the next generation.

The society is named after Dr. L.C. Dorsey, a fierce social justice advocate and civil rights champion known for her commitment to improving the health and well-being of Mississippi's disadvantaged and disenfranchised populations.

2:00-3:00 PM Presentations

3:10-4:10 PM Presentations (Oral and Posters)

4:15-4:30 PM New Members Induction and Awards Ceremony

History and Philosophy of Science

Co-Chair: Gregory Johnson
Mississippi State University

Co-Chair: Robert Waltzer
Belhaven University

Vice-Chair: Paula Smithka
University of Southern Mississippi

Thursday, March 31, 2022

MORNING

Room D6

8:50 Welcome
Gregory Johnson

O7.01

9:00 BLOWING THE TRUMPET TO THE TULIPS: ON SOME POSITIVE EFFECTS OF HETERODOX IDEAS IN NEUROBIOLOGY

John Bickle

Mississippi State University, Mississippi State, MS, USA. University of Mississippi Medical Center, Jackson, MS, USA

Philosopher Ian Hacking (1983, p. 154) approvingly repeated a quote commonly attributed to physicist George Darwin, Charles and Emma's fifth child: "once in a while one should do a completely crazy experiment, like blowing the trumpet to the tulips every morning for a month. Probably nothing will happen, but if something did happen, that would be a stupendous discovery." But if a "crazy" experiment challenges an view widely held by a given field's leaders, Darwin's suggestion will nowadays fall on deaf ears. We live in a time of coerced, or at least pressured conformity to perspectives popular among a field's recognized elites. This enforced conformity is as entrenched in the natural sciences as it is in the social sciences, humanities, arts, popular media and politics. Asserting, even exploring views contrary to the "settled" ones is now widely condemned as not just cranky, but morally irresponsible, dangerous, maybe even treasonous or deadly. But by complying with this stricture, are we cutting ourselves off from an important source of new ideas and discoveries?

The recent history of neurobiology suggests that we are. Gary Lynch was one of the pioneers of late-20th century research that unraveled the molecular mechanisms of long-term potentiation (LTP), an activity-dependent form of synaptic plasticity, and demonstrated the roles its mechanisms play in the neurobiology of learning and memory. Less than a decade after the first systematic explorations of LTP were published by Timothy Bliss, Terje Lømo and Anthony Gardner-Medwin, Lynch's lab used electron microscopy to demonstrate post-synaptic effects of LTP induction in rats. These results stood in contrast to the then-dominant idea, popularized by Eric Kandel's work with **Aplysia** that emphasized pre-synaptic mechanisms for synaptic plasticity. Two years later Lynch's lab published the then-puzzling result that blocking free calcium ions in the post-synaptic dendrite blocked LTP induction. This result soon proved to be especially important for unraveling the role of activated N-methyl-D-aspartate (NMDA) receptors in both LTP induction and learning.

But perhaps the Lynch lab's boldest, most heterodox and contrarian ideas against neurobiological orthodoxy are found in

their research beginning in the late 1980s on the role of cell adhesion molecules as important mechanisms in LTP induction and in memory consolidation. These results flew directly in the face of the accepted views that both late-LTP and memory consolidation required new gene expression and protein synthesis driven by activated intracellular signaling mechanisms, kinases and gene transcription enhancers. But the Lynch lab's turn away from orthodoxy led to their discovery of an additional "stage" of LTP, one that the proscribed focus on new gene expression and protein synthesis was bound to miss.

There are important lessons to be gathered from a careful metascientific exploration of Gary Lynch's science-in-practice. These lessons are especially encouraging for would-be rebels in our current times, so stultifying for heterodox ideas, both within sciences and its broader culture.

O7.02

9:30 ACTIVE FORGETTING IN DROSOPHILA AND THE LIMITATIONS OF COGNITIVE PSYCHOLOGY

Gregory Johnson

Mississippi State University, Starkville, MS, USA

When tracking the stimuli that organisms receive and the behavior that they produce, it is not possible to differentiate between memories that no longer exist and those that are merely inaccessible. Since it is known that some seemingly inaccessible memories can be retrieved with the proper cues, the default stance in cognitive psychology has been that virtually all memories are permanent, albeit often inaccessible (Atkinson & Shiffrin 1971; Davis 2007; Wixted 2007). That memories might be permanently lost is not typically defended, although a model whereby some memory traces decay over time and are thereby lost is sometimes outlined (Baddeley 1999; Davis 2007).

Cellular and molecular investigations of memories that have been formed by associative learning in D*rosophila* suggest that there are mechanisms for "active forgetting." Recent research has revealed two small populations of dopaminergic neurons that innervate separate compartments in the mushroom body and drive the deletion of memory traces (Berry et al. 2012, Shuai et al. 2015). In contrast to those mechanisms, a separate cellular process has been found that underlies temporary forgetting (Sabandal et al. 2021). Multiple molecular processes in mushroom body neurons that appear to carry out the deletion of memory traces have also been identified (Gao et al. 2019, Himmelreich et al. 2017, Cervantes-Sandoval et al. 2020).

Hence, while forgetting is an aspect of memory that is opaque at the psychological level, the relevant neurobiological processes can, and are, being investigated. Moreover, these cellular and molecular investigations suggest that there are multiple mechanisms for actively erasing some memories. Not all memories are retained, and those that are lost do not merely decay away. The moral, then, is that the investigative methods used by cognitive psychology have an in-principle limitation, and that limitation, in turn, imposes a limitation on the explanations offered in cognitive psychology.

10:00 BREAK

Thursday, March 31, 2022

MORNING

Room D6

O7.03

10:15 WHAT'S WRONG WITH THE NEW BIOLOGICAL ESSENTIALISM? NOT MUCH.

Paula Smithka

University of Southern Mississippi, Hattiesburg, MS, USA

Despite the rejection of traditional essentialism by the received view in biology and philosophy of biology that biological taxa have essences, some recent approaches in these areas contend that biological taxa do have essences, but this new biological essentialism differs significantly from the traditional form. Among these recent defenders are: Griffiths (1997), Boyd (1999a, 1999b), Okasha (2002), LaPorte (2004), Wilson (1999), Wilson, et al. (2007), Devitt (2008, 2018a, 2018b). Austin (2017) has even argued that with recent evo-devo modifications, Aristotelian essentialism is compatible with evolutionary theory. The approaches taken by defenders of a new biological essentialism vary, but against all of them, Marc Ereshefky contends that the "costs of adopting the new biological essentialism are many, yet the benefits are none. Therefore, there is no compelling reason to resurrect essentialism when it comes to biological taxa" in his "What's Wrong with the New Biological Essentialism" (2010, p. 675). He argues against the Homeostatic Property Cluster approach (HPC) to essences and the Relational Essentialism approach. Against HPC, he makes 3 claims: (1) it's inconsistent with biological theory, (2) it fails to provide a non-circular means for identifying taxon essences, and (3) it conflates the distinction between kinds and individuals (pp. 675-676). Though Ereshefsky claims that relational essentialism gets the phylogenetic and populations relations of organisms correct with respect to biological practice, claiming that "the occurrence of certain relations **is** the species" (p.682), he contends that relational essentialism is not essentialism at all because it fails to bear the central explanatory burden of accounting for why the members of a kind have the traits that they do. Ereshefsky ultimately suggests that in order to resurrect essentialism, one might have to accept an open-ended disjunction of properties and relations. But that is false. I deny Ereshfsky's claims that the costs are "too high and the benefits are none." Instead, the new biological essentialism provides an account of "what it is to **be** a member of a natural kind"; and this seems right. I further argue that the HPCK approach to biological taxa (Boyd, 1999a, 1999b, 2021; Wilson et al., 2007), especially as it applies to biological species, accounts for the partly intrinsic (Devitt, 2018a) and partly relational (Devitt, 2018b) essences that species have. And, when homeostasis is understood in terms of recent systems theory, HPCK remains the most robust and fecund approach to what it is to **be** a member of a biological species in particular and a natural kind more generally, Ereshefsky's counter arguments notwithstanding.

O7.04

10:45 MULTIPLE FUNCTIONAL STATES IN ONE PROTEIN. HOW DOES THIS OCCUR? HOW IS SUCH A PROTEIN CONSTRUCTED?

Robert Waltzer

Belhaven University, Jackson, MS, USA

It is understood and accepted that proteins can alternate between

an on state and an off state as a result of allosteric regulators (Berg et al. Biochemistry, 9th ed. 2019). But how does one construct a single protein that can carry out an ordered set of functional states and then reset to initial conditions. An example of this is a "motor" protein which connects to and drags cargo throughout the living cell. These motor proteins have been portrayed by Drew Berry in Animations of Unseeable Biology. One particular motor protein, kinesin, was discussed in a previous presentation (Journal of MAS Vol 66 No.3 2021 p. 94). The goal of this presentation is to elaborate on the concept of multiple functional states of kinesin in order which they occur, how those functional states are an ideal fit for its overall function and context, and how one might think about the assembly of such a protein from polypeptide sequences. An attempt will be made to consider a step-by-step analysis of the factors which induce each state change in kinesin. The first change in state involves the attachment of cargo to the free end of kinesin, causing the kinesin to begin its stepping cycle. Kinesin movement can be understood as a crawling motion. Kinesin is a dimer and has two similar components. Each has a head (or foot process) which can attach to the microtubule track. The heads connect to neck/linker regions and which are then connected to a helix. The helices of each member of the dimer wrap around each other (coiled-coil) holding the two units together. One head swings around, grabs the track, and pulls the complex (with the attached cargo) forward. The same occurs for the other head. The process repeats, using a molecule of ATP to fuel each step. The act of swinging a head around, having it attach to a microtubule, and binding and hydrolyzing ATP involve multiple changes in shape of the protein and each will be analyzed. How can we think about the construction of such a protein that can go through multiple state changes? The first step is to consider each state that must be arrived at and to consider the sequence in which they must occur. Then it will be considered how the shape of the protein must be changed from a preceding state to a subsequent state. And then the factors that cause one state to change into another will be looked at, ultimately resetting to the initial on state. The last component to consider is how sequences of amino acids assembled together can produce such an ordered arrangement of functions. The overall goal is to understand the nature of these extraordinary molecules and consider what kind of process could produce them.

11:15 BREAK

12:00 GENERAL SESSION

Thursday, March 31, 2022

AFTERNOON

Room D6

O7.05

1:00 CONCEPTS OF WILDNERNESS

Shawn Simpson

Mississippi State University, Starkville, MS, USA

The nature of wilderness is of key interest to philosophers, scientists, and natural resource managers alike. A better understanding of what constitutes wilderness is important for projects dealing with climate change, wildlife conservation, and the regeneration of wild areas. The issue is pressing as by some estimates wilderness now only covers less than 25% of the globe and its coverage is rapidly shrinking In the US, federally designated wilderness makes up a mere 4.5% of the land. There have been three prominent conceptions of wilderness represented throughout American history. Each concept emphasizes a different focus. The "folk" concept looks at the history of the term and the way it has been used in modern language. This analysis incorporates work of the American historian Roderick Nash, in particular, his 1967 book Wilderness and the American Mind. This view of wilderness implies that there will be no (0%) wilderness left on the planet. Aldo Leopold, former US Forest Service wilderness ranger and professor of game management, conveyed the second concept. This view of wilderness remains popular among forest and park rangers, especially horse and mule packers, but lacks much to be desired in terms of precision and utility. This definition also results in wilderness covering even less than 25% of the planet. The third conception of wilderness is represented by the definition put forward by the US Congress in America's key piece of legislation in this area – the Wilderness Act of 1964. Although, much better than the first two conceptions, the definition found in the Wilderness Act is still much too imprecise and unclear to do all the work for which a good concept of wilderness is needed. This definition of wilderness also unfortunately permits too much flexibility of interpretation, making it unclear what exactly counts and how much is left. In the end, I argue, these three concepts of wilderness are inadequate for the purposes for which we might want such a concept to serve. Wilderness as a concept lies on a sort of sliding scale. There are paradigm cases of wilderness and less paradigm ones – ones with more, and ones with fewer, of the markers that we find important when assessing some area's wilderness status. This way of looking at wilderness, I believe, will better capture our most important intuitions. More importantly, this conception seems to function as a better guide for our conservation and preservation efforts and allow us to protect more of the planet.

O7.06

1:30 INDUCTION, CONCEPTUAL SPACES, AND HOMOTOPY: A RESPONSE ON CARNAP'S BEHALF

Jared Ifland

Florida State University, Tallahassee, FL, USA

Despite logical empiricism falling out of favor in the second half of the 20th century, a resurgence of historical interest beginning in the 1980's has led to the recognition of the diversity of views within the movement and a reexamination of the objections mounted against its participants. This has led to a growing body of literature defending Carnap against several of his detractors and resuscitating much of his work, such as Awodey & Carus [2004], Justus [2014], and Price [2009]. This paper is a contribution to this Carnap revivalism, proposing a mathematically updated version of Carnap's inductive logic.

Goodman's new riddle of induction, one of the problems which plagued logical empiricism, continues to shape discourse in areas ranging from philosophy of science to artificial intelligence. It is argued in Gärdenfors [1990] that the problem of projectability – that of delineating predicates such as "green" which can be used for inductive projections from those such as "grue" which cannot – is as much a problem for a computational theory of induction as it was for logical empiricism. According to Gärdenfors, the problem arises because of the use of solely linguistic or propositional formulations of projectible predicates which treat all predicates symmetrically, whereas what is needed is a

formulation that does not preserve these symmetries. What he proposes and develops at greater length in Gärdenfors [2000] and [2014] is a non-linguistic formulation of **natural properties** based on conceptual spaces, where a property is taken to be a region of a conceptual space and that property is **natural** (i.e., projectible) if it is **convex**. While this provides a workable solution for a computational theory of induction, Gärdenfors claims that the logical empiricists could not make such a move to fend off Goodman's riddle.

However, Sznajder [2016] has recently argued that the connection between Gärdenfors's conceptual spaces and Carnap's attribute spaces helps toward revitalizing Carnap's late inductive logic. Moreover, recent advances in the foundations of mathematics have led to an interpretation of Martin-Löf's dependent type theory, termed **homotopy type theory**, where types are interpreted as spaces using the notions of abstract homotopy theory. What I aim to do here is further this revitalization of Carnap's inductive logic by arguing that a type-theoretic explication of attribute spaces would be a step forward in developing a computational theory of induction. Along the way, I will address some potential objections by appealing to the features of homotopy type theory as well as Carnap's metaphilosophical standards, making my approach distinctively a defense of Carnap rather than one more generally of logical empiricism. Since Gärdenfors has framed the problem of projectability as a problem of knowledge representation, the upshot is two-fold: the response not only contributes to the Carnap literature, but additionally motivates a positive research program in inductive logic and artificial intelligence. I will conclude by discussing the potential benefits for philosophical practice and the work that remains to be done.

2:00 BREAK

O7.07

2:15 NO METAPHYSICAL STRINGS ATTACHED: NOMOLOGICAL ELIMINATIVISM IN THE PHILOSOPHY OF SCIENCE

Eleni Angelou

CUNY Graduate Center, New York, NY, USA (via Zoom)

Lawlessness is hard to admit; the assumption that nature is governed by laws and that the aim of science is to discover them is often regarded as a platitude. I will argue that the question 'are there laws of nature' can be answered in two ways, and both of them lead to what I will call 'nomological eliminativism'. The first way to answer the question is to claim that there are no laws of nature and what exists is merely regularities. Science describes many of these regularities without metaphysical commitments. The descriptions of the regularities have little or no explanatory power (since they are not laws) and they might change anytime. This leads to the elimination of laws. The second answer is that laws of nature exist and sometimes manifest themselves through observable regularities. In this case, however, there is no way to know whether science discovers mere regularities or the laws of nature. This leads to accepting that it is impossible to know whether there are laws or not. The positive proposal is that it is the human cognitive faculties that make us perceive the world in terms of necessary regularities, such as laws. Further, we should abandon trying to elucidate the metaphysics of lawhood and work towards explaining why human cognition is so attached to generating law-related theories about the world. Nomological eliminativism is ultimately a pragmatist suggestion: science may continue using laws instrumentally but thinking that the universe is governed by laws is nothing more but a projection of human faculties into the physical world. Our inquiries should focus on explaining why lawlessness seems less appealing than lawhood and why does it make sense to us to understand the world in terms of uniformities.

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

Friday, April 1, 2022

MORNING

Room

8:50 Welcome

O7.08

9:00 CITATION ETHICS: AN EXPLORATORY STUDY OF NORMS AND BEHAVIORS

Samuel Bruton[1], *Alicia Macchione*[1], *Mohammad Hosseini*[2]

[1]*University of Southern Mississippi,, Hattiesburg, MS, USA.*
[2]*Northwesternrn University, Evanston, IL, USA*

The purpose of this presentation is to report and discuss findings from a scheduled survey on citation ethics. While certain forms of citation impropriety have recently gained attention in the research ethics literature – most notably, abusive self-citations (Szomszor et al., 2020) and coercive citations (Fong & Wilhite, 2017) – the aim of this study is to explore a wide range of citation-related normative attitudes and practices. Sound citation and referencing are an important (albeit often neglected) structural aspect of science. Proper citation and referencing serves various useful purposes, by situating work relative to the broader literature, indicating useful background material for readers, establishing the researchers' credibility, and acknowledging and crediting sources.

Between now and February 2022, invitations to participate will be sent to federally funded (NIH, NSF and NEH) researchers with a goal of 3 x 100 (300 total) completed surveys. Our presentation will present these findings. The research instrument was developed through an extensive literature review and a feedback and revision process that involved several prominent research integrity scholars and practicing scientists. Pilot testing of the study is currently in process. The piloted version of the questionnaire includes five general mc-response questions (e.g., "The most important source of my knowledge about specific citation practices has been…"), questions based on thirty-eight different scenarios (e.g., " a researcher cites and references several articles authored by the editor of the target journal even though some of them are of only marginal relevance to the manuscript"), two open-ended narrative response questions (e.g., "What other questionable or exemplary citation practices are you aware of?") and five demographics questions (e.g., "Discipline/Field"). Participants will be compensated with $10 Amazon e-gift cards. The project has been pre-registered on OSF: https://osf.io/b64px/

O7.09

9:30 IMPACT BIAS AMONG HHEALTHCARE PROVIDERS

Lamar Hamil[1] and Kenneth Butler[2]

[1]Vital Core Health Strategies, Pearl, MS, USA and [2]University of Mississippi Medical Center, Jackson, MS, USA

10:00 BREAK

O7.10

10:15 MONSTERS AS EXPRESSIONS OF CULTURAL ANXIETY IN REGARD TO HEALTH ISSUES

Nicholas Bennett

University of Southern Mississippi, Hattiesburg, MS, USA

Monsters have always lurked at the edges of the human mind. Although they are drawn from inspiration and experiences found in reality, they are largely a construction of fears and are an emotional response to threats offered by the outside world. Philosopher Steven Asma (2014) characterizes monsters as mental constructs based on fears of perceived threats and an aversion to that which is "other", non-human, or impure. A complimentary understanding of monsters is presented by Jenny Hamilton who argues that monsters are symbolic manifestations of traumatic experience brought into the consciousness (2020). These definitions point to monsters serving as expressions of cultural anxiety, personifying the fears present within individuals and their communities covering diverse issues such as war, xenophobia, civil and economic equality, and fears regarding mental and physical health (Detweiler, 2020). Focusing on cultural concerns over health issues, I argue that monsters such as vampires, werewolves, and wendigos offer examples of monsters as symbolic expressions of cultural anxieties regarding mental and physical health. The origins of vampire myths and stories are historically based in the context of civilizations that dealt with rampant war and disease and are characterized by a parasitic bite which imparts symptoms like those exhibited by a variety of infectious diseases and is followed by transformation or death. Sartin (2019) contends that Bram Stoker's **Dracula** (1897) serves a metaphor for the rampant spread of syphilis throughout Victorian England in the late 19th century. Werewolves, similarly, symbolize this fear of rampant infection through both transformation and transmission and are also evocative of mental illness with connections to the full moon and bipolar disorder as well as the condition of psychosis known as lycanthropy (Erren & Lewis, 2019). The connection between monsters and mental health concerns can also be found in the cannibalistic wendigo of Ojibwe tradition, representing a spiritual imbalance that manifests in those whose behavior antagonizes social norms or those overcome with anxiety, resulting in the "wendigo psychosis" that is studied today (DeSanti, 2015). So, while monsters can serve as modes of entertainment in the stories of folklore and popular culture, the functional role that monsters play in society is more significant; they are expressions of cultural anxieties regarding public health issues.

O7.11

10:45 CHOICES AND CONSEQUENCES: A DISCUSSION OF PERSONAL RESPONSIBILITY AS A CRITERION FOR HEALTHCARE ALLOCATION

Emma Cox

University of Southern Mississippi, Hattiesburg, MS, USA

The COVID-19 pandemic has exhausted the resources of many healthcare facilities where the number of patients in need exceeds the number that can receive treatment (Everett, et al. 2021). Thus, both public health authorities and medical health practitioners must make difficult choices regarding the allocation of medical resources. Such decisions may entail life-saving treatment for some and probable death for others. Clearly, providing treatment to one patient over another carries serious moral implications and therefore should not be done arbitrarily. Pre-pandemic discussions of healthcare allocation have involved social contract theory as a basis for (de)prioritization; thus, under this theory, personal responsibility for one's illness was considered as a relevant criterion. Rawls and other social contract theorists impose obligations unto individuals who derive benefits from membership in a society (1999). Norwegian and British doctors report that patients who smoke, drink alcohol excessively, and abuse drugs should receive lower priority for treatment compared with those who do not engage in these risky behaviors (Everett, et al. 2021). Similarly, in a national survey conducted in 2006, 53% of Americans reported that they thought it would be "fair" for individuals with unhealthy lifestyles to pay higher insurance premiums, deductibles, or copayments than their healthier counterparts (Steinbrook 2006, 753). West Virginia's 2006 modified Medicaid program offered enhanced benefits to those who signed a "member agreement" and accepted numerous lifestyle expectations, including submitting to screenings and following health improvement plans (Steinbrook 2006). However, due to the numerous factors, including the social determinants which impact an individual's health, including income, education level, and employment, social contract theories cannot ethically be used to distinguish between patients. As an alternative, utilitarianism has been applied to triage guidelines in the pandemic, supposedly providing a more objective, non-discriminatory basis for treatment allocation (Savulescu, et al. 2021). Under utilitarian standards, patients are weighed against each other by the benefit (survival, life quality) posed from treatment rather than by their health-related behaviors. Prima facie, there seems to be a distinction regarding the role of personal responsibility across the two discussed perspectives. Namely, social contract theory directly implies that personal responsibility is a relevant criterion for medical resource allocation, while utilitarianism does not. However, given the inseparability of an individual, her social circumstances, and her subsequent health decisions and outcomes, I contend that both perspectives result in the same moral pitfalls. Further, I argue that personal responsibility ought not to be used as a criterion for healthcare allocation, whether under the application of social contract theory or utilitarianism.

11:15 BREAK

O7.12

11:30 RACIAL DISPARTIES OR SOCIODEMOGRAPHICS SIMILARTIES IN HEALTHCARE

Kenneth Butler[1] and Lamar Hamil[2]

[1]University of Mississippi Medical Center, Jackson, MS and [2]Vital Core Health Strategies, Pearl, MS

O7.13

12:00 OVERZEALOUS HEATH: A CONCERN OF INDUCTIVE RISK IN CANCER DETECTION.

Kevin Hollahan

Florida State University, Tallahassee, FL, USA

Due to cancer's widespread prevalence, erratic behavior within the body, and its subsequent difficulty to treat, doctors will take up the noble cause to detect and treat the disease in its earliest stages. Most of the time, doctors must decide on what diagnostic path to pursue using the symptoms presented by the patient. Some are more obvious than others, such as a lump in the neck. While most other symptoms are less obvious, like a persistent cough. With this lack of empirical evidence, doctors will refer to their non-epistemic values, such as not wanting to see a younger patient's life cut short, to help make a recommendation as to how best to proceed. In this paper, I argue that when doctors consider their non-epistemic values, they can risk putting their patients at harm from their value-laden recommendations. I support this argument by looking at over-screening in certain cancers such as prostate and breast cancer to show the inductive risk behind a doctor's value-laden recommendation.

To begin the paper, I offer a discussion as to how medical doctors fit in the debate on inductive risk and the scientist qua scientist between Richard Rudner and Richard Jeffrey. Here I show that we can say doctors can fit under Rudner's description of the scientist qua scientist as well as Jeffrey's description of the policymaker. Doing this, I establish what would allow us to refer to a doctor as the doctor qua doctor. After this, I move on to describe over-screening and some of the negative effects it can cause. Such as putting people through invasive biopsies that may be unnecessary for various reasons. In my argument, along with the negative physical risks, I also point out that the value-laden recommendations are causing a skew in cancer detection statistics. This is dangerous because it is leading to more over-screening in certain groups of patients and under-screening in others. I conclude this paper with a section where I attempt to offer a solution. The solution will hopefully lead to more transparent communication between doctors and their patients as well as screening recommendations that detect cancer early but do not risk excess harm to the patient.

O7.14

12:30 AN OTTOMAN INTELLECTUAL: SEMSEDDIN SÂMI

Batuhan Akgündüz

Selçuk University--Konya, Konya, Turkey

Şemseddin Sâmi (1850-1904) is a well-known journalist, lexicographer, grammarian, playwright and novelist of the Turkish literature after Tanzimât (Edict of Gülhane). In this study, Şemseddin Sâmi's two important works *İnsân* (1879) and *Yine İnsân* (1886) will be introduced.

Şemseddin Sâmi probably mentioned the term "anthropology" ('ilmü'l-beşer) in *İnsân* for the first time in the East and drew attention to the novelty of this discipline in his book. According to Şemseddin Sâmi, *İnsân* is also related to geology, that is, "İlm-i Arz". Since geology emerged as a discipline in the 19th century, it is natural that there are no works written in the past on this new discipline in Turkish and perhaps in all Eastern Languages.

Şemseddin Sâmi, while answering the question "What is human?", first conveys different views on humans, and then states that the human body, which he says, is more perfect than all animals, was created in the most beautiful way, but he also emphasizes that humans are not completely different from other animals. Humans have in common with other animals the nature of the substances that make up their body, the way of formation, the nutrition of the body, and the movements and functions of their external and internal organs. Even in some emotional and spiritual situations, humans have in common threats with other animals. However, since reason and perception are unique to humans, this "spiritual light" is sufficient to distinguish them from animals. Thus, Şemseddin Sâmi stands at an equal distance from both evolutionary thought and the concept of Eşref-i Mahlukat (The most glorious one among all creatures):

"We will show the smallness and flaws of human to those who want to make them exaggerate, and we will show their superior qualities to those who want to reduce the value of this creature."

According to Şemseddin Sâmi, although anthropology, which is the main theme of *Yine İnsân*, is perhaps the most important discipline of Natural History, that is "Târîh-i Tabi'î", ancient scholars were not interested in this discipline and left no books written on this field. Although the division of the human species into various tribes and nations and their separation into three groups in relation to Noah's children has been mentioned in the history books for a long time, yet no details were found on this issue. After that, the basis of this primitive division was destroyed by positive sciences and new discoveries. It is believed that the truth is different than myths and by this way, it has become clear that scientific disciplines should be based on the scientific criteria.

Thus, Şemseddin Sâmi seems to have introduced anthropology and geology to the Ottoman Empire through his studies. The subject of this study is to demonstrate Şemseddin Sâmi's thoughts on the aforementioned disciplines.

10:00 -1:15 Student Awards

1:00-1:45 Business Meeting

Marine and Atmospheric Sciences

Chair: Francis Tuluri

Jackson State University

Vice-Chair: Courtney Roper

University of Mississippi

Vice-Chair: Remata Reddy

Jackson State University

Thursday, March 31, 2022

AFTERNOON

Room L6

12:50 Welcome

O8.01

1:00`MODEL SIMULATION FOR A DRYLINE CASE STUDY

Duanjun Lu, Loren White, Kendall Parks

Jackson State University, Jackson, MS, USA

Drylines are very similar to fronts. However, instead of being characterized by a difference in temperature, they are characterized by a difference in dew point. In this study, we used a numerical model system, Weather Research and Forecast (WRF), to perform a case study for dryline occurring in western Kansas in 2016, Fall. The WRF version 4.1 released by NCAR (National Center of Atmospheric Research) was used. The WRF model is configured with three domains for simulations: the outer domain has a mesh with a horizontal resolution of 24-km, the middle of 6-km and fine domain of 1-km. The analyses will mainly be focused on the 1-km domain. We will show how the model simulations accurately reproduce measured aspects of this dryline according to the timing, the dryline vertical and horizontal structures, and location of convection initiation.

O8.02

1:20 CONSISTENCY OF OXIDATIVE POTENTIAL USING DIFFERENT FINE PARTICULATE MATTER ($PM_{2.5}$) EXTRACTION TECHNIQUES

Amelia Craze, Courtney Roper

University of Mississippi, University, MS, USA

According to the World Health Organization (WHO) in 2019, a staggering 99% of global population lived where WHO guidelines on air quality were violated. Fine particulate matter ($PM_{2.5}$) is a complex mixture of solid and liquid particles that vary based on sources and time of year. Hypothesized to induce oxidative stress, there are a wide range of both short-term and long-term health effects triggered by $PM_{2.5}$. To better understand the risks of exposure, $PM_{2.5}$ is collected onto filters. Removal of $PM_{2.5}$ from filters prior to toxicologic or chemical analysis is a critical step. Currently, no standard method for filter extraction exists, which allows for a wide variation between methods, creating the potential for methods biases leading to variation in toxicity responses. The objective of this study was to extract evenly split $PM_{2.5}$ filters in different solvents to determine if the extraction method used impacts the chemical composition and oxidative potential of $PM_{2.5}$. We used $PM_{2.5}$ filters collected by the Arkansas Department of Environmental Quality at four locations, both urban and rural, during the same 24-hour collection period for days across all four seasons in 2012. Collection dates (n=5/season) were selected, with three weekdays and two weekend dates from each included. Prior to extraction, black carbon data was collected. After quartering, the filter portions were sonicated in either: 1) methanol 2) DCM, 3) DI water or 4) 0.9% saline. Filter quadrant extracts were divided into soluble and whole particle fractions and oxidative potential was determined using the dithiothreitol (DTT) assay. Chemical analysis was performed using Inductively Coupled Plasma-Mass Spectrometry (ICP-MS) to characterize elements present, including, Pb, Sr, Cd, Fe, Ni. Comparisons between seasons based on solvents for extraction technique, location, and fraction are underway. Preliminary data from five winter and five spring dates identified that significant differences in DTT consumption (nmol/min/m3) occurred between extraction methods as well as between seasons. Initial findings indicate that there was not a significant difference between soluble and whole particle fractions, leading us to believe that the chemical components of $PM_{2.5}$ impact oxidative potential more than the physical presence of particles. Ongoing analysis of ICP-MS results will provide chemical composition differences based on the extraction solvents. We anticipate that the extraction solvents used will continue to lead to significant differences, not only in DTT assay results, but also in the chemical composition. Additionally, utilizing samples across seasons will provide insight on compositional and oxidative potential changes in $PM_{2.5}$ that could be based on factors such as meteorological events, human behavior, and agricultural processes. This project will allow for further research on method standardization for extraction of $PM_{2.5}$ from filters as well as investigating $PM_{2.5}$ composition and seasonal patterns.

O8.03

1:40 SIMULATIONS OF THE SOUTHEAST LOUISIANA AND SOUTHERN MISSISSIPPI FLOOD OF MAY 8-10, 1995, WITH A PENN STATE/NCAR MESOSCALE MODEL (MM5) AND RS/GIS TECHNOLOGY

Remata Reddy[1], *Duanjun Lu*[1], *Mehri Fadavi*[1], *Wilbur Walters*[1], *Paulinus Chigbu*[2]

[1]*Jackson State University, Jackson, MS, USA.* [2]*University of Maryland Eastern Shore, Princess Anne, MD, USA*

The Gulf Coastal states region of United States is prone to the highest national frequency of both severe weather and climate problems accompanied by economic losses (e.g., severe convection, flooding, tropical cyclones, ice storms etc.,). A GIS/Remote Sensing framework is necessary to properly understand physical processes, investigate cause and affect relationships and develop conceptual models of the behavior of environmental systems. Our goals included focusing on the environmental effects and impacts of heavy rains and flash flooding and finally to produce a prototype GIS/RS Environmental Risk Assessment System (ERAISA) for the region of interest. We selected "The historic Southeast Louisiana and Southern Mississippi flood activity during May 8-10th, 1995" as our study case. The NCAR/Penn State Mesoscale model (MM5) is used to study the effects of warm sea surface temperature anomalies, sea surface pressure and winds on the precipitation characteristics of this event. Mesoscale model simulations are used to forecast and better understand the physics associated with the flood event. Each component is modified to accommodate the detailed study. For the preliminary model run, a doubly nested domain centered over the Central Gulf of Mexico with grid spacing of 90 km and 30 km is employed. MM5 is run for each 6-hr. period, from the initial storm development - May 8th and through May 10th. NCEP/NCAR reanalysis data and synoptic data are used for constructing the initial and boundary conditions.

The model simulations are compared with Radar data for further comparisons and validations. The phenomenon of interest – flooding here is narrowly defined to depict, analyze, and predict (or manage) environmental dynamics through the use and application of GIS and Remote Sensing (RS) data and technologies. A major goal is to unify our understanding and knowledge of similar historic events into a more comprehensive integrative framework from different disciplines - meteorology, marine and fisheries sciences, environmental sciences etc., and develop a system of Integrated Environmental Risk Assessment for the Gulf Coast, which would be ultimately used for operational use.

O8.04

2:00 MULTIVARIATE CROSS CORRELATION BETWEEN WEATHER AND COVID-19 AT A REGIONAL LEVEL

Francis Tuluri, Demontavious Davis, Reddy Remata, Wilbur Walters

Jackson State University, Jackson, MS, USA

The increasing spread of COVID-19 has prompted many scientific communities to study its association of with weather. World Health Organization (WHO) has declared on March 11, 2020, that the coronavirus (COVID-19) outbreak a global pandemic. Since then, it is known that the virus SARS-CoV-2 causing COVI-19 has led to an enormous increase in mortality rate globally. Regarding the impact of weather on COVID-19, it is generally assumed that high temperature and humidity would decrease the spread of COVID-19. Even until late 2020, there was a widespread increase of COVID-19 locally and globally. In the present work, we study multivariate correlation analysis between weather and COVID-19 at a small scale to see any association between them cumulatively. The region of study is Jackson, Mississippi, USA over early onset of the pandemic. The weather data and COVID-19 data over the study region will be analyzed using Python programming. Basic statistical methods will be used to find cross correlation between the two data sets and the results of the study will be presented

2:20 BREAK

2:30 Business Meeting

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P8.01

SENTIMENT ANALYSIS AND ITS APPLICATIONS IN EMERGENCY MANAGEMENT

HuiRu Shih, Mia Pettigrew, Jordan Hundley

Jackson State University, Jackson, MS, USA

Sentiment analysis is the use of computational and natural language processing-based techniques to identify, extract, quantify, and study subjective information expressed in a given piece of text. Sentiment analysis has many applications in different domains. This study aims to analyze people's sentiments towards disasters and emergencies.

Social media sites such as Twitter are often the most popular outlets people turn to in times of crisis to voice their opinions and relay other information. Therefore, Social media sites can play a vital role in spreading information before, during, and after disasters and emergencies. However, the volume and velocity of messages posted tend to be extremely high. It is difficult for professional responders in disaster-affected regions to process the information in a timely manner.

The sentiment of the affected people during and after the disaster determines the success of the disaster response and recovery process. In this study, we use Twitter data for artificial intelligence (AI)-based sentiment analysis to understand the feelings of people in disaster-affected communities. We collect data from Twitter and categorize them according to the needs of the affected people (such as "resource needs", "resource availability", and "others" being neutral and of no useful information). The categorized data are classified through machine learning algorithms to analyze people's sentiments. We focus on the concerns, emotions, and feelings expressed on social media during emergencies and examine those emotions and perceptions. Sentiment analysis can be exploited to determine how people react during disasters and emergencies. This information can be used to improve disaster and emergency management.

We also discuss various other applications and opportunities of Social media technologies and current challenges and future directions for enhancing emergency management.

P8.02

USE OF MACHINE LEARNING TO DETERMINE OBSERVATION ERRORS IN GLOBAL SATELLITE DATA ASSIMILATION

Kayla Hudson[1]*, Kelvin Garrett*[2]*, Erin Jones*[2]*, Narges Shahroudi*[2]*, Remata Reddy*[1]

[1]*Jackson State University, Jackson, MS, USA.* [2]*NOAA/NESDIS, College Park, Maryland, USA*

According to McLaughlin et al., 2005 data assimilation is defined as, "A way to integrate the data from a variety of sources with different resolutions and accuracies, with model prediction, to improve deterministic model accuracy." Data assimilation is known to be helpful in observational data usage and global analyses while at the same time being a key necessity in weather prediction and simulations systems. Although satellite observations are critical for numerical weather prediction, they remain under-utilized in terms of volume of data assimilated, and information content extracted. A machine learning (ML) model framework was developed to optimize observation errors to increase their impact in NOAA's global numerical weather prediction (NWP) data assimilation system. The ML model uses a Deep Neural Network (DNN) to predict the observation errors assigned to the Advanced Technology Microwave Sensor (ATMS) onboard the Suomi-NPP and NOAA-20 satellites. The initial ML model was trained to predict the current observation errors used in DA, but based on the measured ATMS brightness temperature for all 22 channels. The ML model was then integrated into a preprocessing framework for ingest and use in the DA system. Finally, a case study was used to assess the impact on medium-range forecasts for the 2020 Easter Tornado Outbreak in the United States using the ML-based observation errors and compared with the forecast skill using the default observation errors. The results, including the assessment of several forecast metrics, including stability, wind, and precipitation forecasts, will be discussed. Ultimately, this project aims to improve the

utilization of satellite data in NWP data assimilation, as well as cater to the improvement of satellite data's impact through forecast accuracy and weather preparedness for future extreme weather events.

P8.03

A STUDY OF AIR-SEA INTERACTIONS, VERTICAL MOTIONS, HIGH WINDS AND HEAVY PRECIPITATION ASSOCIATED WITH LAND FALLING TROPICAL STORM LEE AND HURRICANE HARVEY OVER THE GULF OF MEXICO USING REMOTE SENSING AND SATELLITE DATA

Makenzie Frith[1], *Remata Reddy*[1], *Latrice Maxie*[2]

[1]*Jackson State University, Jackson, MSi, USA.* [2]*National Weather Service, Jackson, MS, USA*

While participating in constructing research with NCAS-M ETSP at Jackson State University and Howard University, how air and sea temperatures interact, large scale heat fluxes and intensity changes associated with landfall of tropical storm lee and Hurricane Harvey. Tropical Storm Lee was a devastating tropical storm that first made its appearance in September 2nd 2011. It began near the Western Caribbean in late August and continued to affect areas as far as the Louisiana-Mississippi coast. Despite lacking wind/pressure intensity, T.S Lee absorbed large amounts of moisture, contributing to intense precipitation. This monumental and powerful tropical storm has driven many researchers to question the storm's forcefulness and its access to damages. My research aims to seek clarification about the relationships between air and sea interactions, large scale heat fluxes, and intensity changes associated with landfall of Tropical Storm Lee as well as the vertical motions of Hurricane Harvey. Also, we will examine vertical motions associated with intensity changes of Tropical Storm data on Convective Available Potential Energy, CAPE, sea level pressure and wind speed. These elements are mainly displayed mostly through graphs and tables; however, analysis can show why the storm was continuous and how the simple understanding of the formation of a hurricane and tropical storm can improve our knowledge greatly. The relevance from my research to NOAA's mission is to better understand and predict changes in climate, weather, oceans, and coasts, to share that knowledge and information with others, and to conserve and manage coastal and marine ecosystems and resources. All conclusions are supported by graphs and analysis of conditions provided by buoy data and data recorded from Tropical Storm Lee. Buoy data shows sea and air temperatures in the West Gulf of Mexico and is evidence for potentially more destructive storms.

P8.04

ARCGIS ECONOMIC IMPACT ANALYSIS OF TORNADOES IN MISSISSIPPI

Kendall Parks, *Duanjun Lu*

Jackson State University, Jackson, MS, USA

Tornadoes are nature's most violent windstorms and are a significant hazard to life and property throughout the United States. A key component of analyzing tornado involves understanding the impacts of the socio-economic factors. In this work, we collected, graphed and analyzed various tornadoes in Mississippi and showed how much they affect a specific socioeconomic population, more specifically those who live in mobile homes. Mississippians are at an increased risk of tornado related damages not only due to the sheer number of occurrences but due to the population dense mobile or manufactured home communities. Over 130,000 Mississippians live in mobile or manufactured homes to which they accounted for a majority of the damages due to the poor structural integrity of their homes and the inability to evacuate due to their lack of resources. Using the National Weather Service storm survey data, GIS plotting of tornados and population center, and various news outlets we hope to show how tornadoes are most impactful to those of a lower socioeconomic status.

P8.05

INDOOR FUEL SOURCES INFLUENCE $PM_{2.5}$ CHEMICAL COMPOSITION AND ALTER ZEBRAFISH (*Danio rerio*) BEHAVIOR

Shayla Victoria[1], Lisandra Trine[2], Staci Simonich[2], Perry Hystad[3], Courtney Roper[1]

[1]*Department of BioMolecular Sciences, University of Mississippi, University, MS, USA.* [2]*Department of Chemistry, Oregon State University, Corvallis, OR, USA.* [3]*College of Public Health and Human Sciences, Oregon State University, Corvallis, OR, USA*

Fine particulate matter ($PM_{2.5}$) is the solid and liquid portion of air pollution with an aerodynamic diameter of less than 2.5 µm. $PM_{2.5}$ has been gaining attention due to its relatively high ambient concentrations and its ability to cause adverse health effects in humans. Recent research has linked $PM_{2.5}$ exposure to cardiovascular and respiratory illnesses and animal studies have uncovered impacts on developmental processes. Indoor air pollution caused by varying fuel types used for cooking and heating is less-studied. $PM_{2.5}$ was collected using personal samplers worn by females in 19 homes that used either biomass or non-biomass fuel sources and samples were analyzed for chemical composition (organic compounds and elements) and oxidative potential. Zebrafish (*Danio rerio*) embryos were exposed to varying concentrations of collected $PM_{2.5}$ beginning at 6 hours post-fertilization until 5 days post-fertilization and behavioral analyses were conducted. Elemental composition was found to differ between $PM_{2.5}$ from different fuel sources and oxidative potential was correlated with several elements and compounds present in the $PM_{2.5}$ samples. In zebrafish, waterborne exposure to varying concentrations of $PM_{2.5}$ from both fuel sources induced changes in characteristic behaviors. Zebrafish experienced a decreased larval startle response and larval photomotor response during the excitatory interval after exposure to $PM_{2.5}$ from both fuel types and decreased embryonic photomotor response during the excitatory interval after exposure to $PM_{2.5}$ from non-biomass burning samples. Overall, this work reveals that $PM_{2.5}$ generated from the burning of different fuel sources varies in chemical composition, which may also influence oxidative potential. Our results also raise concerns about the risk of additional health impacts resulting from exposure to $PM_{2.5}$ from varied fuel sources, indicating need for further investigation into specific health effects and their real-world implications for human health.

P8.06

ESTABLISHING PROCEDURES FOR THE COLLECTION OF GUNSHOT RESIDUE FOR TOXICITY STUDIES

Samuel Smith, Oscar Black, Courtney Roper

University of Mississippi, Oxford, MS, USA

Gunshot residue (GSR) inhalation has potential negative health effects in humans as a result of exposure to the organic and inorganic components of GSR such as Pb, Sb, Ba, nitrocellulose, and nitroglycerine. The particle size of GSR is a key factor in the

health effects research since particles less than 2.5 microns in aerodynamic diameter, $PM_{2.5}$, are able to enter deep into the respiratory tract and potentially enter into the bloodstream. Currently, there is very limited research investigating the particle size of GSR. Air sample collection was done during single and triple firing of a .22 caliber revolver. Both size selective (ultrasonic personal air sampler (UPAS) collecting $PM_{2.5}$ onto filters) and non-size selective (double-sided tape (DST)) collection methods were used to determine the composition and presence of GSR. In addition to airborne GSR, dermal exposures were considered using hand swabs on the shooters' hands post firing and after using a de-leading wipe that is designed to remove the heavy metals. All samples and controls were collected in at least triplicate and underwent various analysis to investigate physical (morphology, size distribution, zeta potential), chemical (black carbon and element concentrations), and potential to induce oxidative stress (oxidative potential via the dithiothreitol (DTT) assay). Morphological analysis using scanning electron microscopy with energy dispersive x-ray spectroscopy (SEM-EDS) confirmed the ability to detect GSR on DST and the inability to detect GSR on the filter samples due to the complex woven fibers of the filters. According to dynamic light scattering analysis, similar size particles were present, regardless of collection method, indicating that predominantly particles less than 2.5 microns are present in GSR. Black carbon was detected on 5 of the 6 filter samples from both shot scenarios. Elemental concentrations on filter samples showed elevated concentrations of Pb (1.808±1.377 ppb and 8.834±6.910 ppb) and Ba (12.642±12.330 ppb and 20.274±13.405 ppb) the averages and standard error mean from the single and triple shot samples, respectively. Oxidative potential was elevated in the size-selective samples for triple shots compared to single shots. Comparison of oxidative potential for the other collection methods, zeta potential, and further elemental analysis and correlations are all currently being interpreted. This study outlines collection methods and sampling procedures for future research into the impact of GSR on human and environmental health.

P8.07

CONSISTENCY ACROSS FINE PARTICULATE MATTER (PM2.5) FILTERS: CHEMICAL COMPOSITION AND OXIDATIVE POTENTIAL DIFFERENCES ON THE SAME FILTER

Allie Sidwell, Courtney Roper

University of Mississippi, Oxford, MS, USA

Fine particulate matter (PM2.5) is a complex mixture of particles and sorbed chemicals that poses serious, adverse effects on human health such as increasing cardiovascular and respiratory morbidity. There is ongoing research into the impacts of PM2.5 of differing chemical compositions and the mechanisms for the observed health effects. To conduct these analytical and toxicology studies of PM2.5, researchers often split filters into sections. This process allows multiple, often destructive, assays to be performed. Our previous research showed chemical composition differences across PM2.5 filters. The goal of our study was to determine the validity of splitting filters for use in multiple analyses by assessing differences in chemical composition and oxidative potential within the same filter. Six PM2.5 filter samples collected from urban and rural locations were used. Each filter was split into quadrants, resulting in a total of 24 pieces; laboratory and blank filters were also prepared in the same manner. Each filter piece was extracted, concentrated, and a whole particle and soluble fraction were prepared. The extracted, whole particle suspensions and soluble fractions were then analyzed with dithiothreitol (DTT) assay run in triplicate to determine oxidative potential. Inductively coupled plasma mass spectrometry (ICP-MS) was run on all samples and controls to compare chemical composition of the filter quadrants (n=30). Significant differences in oxidative potential between filter quadrants were not seen in the whole particle suspension and only seen in one filter in the soluble fraction. However, stark differences in total elemental content were observed between quadrants of the same filter. Correlation analysis between oxidative potential and elements is underway. This work will provide information about the feasibility of splitting PM2.5 filters for multiple analyses on the same sample.

P8.08

DATA ASSIMILATION USING WEATHER RESEARCH AND FORECASTING MODEL: AN EFFORT TO IMPROVE FINE-SCALE MODELING

Remata Reddy, Duanjun Lu, Francis Tuluri, Loren White, Jerzy Leszczynski, Mehri Fadavi, Wilbur Walters

Jackson State University, Jackson, MS, USA

Special attention is placed on addressing the improvement, validation and verification of mesoscale and microscale modeling through better model initialization. Solution, and application of model physics to specific environments, terrain, and surface boundary layer problems are important for model predictions. In addition, the ability to predict ground/terrain conditions and its effect on troop and vehicle mobility is of great importance to the army and in maintaining homeland security. Battlefield operations demand precise forecasting according to weather regime and location using fine scale modeling of 1-3 km resolutions. Reliable mesoscale models provide insight on the potential effectiveness of the transport and diffusion of chemical and biological agents and support the deployment of ground and airborne assets. Data from various sources, using data assimilation techniques, fed into the atmospheric numerical model can be tuned to generate acceptable output and then incorporated into a decision support matrix. In the present study, MM5 and WRF models are run on a high performance-computing environment to simulate the severe weather event that occurred on May 3 and 4, 1999 over the Oklahoma-Kansas region. The WRF has predicted a strong temperature gradient (14 K) at 2200Z compared to MM5 (8 K) with warmer temperatures over the southeast region. A cooling effect due to heavy precipitation has been depicted at 00Z. The WRF has improved in simulating widespread total precipitation during forecast time compared to MM5. A maximum total precipitation of about 33 cm has been predicted at 2300Z and 00Z, which is close to the observations. MM5 predicted strong surface winds (15 m/s) on 2155Z with a strong convective PBL height over the western region.

P8.09

DIFFERENCES IN $PM_{2.5}$ COMPOSITION, OXIDATIVE POTENTIAL, AND DEVELOPMENTAL TOXICITY COLLECTED ACROSS MONTHS AT LOCATIONS THROUGHOUT TENNESSEE.

Voke Tonia Aminone, Courtney Roper

University of Mississippi, Oxford, MS, USA

The exposure to fine particulate matter ($PM_{2.5}$) and its components including black carbon can result in adverse health

effects to humans and animals with a growing number of studies finding associations between developmental effects and $PM_{2.5}$ and black carbon. $PM_{2.5}$ exposure leads to oxidative stress and prolonged exposure exacerbates inflammatory diseases and it can also affect the growth of embryos because it can enter the blood stream and cross the placenta into the fetus. Prolonged black carbon exposure has been linked to causing and exacerbating cardiovascular conditions. Zebrafish is the accepted model of choice due to its similar genomic profile to that of humans and the sensitivity of it's embryo to toxic pollutants. The goal of this study is to determine the chemical composition of $PM_{2.5}$ from locations in Tennessee during the Fall and then assess the oxidative potential and developmental toxicity of these samples. $PM_{2.5}$ filters were collected every third day from September to December 2014 from 14 Locations in Tennessee by the Tennessee Department of Environment and Conservation (TDEC). Black carbon concentrations were determined using a Magee OT21 Soot scan at 880 nm prior to extraction. The filters were then extracted via sonication in methanol for 60 minutes. Aliquots of the daily extracted $PM_{2.5}$ were removed to assess oxidative potential using the dithiothreitol (DTT) assay. Zebrafish (n=33) from 6 hours post fertilization to 5 days post fertilization will be exposed to the $PM_{2.5}$ solutions or controls (vehicle, blank filters) for analysis of the developmental impacts of $PM_{2.5}$ exposure. The mortality, morphology and behavioral changes between the zebrafish treatment and control groups will be measured and comparisons will be made between groups based on the sampling location and month. Our preliminary data for four locations in November with the highest and lowest $PM_{2.5}$ average concentrations indicates that the average black carbon concentrations for Loudon, Harriman, Dyersburg and Jackson ranged from 1.11 to 2.47 $\mu g/m^3$ while the average $PM_{2.5}$ concentrations ranged from 7.02 to 12.3 $\mu g/m^3$. We will also compare the exposures in November locations to exposures in September and access the effect of both months in zebrafish. Weak correlations were observed between the oxidative potential, black carbon and $PM_{2.5}$ from the four locations and oxidative potential varied between dates. Zebrafish exposures are underway and we expect to see differences between locations and months in developmental toxicity outcomes including mortality and behavioral changes. The differences between black carbon, $PM_{2.5}$ concentration, oxidative potential and developmental toxicity at each location will be highlighted in this research. This work will help determine if embryonic exposure to $PM_{2.5}$ from varying locations/months will alter zebrafish development and the role that chemical components plan in these responses.

P8.10

ASSESSING CLIMATE CHANGE RISKS IN THE US MIDWEST REGION'S ENVIRONMENT

Edmund Merem[1], Yaw Twumasi[2], Joan Wesley[3], Gloria Hirse[4], Marshand Crisler[3], Duro Olagbegi[3], Mohammed Alsarari[1], Zimuzo Ozuah[3], Emmanuel Nwagboso[5], Siddig Fageir[6], Jude C. Offiah[3], Samson Zino[7]

[1]Department of Urban and Regional Planning, College of Science, Engineering and Technology Jackson State University, Jackson, MS, Nigeria. [2]Department of Urban Forestry and Natural Resources, Southern University, Fisher Hall,, Baton Rouge, LA, USA. [3]Department of Urban and Regional Planning, College of Science, Engineering and Technology Jackson State University, Jackson, MS, USA. [4]Department of Public Policy and Administration, College of Liberal Arts, Jackson University, Jackson, MS, USA. [5]Department of Political Science, College of Liberal Arts, Jackson University, Jackson, MSi, USA. [6]Department of Sociology, College of Liberal Arts, Jackson University, Jackson, MSi, USA. [7]Department of Environmental Science, College of Science, Engineering and Technology Jackson State University, Jackson, MS, USA

The US Midwest region known for its web of lakes, rivers and vast swaths of farmland ranks high as the nation's food basket. Being a huge agricultural hub with access to global markets, the region's immediate influence spans across a multiplicity of states supported by a flourishing supply chain network sustained by farming centers and activities in and outside of the Midwest. Notwithstanding the region's place as an active farm hub, it is slowly emerging as an epicenter of changing climatic hazards with the manifestations evident in different forms over the years. The gravity of the risks which transcends the upper, lower, and central parts of the Midwest region, involves the threats of periodic heat waves, extreme drought, heavy rainfalls, recurrent flooding, destruction of farmland and shifting temperature. With much of the risks and recurrent changes now a common trend among various states from Nebraska, Missouri, Iowa, Wisconsin, and Michigan to Ohio. The impacts come under varying forms including damages to both the built and natural environment through damages to property, the collapse of dams, elevated and falling temperature as well as displacement of people. In as much as several efforts have been put into place by agencies in the zone to remedy the situation. The extent of changing climate in the Midwest does not occur in isolation as most of that are attributed to socio-economic, physical, environmental and policy elements located within the larger ecological system. Even at that, very little has been done in the literature to assess the changing climate situation in the study area using a mix scale model anchored in GIS and descriptive environmental statistics. Accordingly, this enquiry will fill that void in research by assessing climate change hazards in the Midwest using mix scale techniques and secondary data with emphasis on the issues, trends, impacts, factors, and efforts. In applying these tools, preliminary results show widespread surge in changing climatic parameters over time and space with exposure to severe risks and impacts on the surrounding ecology of the states in the zone. Further along these lines, spatial mappings of change using GIS, pinpointed the gradual diffusion of risks on clusters of areas deemed epicenters of disasters along heavily impacted spots over time, due to a set of factors from socio-economic forces to physical variables. To address the risks, the paper proffered solutions in the form of education, enactment of effective policies, the design of regional climate risks info systems and the installation of advanced early warning devices to alert communities at risk while ensuring public safety.

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Mathematics, Computer Sciences and Statistics

Co-Chair: Jamil Ibrahim

Independent Scientist

Co-Chair: Ping Zhang

Alcorn State University

Vice-Chair: Rena Patel

US Army Engineer Research and Development Center

Vice-Chair: YaunYaun Duan

University of Mississippi Medical Center

Thursday, March 31, 2022

MORNING

Room D7

7:50 Welcome

8:00 STEM Teaching and Learning during the COVID-19 Pandemic

O9.01

8:30 ETHIO -TOUR AND TRAVEL

Solomon Gebrhana

Mississippi Valley State University, Itta Bena, MS, USA

This project will produce a web application system that will give the users that opportunity to come to Ethiopia and exploring new places, new food as well as a new culture. The application will provide a preview of what Ethiopia looks like. The general purpose of this project is to introduce Ethiopia to other foreign citizens, Ethiopia has lots of interesting places and cultures to explore, it is also rich in history. Whenever I asked my coworkers and my classmates if they want to come and visit, they always say that they are scared and automatically assume that they will get hurt, on top of that they don't have the knowledge on which places to visit, where to go or even how to get there, this got me motivated to create a platform where they can come and see what they are missing. When they come and visit the web application, they will have the knowledge on which places to visit, how to get there and some services that we provide to give them the tour of a specific location, they will also see some foods they should try and the places that they can go and enjoy those cuisines. This web application will inspire the people to go a visit Ethiopia which is the birthplace of ancient civilization, the origin of mankind, the country that has its own calendar system, the country with its own letters and 80 different languages, the only African nation that was never colonized by the westerns and so on. When they see that I am sure it will bring some kind of inspiration and curiosity to come and visit.

O9.02

8:50 ONLINE STORE

Roseline Shapi

Mississippi Valley State University, Itta Bena, MS, USA

ECommerce has redefined how people buy and sell goods. It has made it more empowering for consumers to buy products in the comfort of their homes and get them delivered to their door steps, making it convenient. Through their websites and online advertisements, businesses can communicate with their clients, provide information on new products and complete sales.During the onset of Covid 19 pandemic, a lot of people resorted to online shopping. This consumer behavior has continued even until now. On the other hand Ecommerce makes it easy for small businesses as they do not need to pay high rentals. They can use their basements for storage. This significantly reduces the operating expense. E-commerce empowers small businesses. Ecommerce has helped businesses improve their efficiency through streamlining the production and service delivery process.Execution of online business transactions that are fast and cost effective has gone a long way in bolstering business efficiency. Moreover, business can reach people that they would have not otherwise reached. It is not limited by geographical location.

O9.03

9:10 A STAND-LEVEL GROWTH AND YIELD MODEL SYSTEM FOR SHORTLEAF PINE PLANTATIONS IN THE WESTERN GULF

Curtis VanderSchaaf

Mississippi State, Raymond, Mississippi, USA

A system of growth and yield equations using data from across the Western Gulf region is presented that can ultimately be used to determine the financial feasibility of establishing and managing shortleaf pine plantations. Predictions of trees per acre, basal area per acre, and total volume per acre can be obtained using this system of equations. Quadratic mean diameter can be mathematically derived from the trees and basal area per acre estimates.

O9.04

9:30 KEEP THE ASIAN CARP DOWNRIVER: USING INFLUXDB AND OTHER TECHNOLOGIES FOR MONITORING POWER AND ACOUSTIC SYSTEMS

Brandon Randle, David Jackson

US Army Engineer Research and Development Center, Vicksburg, MS, USA

The migration of Asian carp (specifically bighead carp, black carp, grass carp, and silver carp) into the Mississippi River basin and up the river and its tributaries is an established, notable ecological problem. Various efforts have been underway over the years to mitigate and eliminate the negative impact these fish species are having upon the native aquatic ecosystems in the central United States. One such effort is the Underwater Acoustic Deterrent System (uADS) – a full-scale study of a potential means of preventing the movement of invasive carp, sponsored by the US Geological Survey and the US Army Corps of Engineers. This study is testing the feasibility of using acoustic signals to achieve such a goal.

One element of making this study a success is powering and monitoring the hardware to ensure three years of constant uptime during the study. The uADS effort uses a suite of amplifiers and other hardware to deliver the sounds necessary, and this suite is powered through Uninterruptible Power Supplies (UPS). This presentation will discuss how InfluxDB and other associated technologies have been implemented to monitor these UPS and acoustic systems to ensure issues are reported in a timely manner, detailed log information is generated, parsed, and analyzed, and the system maintains a high level of uptime to ensure the success of the study.

O9.05

9:50 LOCALIZED METHOD OF PARTICULAR SOLUTIONS USING POLYNOMIAL BASIS FUNCTIONS FOR SOLVING TWO-DIMENSIONAL NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS

Thir Dangal[1], Balaram Khatri Ghimire[2], Anup Lamichhane[3]

[1]Alcorn State University, Lorman, MS, USA. [2]Alabama State University, Montgomery, AL, USA, and [3]Ohio Northern University, Ada, OH, USA

The localized method is one of the popular approaches in solving large-scale problems in science and engineering. In this paper, we implement the localized method of particular solutions using polynomial basis functions for solving various nonlinear problems. To validate our proposed numerical method, we present four numerical examples in regular and irregular domains which are solved by using localized method of particular solution with polynomial basis functions. We compared our numerical method with localized method of particular solutions using multiquadric radial basis function and numerical results clearly show that our numerical method is highly accurate, efficient, and outperformed the method using multiquadric radial basis function.

O9.06

10:10 MODELING CONFIGURABLE SENSORS USING EFFICIENT COMMUNICATION WITH A PARALLEL LARGE-SCALE GEOMETRY RAY TRACING ENGINE

Abdias Santiago-Lugo, Barry White, Reena Patel

U.S. Army Corps of Engineers, Engineer Research and Development Center, Vicksburg, MS, USA

The Virtual Environment for Sensor Performance Assessment (VESPA) project is attempting to generate image training sets for Automated Target Recognition (ATR) algorithms using artificial environments with modeled sensor response. The sensor response collects multispectral information from the faceted physically modeled artificial environment. This multispectral information is passed through an analog-to-digital (A2D) converter to create an image with millions of pixels, requiring a large amount of information to be communicated. Our goal is to provide a direct memory communication transfer and an efficient server communication model between a sensor model instance and the VESPA Geometry Engine. The Sensor Engine generates query rays for the VESPA Geometry Engine, which uses ray-tracing for determining surfaces that emit and/or reflect multi-spectral radiance. The Sensor Engine generates perspective rays for the entire pixel array of the sensor. The number of rays created can be affected by the amount of super-sampling used. The sensor also has a specific multi-spectral response range. The communication of rays and ray responses can be made efficient by calling the radiance band for transmitting/receiving information. ADIOS2 allows for direct memory transfer of information between the two programs. An API has been developed for server side communication between the Sensor Engine and the Geometry Engine. We have implemented the API and performed timings of communications between a Sensor Engine and the Geometry Engine. These results are included in this presentation. An API has been developed that allows us to perform efficient server-side communication for sensor modeling.

10:30 BREAK

O9.07

10:50 THE IMPACT OF CORONAVIRUS DISEASE (COVID-19) PANDEMIC ON COURSE DELIVERY METHODS IN HIGHER EDUCATION.

Jamil Ibrahim[1], Saja Ibrahim[2], Waseem Ibrahim[3], Ibrahim J Ibrahim[4], Hidaya Ibrahim[5]

[1]UMMC, Jackson, MS, USA. [2]University of Jordan Medical School, Amman, Jordan, Jordan. [3]Arab American University, School of Medicine, Jenin, West Bank, Palestine. [4]Arab American University, School of Dentistry, Jenin, West Bank, Palestine. [5]Al-Najah University, School of Pharmacy, Nablus, West Bank, Palestine

Over the years, substantial efforts have been made to compare the effectiveness of traditional course formats to alternative formats (most often, Hybrid methods compared to traditional on-site delivery). The coronavirus disease 2019 (COVID-19) pandemic has greatly affected higher education teaching and learning. As academic institutions across the world continue to deal with the global health crisis, there is a need to examine different instructional modalities including online, and hybrid learning methods. COVID-19 lockdown phenomenon enabled Higher Education stakeholders to reflect on dealing with new technologies, changes in lifestyle and livelihoods, and the impact that they had on teaching and learning. With the improvement of technology, there has been a rapid increase in these approaches. The process for evaluating courses and faculty varies greatly from institution to institution. Experts agree that student opinions are valuable to faculty and institutions. Practically every college and university spends significant time, money, and effort to collect, analyze, and distribute opinion surveys as an important component of institutional assessment planning. This study sought an answer to the following question: What are the differences in students' perceptions of the quality of instruction of hybrid modality as compared to traditional modality? The IBM Statistical Package for the Social Sciences (SPSS 24) and Minitab 15 were used to analyze the data. The test for significance was specified at the p =.05 level. Statistical analyses were conducted using independent samples t-tests and supported with a non-parametric Mann-Whitney U test, and Chi-square test. Other appropriate qualitative and quantitative techniques were used for analyzing the results.

O9.08

11:10 THEORY OF COMPUTATION AND ITS APPLICATIONS

Andrew D. Meadows, Lawrence G. Mack, D'Munntearrious J. Jackson, Ping Zhang

Mathematics and Computer Science Department, Alcorn State University, Lorman, MS, USA

In this Theory of Computation analysis project, different automata have been reviewed. The languages and their corresponding grammars are investigated and some examples are given and analyzed. The definitions of Finite Automata, Deterministic Finite Automata, Pushdown Automata and Turing Machines are defined. The grammars of the regular and context-free languages are analyzed. The languages created by the grammars are listed in the project. Examples of language recognition and verifications are given in the presentation. The future research on this topic is discussed.

11:30 Divisional Business Meeting

12:00 General Session

Thursday, March 31, 2022

AFTERNOON

Room D7

1:00 WORKSHOP

THE IMPORTANCE OF POWER ANALYSIS IN CLINICAL RESEARCH AND THE ROLES OF BIOSTATISTICIANS AND MEDICAL EXPERTS IN DETERMINING SAMPLE SIZE FOR CLINICAL TRIALS

Jamil Ibrahim[1], *Waseem Ibrahim*[2], *Saja Ibrahim*[3], *Ibrahim J Ibrahim*[4], *Hidaya Ibrahim*[5]

[1]*UMC, Jackson, MS, USA.* [2]*Arab American University, School of Medicine, Jenin, Palestine, Palestine.* [3]*Saja Ibrahim, Jordan University, School of Medicine, Amman, Jordan, Jordan.* [4]*Arab American University, School of Dentistry, Jenin, Palestine, Palestine.* [5]*Al-Najah University, School of Pharmacy, Nablus, Palestine, Palestine*

Power analysis and optimum sample size is an essential component of any research. Sample size determination has to be solved during the planning and designing stage of the study. Expert knowledge of clinicians is important to provide an estimate of the relevant effect. Statisticians should be involved from the beginning of these studies. In research practice, the most common requests to statisticians from investigators are sample size calculations or sample size justifications. Methods for estimating sample size and performing power analysis depend primarily on the study design and the main outcome measure of the study. There are different procedures for computing sample size for the confidence interval approach and the test of significance approach of drawing statistical inference from the study results, The aim of this presentation is to describes some commonly used terms, which need to be specified for a formal sample size calculation and to provide practical examples on how to calculate sample size for clinical studies. The components of sample size calculations will be discussed and what factors to consider in choosing the sample size. Other concepts related to this issue such as power analysis, confidence intervals, variability, type I error, type II error, and minimum effect size of interest will also be discussed. Common software programs for calculating sample size include Nquery, SPSS with Sample Power, and SAS with the procedures PROC POWER and PROC GLMPOWER. Sample size calculation by hand will also be performed. Undersized studies may waste time, effort, and money by using resources without finding results and oversized studies may be wasteful, unethical and may expose study units to unnecessary risks. Also, the advantages and limitations of power analysis will be discussed.

2:30 BREAK

O9.09

2:40 STUDY ON THE EFFECT OF MVG ON FLOW FIELD UNDER HIGH MACH NUMBERS

Yonghua Yan[1], *Caixia Chen*[2]

[1]*Jackson State University, Jackson, MS, USA.* [2]*Tougaloo College, Tougaloo, MS, USA*

Micro Vortex Generator (MVG) is a device used for flow control. Its mechanism and application in low-speed fluids have been studied to some extent, but the influence in supersonic and hypersonic flows still needs to be explored. In this study, the effect of Micro Vortex Generator (MVG) on the high-speed flow field under high Mach numbers is investigated. Large Eddy Simulations (LES) of MVG controlled supersonic flows and hypersonic flows (Ma>=5.0) are conducted. The numerical results are compared with the ones in the lower speed flows (Ma=1.5-3.0). It is found that with the increase of Ma, the ring-like vortices generated by the induced momentum deficit are also intensified. However, due to the lower position, more interaction between the ring-like vortices the lower vortex structures in the boundary layer was observed, resulting in greater deformation of the ring-like vortices. The frequency of the ring-like vortices generated under high Mach numbers are also investigated, no obvious difference was observed.

O9.10

3:00 SIMULATION OF SWALLOWING PROCESS WITH DYSPHAGIA

Caixia Chen[1], *Yonghua Yan*[2], *Tyler Hickman*[1], *Bradford Patton*[1], *Alitzel Serrano*[1], *Tizon D. Matthews-Harris*[1]

[1]*Tougaloo College, Tougaloo, MS, USA.* [2]*Jackson State University, Jackson, MS, USA*

Dysphagia refers to difficulty with eating or swallowing. Understanding normal swallowing mechanics and how they may be disrupted is a vital patient safety goal in rendering care. In this study, the process of swallowing liquid food in the pharyngeal stage is modeled and simulated numerically. The bolus flow is treated as the free surface ejection flow in fluid dynamics. Multi-phase LBM (Lattice Boltzmann Method) algorithm is adopted to simulate the bolus flow. 2D numerical results of the bolus ejection flows without considering the effect of breathing are obtained with different flow parameters, such as viscosity and initial speed of the flow. In the case of loss of normal swallowing ability, the possibility of water/food choking caused by the swallowing process has been studied. This study provides some guidance for understanding dysphagia and finding corresponding aids.

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P9.01

MODERNIZING LEGACY, MISSION-CRITICAL APPLICATIONS TO WEB-BASED IMPLEMENTATIONS

Matthew Little

US Army Engineer Research and Development Center, Vicksburg, MS, USA

The United States Government relies heavily on a plethora of legacy applications for the execution of day-to-day duties. These

applications play a vital role in the daily operations of agencies across all three branches of government. While these still function as intended, they are often operated as a standalone desktop application and are often unable to easily share data with other government users and agencies. To address the issue, many agencies are hiring groups to create web-based application portals that will enhance collaboration among agencies and civilian organizations. Agencies choose the portal/modernization route to give the tools a new look, incorporate collaboration toolkits, and upgrade the business logic to current implementations removing the dependence on out-of-date languages and end-of-life hosts. The purpose of this poster will be to give an overview of the pitfalls of our journey modernizing legacy software and the approach we used to accomplish this task.

P9.02

ATTENTION-DEFICIT/HYPERACTIVITY DISORDER DIAGNOSIS THROUGH DIFFUSION CONVOLUTIONAL RECURRENT NEURAL NETWORKS USING TEMPORAL NETWORK DATA

Yibin Wang[1], *Haifeng Wang*[1], *Harun Pirim*[1], *Zhiqian Chen*[1], *Lir-Wan Fan*[2], *Norma Ojeda*[2]

[1]*Mississippi State University, Mississippi State, MS, USA.* [2]*University of Mississippi Medical Center, Jackson, MS, USA*

Attention-deficit/hyperactivity disorder (ADHD) is one of the most common neuro-developmental disorders among children. This disorder is recognized by an occurrence of inattention and hyperactivity impulsivity that interferes with functioning. Brain network provides a mathematical description of the complex connections and interactions among neurons in brain. In this paper, we propose a graph deep learning method to classify ADHD using time series brain resting-state functional magnetic resonance imaging (rs-fMRI) data. A graph diffusion convolutional recurrent network (GDCRN) architecture is implemented for the time series graph-structured ADHD classification. Correlation matrices at different time stamps are constructed based on the fMRI acquisition repetition time (TR), which are converted to multiple adjacency matrices for brain network as the model input. Various training scenarios are designed for the experimental test. GDCRN has been compared with conventional diffusion convolutional neural network (DCNN). The experimental results have demonstrated that our model is able to classify ADHD and non-ADHD patients. The outcome of this research is expected to promote the implementation of deep learning for ADHD detection as well as brain network analysis in the computer-aided diagnosis field.

P9.03

SELF-EFFICACY DEVELOPMENT IN ELEMENTARY-AGED LEARNERS THROUGH DANCE AS AN ALGORITHMIC THINKING TOOL

Niva Shrestha, Sarah Lee

The University of Southern Mississippi, Hattiesburg, Mississippi, USA

The purpose of this research is to demonstrate the effectiveness of a transdisciplinary approach in teaching computational thinking through dance to elementary-aged learners, with primary attention to females. With limited literature available on how pre-adolescents begin to construct conceptions of computer science and other engineering domains, including potential career pathways, the incentive of this project was to leverage a day camp to about 20 rising 3rd - 5th-grade learners to assess their identity development in computer science. Modules that teach computational thinking through dance paired with Unruly splats (block-based programmable electronic gadgets) were implemented by the researcher. By conducting pre-and post-surveys and a 'draw a computer scientist' exercise at the beginning and at the end of the dance modules held on day 2 of the camp, the researcher was able to evaluate and determine the effect of the transdisciplinary approach on the elementary learners' perceptions and self-efficacy.

P9.04

POSTURE OF PROTECTION: HARDENING WEB APPLICATIONS FOR RELEASE ON THE PUBLIC INTERNET

Michael Clement

US Army Corps of Engineers - Engineer Research and Development Center, Vicksburg, MS, USA

Cyber threats are a continual reality for applications hosted on the public internet. From Denial of Service (DOS) attempts to brute force password guessing, the onslaught of cyber-attacks places many applications in constant danger of being compromised. These attacks range from the simple to the complex, and vary dramatically in scope. In order to prepare for and mitigate the effects of such attacks, it is imperative that web applications be hardened against these assaults. Two crucial bastions of improved security posture come in the form of containerization (through Docker) and the use of open-source, peer-reviewed software. The former enables rapid deployment and offers the critical benefit of enhanced isolation coupled with the ability to easily return to a known state when the virtual host becomes compromised. The latter provides a software platform that has been vetted and hardened by a community of vigilant contributors. This brings the benefit of constant revalidation and collaboration, preventing the formation of security vulnerabilities through careless, unverified development that may occur with in-house/proprietary solutions. This poster will detail how the use of a containerized deployment environment, paired with open-source software, provides a solid foundation for a hardened web application.

P9.05

THE EFFECTS OF COVID: PRE-COVID, DURING COVID, AND POST-COVID

Megan Burch

Mississippi Valley State University, Itta Bena, MS, USA

The risk of COVID-19 in higher education has affected all its degrees and forms of training. To evaluate the effect of the pandemic on the learning of college students, a new reference framework for educational data processing was proposed. The structure binds together the steps of investigation of COVID-19 consequences for the higher education establishments in various nations and times of the pandemic. It comprises both classical statistical methods and modern intelligent methods: machine learning, multi-criteria decision making and big data with symmetric and asymmetric information. The new structure has been tested to examine a dataset gathered from a college students' review, which was led during the second wave of COVID-19 toward the end of 2020. The principle task of this research are as per the following: (1) assess the mentality and the preparation of students as in regard to distance learning during the lockdown; (2) explain the hardships, the potential changes and the future assumptions from distance learning in the next month; (3) propose proposals and measures for further developing the advanced education climate. After data analysis, the conclusions are drawn and recommendations are made for enhancement of the

quality of distance learning of university students.

P9.06

NUMERICAL SIMULATION OF THE BOLUS EJECTION FLOW IN THE PHARYNGEAL STAGE

Tizon D. Matthews-Harris, Bradford Patton, Tyler Hickman, Alitzel Serrano, Caixia Chen

Tougaloo College, Tougaloo, MS, USA

Dysphagia is the disruption of the normal swallowing process; its epidemiology is a national health care concern. Understanding normal swallowing mechanics and how they may be disrupted is a vital patient safety goal in rendering care. The bolus flow in the pharyngeal stage can be considered as the free surface ejection flow in fluid dynamics. LBM (Lattice Boltzmann Method) which is based on Boltzmann equation is becoming an alternative and promising numerical scheme for simulating multiphase and multi-component fluid flows due to its ability to maintain sharp interfaces without any artificial treatments and interface tracking. LBM will be adopted to simulate the bolus flow in the pharyngeal stage in this paper. 2D numerical results of the bolus ejection flows without considering the effect of breathing are obtained. Based on the results obtained, investigation of the mechanisms on the generation of aspiration during improper treatments of liquid food for patients will be conducted.

P9.07

THE CORRELATION BETWEEN SOCIAL MEDIA AND ACADEMIC PERFORMANCE

Caleb Wafer

Mississippi Valley State University, Itta Bena, Mississippi, USA

The advent of social media has revolutionized all around communication in the 21st century. Social media has transformed the speed that information and news could be transferred. Social media apps such as Facebook was built on the principle of being able to social network and exchange information between peers and engage students who might not have been the most social. While social media has its obvious positives for students on college campuses, such as its social engagement factor, this research argues that it can become a hindrance and distraction towards their academic success. This study intends to collect a random study of the male and female population attending Mississippi Valley State University on their use of any forms of social media, how much they are consuming, and its effects on their studies. An analysis will be conducted by looking at the students' academic performance and social media usage. Then statistical data will be correlated on the impacts of social media on academic performance.

P9.08

METABOLIC SYNDROME AMONG MEXICAN AMERICANS

Hiram Beltran-Sanchez[1], *Alitzel Serrano*[2], *Chen Caixia*[2]

[1]*University of California, Los Angeles, California, USA.* [2]*Tougaloo College, Tougaloo, MS, USA*

Abstract

Despite the growth and prevalent health issues in the Latin American population, there is still insufficient research focused on understanding their health outcomes. Particularly, not enough is known about how Metabolic Syndrome (MetS) affects Cardiovascular disease (CVD) in Mexican Americans. Thus, the purpose of this study is to examine the prevalence of MetS and to analyze how different components of MetS predict CVD in Mexican Americans. Other variables are also taken into consideration, including socioeconomic status (e.g., education), alcohol consumption and cigarette smoking, and how they interact with MetS. Therefore, by investigating how MetS and other behaviors affect CVD, improved evidence-based interventions can be proposed to reduce CVD risks in Mexican Americans.

Friday, April 1, 2022

MORNING

Room D7

8:20 Welcome

O9.11

8:30 NONDETERMINISTIC EXECUTION SEQUENCE OF THE EVENT-DRIVEN PROCEDURES IN VISUAL BASIC

Lixin Yu[1], *Sardar Haque*[1], *Yufeng Zheng*[2], *Ping Zhang*[1]

[1]*Alcorn State University, Lorman, MS, USA.* [2]*University of Mississippi Medical Center, Jackson, MS, USA*

Abstract

Traditionally, the sequence of the execution of the procedures or functions are determined by the code in the caller procedure on a one-by-one basis. The caller procedure goes to sleep after calling another procedure. The called procedure wakes up the caller procedure when it finishes its job. The caller procedure then continues to execute the next statement, call another procedure if it is the design. The second procedure will execute only after the first procedure is completed, because the caller procedure needs to wait for the first procedure to return the control to it before it can call the second procedure. In contrast, event procedures in event-driven program are triggered by user actions (such as mouse move, key-press or key-release) or other events the program can detect. This mechanism may cause nondeterministic execution sequence of procedures. The reason is that procedures are not called by a caller procedure. Therefore, after the first event triggered a procedure, the next event can start the second procedure before the first procedure is completed. The parallel execution of two procedures may create unpredictable result when the two procedures need to update the same variable or file record - the second procedure may update the variable before the first procedure does, which is contradictory to the expectation of the programmer. This presentation demonstrates an example of this problem in Visual Basic (an event-driven programming language). A research project in deep learning on keystroke and mouse dynamics needs to record the keyboard and mouse event to study the pattern of users' typing and mouse-clicking activities. This nondeterministic procedure execution problem surfaced when users typed or clicked very fast. The data of the second keypress may be recorded before the first keypress. As a byproduct of that study, this research analyzes the reason of the problem, presents the sequence of execution of the related event procedures, and provides a solution to detect and solve the problem.

O9.12

8:50 THE IMPLICATIONS OF QUANTUM COMPUTING ON MODERN CRYPTOSYSTEMS

Austin Sanders, Bilal Abu Bakr

Collin College, Frisco, TX, USA

Public key cryptography has become an essential component of our global communication digital infrastructure over the last three decades. Mobile phones, online shopping, social networks, and cloud computing are just a few of the applications supported by these networks, which are critical to our economy, security, and way of life. Individuals, corporations, and governments must be able to interact safely in this increasingly linked world. The three main cryptographic functions of public-key encryption, digital signatures, and key exchange are used in many of our most critical communication protocols. Diffie-Hellman key exchange, the RSA (Rivest Shamir Adleman) cryptosystem, and elliptic curve cryptosystems are currently used to implement these features. Some theoretical problems such as Integer Factorization or the Discrete Log Problem over various groups determine these securities. Quantum computers are machines that use quantum-mechanical processes to efficiently solve mathematical problems through quantum parallelism, which allows for simultaneous computations and vastly improved computational speed over a conventional computer. Many of the present public-key cryptosystems will be broken if large-scale quantum computers are ever constructed. This would jeopardize the security and secrecy of digital intercommunications This paper examines RSA at a fundamental level to explain some of the basic principles that newer cryptosystems should avoid relying on to remain secure, including the exclusive use of prime factors as keys for encryption. The inevitable cracking of the three mentioned major modern cryptosystems could lead to wide-ranging consequences in securing data if these problems are not addressed.

O9.13

9:10 ANALYSIS AND REEVALUATION OF CIPHERS IN THE INTERNET OF THINGS

Melissa Genovese, Bilal Abu Bakr

Collin, Frisco, TX, USA

Smartwatches, smart televisions, and smart baby monitors are just a few examples of the emerging Internet of Things (IoT) devices. Our houses, cars, workplaces, remote health sensing, and self-driving cars include smart devices and sensors. IoT has the potential to transform how we interact with the world today. Due to the predicted volume of connected devices, we will no longer have direct control over whom or what our devices communicate. Hackers use new attacks as smart devices become more prevalent, posing severe security and privacy concerns. Attacks on IoT devices demonstrate a sobering problem. Companies are overlooking security as they rush products to market. As a result, companies must evaluate the security of their devices and implement proper security measures, such as Stream ciphers. New security methods and solutions are currently being developed. Block Ciphers are one example; nevertheless, they are not always feasible, and many are complicated. For the past 50 years, the Data Encryption Standard (DES) has been the most prevalent block cipher. Even though the DES keyspace is too limited to be deemed secure against a determined attacker, it is nevertheless utilized in outdated applications. DES is a symmetric cipher, which means that the encryption and decryption keys are the same. DES is an iterative algorithm, as are practically all current block ciphers. Encryption is handled in 16 rounds for each block of plaintext, each performing the same procedure. Stream ciphers are typically compact, quick, and resource-constrained applications.

O9.14

9:30 THE EFFICACY OF DIFFERENT CIPHERS FOR IoT DEVICES

Reed Couture, Bilal Abu Bakr

Collin, Frisco, TX, USA

The Internet of Things (IoT) is a new technological paradigm that envisions a global network of machines and smart devices that communicate with one another. The IoT is attracting significant interest from various businesses, and consumers alike. Communication between these smart devices must be secure; security begins with the most basic security concepts - Confidentiality, Integrity, and Availability (CIA). Traditional cryptographic algorithms are challenging to utilize due to their small size, limited computational capability, limited memory, and restricted power resources of the devices. The birth of a new area, Lightweight Cryptography, resulted from the limits of IoT-enabled devices. The question is the efficacy of these lightweight ciphers in securing the IoT. The ciphers were compared in terms of energy and power consumption, hardware and software efficiency, throughput, latency, and figure of merit. According to the research, the Advanced Encryption Standard (AES) and Elliptic Curve Cryptography (ECC) are the best acceptable lightweight cryptographic primitives. AES algorithm is made up of layers; each layer is responsible for manipulating all 128 bits of the data flow. With shorter operands (160–256 bit vs. 1024–3072 bit), ECC delivers the same level of security as RSA or discrete logarithm systems. Because ECC is based on the generalized discrete logarithm issue, elliptic curves can also be used to implement DL-protocols like the Diffie–Hellman key exchange. ECC often outperforms RSA and Discrete Logarithm (DL) methods in terms of performance (fewer computations) and bandwidth (shorter signatures and keys).

O9.15

9:50 SAFEGUARDING THE MODERN INTERNET: MACHINE-LEARNING-ENABLED WEB APPLICATION FIREWALLS

Robert Crager, Bilal Abu Bakr

Collin, Frisco, TX, USA

In recent years, organizations have been using the web to advertise their products and services and carry out their everyday tasks involving sensitive data and complex workflows. Furthermore, as sophisticated hand-held devices become more popular and widespread, some programs are migrating from traditional desktop-based versions to web-based versions to reach a broader range of devices at a lower cost. On the other hand, the number of attackers is increasing, and their attack strategies are becoming more sophisticated and deadly, posing genuine security difficulties for enterprises trying to protect their web applications. Web-based applications are constantly under attack, and firewalls are the principal front-end protection technique. However, Web application firewalls can be bypassed, allowing malicious traffic to reach the web application server, potentially resulting in remote code execution, sensitive information disclosure, or access to information that end-users would not typically have. According to research, there are several approaches to circumvent Web application firewall solutions due to the lack of comprehensive and in-depth security filtering mechanisms and input validation/sanitization processes implemented by developers.

The issue can be resolved by incorporating an artificial intelligence-enabled adaptive learning system. A more advanced approach takes real-time data gathering and analytical input validation procedures for Web Application Firewalls seriously. It adjusts quickly to new data, gives insights practically instantly, and best of all, because of its adaptive learning capabilities, it will increase the identification of malicious input intended for web applications.

O9.16

AUTOMATING AN ENVIRONMENTAL HEAT FLUX SIMULATION WORKFLOW

Tomas Mondragon

USACE ERDC, Vicksburg, MS, USA

A considerable amount of research has been performed by various groups with the goal of detecting objects of interest in various environments. These objects can be above ground, partially buried, or fully buried. One of the detection methods that has piqued the interest of researchers is Automated Target Recognition (ATR) algorithms that can pick out the locations of such objects from infrared (IR) sensor imagery once it was recognized that such objects absorb and emit heat at rates that distinguish them from their surrounding environments. In order to obtain training data for ATRs, one option is to gather large volumes of field data from many locations, but such efforts are resource and labor intensive. Another option is to generate synthetic training data that simulates heat flux in real environments. Several research groups in the past have implemented a combination of both, using field data to inform and verify simulation tools that model heat flux, energy absorption, and IR emission from various parts of the environment, as well developing simulation workflows that model real environments. Such workflows are often developed for the purpose of simulating a single environment. Our goal is to modify and generalize such a workflow so that simulation parameters and the location of object of interest can be changed by non-experts or automated processes. In addition; this study is also focused on developing an efficient methodology to simulate a large variety of scenarios to produce varied sets of synthetic training data for the ATRs. The HPC simulations involved in generating the training data for ATRs require the exchange of data between several high fidelity physics models. Efficient techniques have been implemented to ensure that the inputs to each component are consistent and correct. A more generalized workflow has been developed that is able to simulate complex scenarios with new LiDAR data, weather data, vegetation placements, target placements, and as output produce synthetic IR imagery useful for training ATRs. The synthetic IR images are automatically tagged with bounding boxes so that minimum post processing is required when the images are used for training the ATRs. The synthetic IR imagery was passed on to researchers developing ATRs and used to train the algorithms. The parts of the workflow that are streamlined can now be executed with relative ease on a high performance computing environment and components of the workflow can now be more easily updated and modified in the future.

10:30 BREAK

O9.17

10:50 A SURVEY OF CURRICULUMS IN DATA SCIENCE, COMPUTER SCIENCE, AND MATHEMATICS

Anil Daramoni, Suresh Anamoni, Prashanth Daramoni, Lixin Yu, Sardar Haque

Alcorn State University, Lorman, MS, USA

Data science is a new interdisciplinary field. The number of google entries about data science and other disciplines reveals that many are confused about the difference and similarity among data science and the related fields. According to Wikipedia, data science is an interdisciplinary field that uses scientific methods, processes, algorithms and systems to extract knowledge and insights from noisy, structured and unstructured data, and apply knowledge and actionable insights from data across a broad range of application domains. Data science is related to data mining, machine learning and big data. It is related to multiple fields such as statistics and artificial intelligence. The definition states what data science is, but still, people need to have a clearer picture on the relationship among these disciplines and fields. This study introduces various view point on this issue from literature study. Further, this study will present the result of a survey of the curriculums of the top six programs, according to US News, in each of the three disciplines and fields. The similarities and differences among the curriculums in the three related fields illustrate the relationship among them objectively. This study will also present a list of data science application areas, such as healthcare, e-commerce, banking, and manufacture. The result of the study may provide guidance for people to select a field of study.

O9.18

11:10 SERIAL CORRELATION COEFFICIENT SIGNIFICANCE POINTS

David Rop

Jackson State University, Jackson, MS, USA

Serial correlation occurs when assumption 4 (observations of the error term are uncorrelated with each other) is violated. When this happens, we cannot use ordinary significance points to test whether the serial correlation coefficient is large enough to warrant the rejection of null hypothesis. We will have to compute serial correlation coefficient significant points. To do this, we need to determine the distribution of the serial correlation coefficient.

We will derive the distribution of lag 1 serial correlation and get an approximate normal distribution. We then compute 5% and 1% significance points. Sometime a data can correlate with different lags. So, we will derive other methods of computing significance levels regardless of the lags or data size.

One way to do this is to derive lag 2 distribution. We will show that when the data size is divided by the number of lags, we will come up with a distribution that involves all other distributions regardless of the lag or sample size. For lag 2 primary distribution, the ratio of sample size and lag equals to 2. If the ratio of the two equals 3, then we have lag 3 primary distribution. Both distributions serve the same purpose. We can use either of the two and still come up the same conclusion.

We will end up with three different tables of significance points. One for lag 1, another one (general case) for lag 2, and another general distribution, lag 3. These tables will be used the same way we use Pearson's linear correlation critical values.

O9.19

11:30 BULLWHIP EFFECTS, DISRUPTIONS AND STABILITIES IN A SUPPLY NETWORK MODEL

Qingwen Hu

Alcorn State University, Lorman, MS, USA

We develop a model of differential equations for a supply network with two suppliers in each level and with state-dependent delivery time delays between every two adjacent levels. With the supply network model, we investigate the bullwhip phenomenon and the stabilities of the equilibrium state of order placements, and further delineate factors which can cause onset of periodic oscillations of the order placement decisions. In particular, the impacts of the disruptions are analyzed when a supplier is dysfunctional. We show that if the supply-demand matrix between every two adjacent levels is a Markov matrix, the supply network is most robust with respect to disruptions. Numerical simulations are given to illustrate Hopf bifurcation and the impacts of disruptions on periodic oscillations in the supply network.

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Neurosciences

Chair: Nicolas Brunet

Millsaps College

Vice-Chair: Lainy Day

University of Mississippi

Vice-Chair: Scoty Hearst

Mississippi College

Thursday, March 31, 2022

MORNING

Room D8

8:30 Welcome

Dr. Nicolas Brunet

O10.01

8:45 EXTRACELLULAR MATRIX ABNORMALITIES IN SUBJECTS WITH SUBSTANCE USE DISORDER

Jake Valeri[1], *Sinead O'Donovan*[2], *Ratna Bollavarapu*[1], *Lindsay Rexrode*[1], *Barbara Gisabella*[1], *Craig Stockmeier*[1], *Harry Pantazopoulos*[1]

[1]*University of Mississippi Medical Center, Jackson, MS, USA.* [2]*University of Toledo, Toledo, OH, USA*

Introduction: Substance use disorders (SUD) are a prevalent and debilitating family of psychiatric disorders. Emerging evidence points to a critical role of extracellular matrix (ECM) molecules as mediators of drug memories. Chondroitin sulfate proteoglycans (CSPGs) are a subset of ECM molecules that form perineuronal nets (PNN) around inhibitory neurons. PNNs restrict synaptic connections and help maintain synapses. Rodent models suggest that PNNs are degraded by endogenous proteases to allow for formation of reward memories and then reconsolidate around synapses involved in reward memory to protect these memories from erasure. Despite this compelling evidence, there is currently a lack of information regarding PNNs in the brain of people with SUD. We used human postmortem brain samples of the hippocampus from subjects with SUD and unaffected control subjects to test the hypothesis that PNNs are increased in subjects with SUD.

Methods: A cohort of 64 human postmortem hippocampi from donors with substance use disorders (n=20), SUD and comorbid major depressive disorder (n=24), and healthy controls (n=20) was used to histochemically label CSPGs using Wisteria floribunda agglutinin lectin, and gene expression was determined using qPCR. Samples labeled with WFA were quantified using stereology-based software and stepwise linear regression analysis of covariance was used to test for effects of diagnosis group and confounding variables.

Results: Our microscopy analysis uncovered increased densities of PNNs and CSPG- labeled glial cells in SUD, coinciding with decreased mRNA expression of the ECM proteases MMP9 and cathepsin-S, and increased expression of the chondroitin sulfate synthase 1 gene and the fast-firing interneuron calcium binding molecule parvalbumin. Furthermore, we observed increase expression of the excitatory synaptic marker VAMP2 and the L-type calcium channel gene CACNA1C, whereas the inhibitory synaptic marker SYN1 was not significantly different between diagnosis groups.

Conclusions: Our findings provide the first evidence for increased PNNs in subjects with SUD and point to a previously unsuspected role for CSPG expression in glial cells. Increased PNN expression is in line with previous preclinical reports that PVB expression fluctuates in parallel with PNN composition around PVB neurons. Furthermore, increases in the excitatory synaptic marker VAMP2 and the L-type calcium channel CACNA1C point to increased neuronal activity in the hippocampus of subjects with SUD. Increased PNNs and VAMP2 expression suggests that PNNs may stabilize synapses involved in contextual reward memory as suggested by preclinical studies. Strengthened reward memory synapses may in turn contribute to context-induced relapse in SUD. Improved understanding of the molecular processes involved in PNN regulation of synapses in subjects with SUD will allow for the development of novel therapeutic strategies to weaken drug reward memories and promote recovery.

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O10.02

9:00 MICROSACCADE DIRECTION IS MODULATED BY COVERTLY ATTENDED, BUT NOT UNATTENDED, VISUAL STIMULI.

Rita Lacy[1], *Andrea Tall*[1], *Madelyn Abbott*[1], *Ashwin Venkatakrishnan*[2], *Susana Martinez-Conde*[2], *Stephen Macknik*[2], *Nicolas Brunet*[1]

[1]*Millsaps College, Jackson, Mississippi, USA.* [2]*State University of New York Downstate Medical Center, Brooklyn, New York, USA*

When our gaze is fixated on a location within our visual field, microsaccades are elicited. These are tiny movements our eyes make to counteract neural adaptation; more specifically, to prevent the retinal image from fading. It is not known whether the direction of these small movements, typically revealing a horizontal bias, is modulated by the presence of unattended but salient visual stimuli.

To characterize these small movements, we collected eye movement data from research participants while they foveated the center of the monitor and images were displayed in their peripheral vision. During each trial, eight images – each representing a different category of visual stimuli such as faces, snakes and candy – were displayed simultaneously, equidistantly from the center, and in random order, while participants were instructed to direct their gaze to a cross displayed at the center of the screen. By modifying the original paradigm, we created two additional versions of the experiment: for experiment two, all but one of the eight stimuli, displayed for each trial, were rendered invisible (selected randomly); for experiment three, all but one of eight stimuli, displayed for each trial, were scrambled to make them unreadable and uninformative. The fourth experiment was identical to the third, except that participants were instructed to foveate the center while also attending, covertly, the one unscrambled image. Our results suggest that the direction of the microsaccades was modulated by the covertly attended stimulus, but not by the unattended, albeit salient, visual images. In other words, the presence of the images did not override the horizontal bias typically observed in microsaccades.

O10.03

9:15 A CLASS OF NON-FACE STIMULI THAT ELICIT A LARGE N170 COMPONENT

Aastha Banga, Sunny Jagdale, Nicolas Brunet

Millsaps College, Jackson, Mississippi, USA

The fusiform face area is strongly activated in response to images of faces, which can be picked up using electroencephalography (EEG): faces typically evoke a large N2 (aka N170), which is a negative deflection in the ERP waveform that peaks between 150 and 200 ms For the current study we explore early ERP components in response to three different categories, each counting 60 images. The first category consists of images of houses; to obtain the other categories, we used “Crop Image”, a free online application to crop out 60 unique persons, shown in front views, retrieved from original photos; the size of the obtained silhouettes were either adjusted in size to fill a complete image, and superimposed upon a gray homogeneous background (category 2) or reduced in size and superimposed on the images used for category 1, in a way that each person was randomly linked with one of the houses (category 3). Data recorded from 19 healthy participants reveals that the ERPs in response to images of categories 1 (houses) and 2 (persons on gray background) are surprisingly similar. Interestingly, combining houses and persons (category 3; person with house in the background) yields a completely different ERP signal with a very pronounced N2, reminiscent of that produced by faces, and a very large P2. Because the literature does not provide an explanation for this unexpected result, we will build upon this finding by conducting carefully controlled EEG experiments.

9:30 BREAK

Thursday, March 31, 2022

MORNING

Room D8

O10.04

9:45 BIODISTRIBUTION AND EFFICACY OF AN NUCLEAR FACTOR KAPPA B TARGETED BIOLOGIC FOR THERAPY OF ISCHEMIC STROKE

John Howell, Eddie Perkins, Stephen Burke, Mariper Lopez, Gene Bidwell, III

University of Mississippi Medical Center, Jackson, MS, USA

Strokes are the fifth leading cause of death in the United States, and ~87% of strokes are ischemic, meaning that they are caused by occlusion of a cerebral artery or its branches. This occlusion results in a lack of oxygen reaching the tissue, increases in intracellular calcium and glutamate release, and the activation of inflammatory processes, which can cause additional tissue loss and worsen neurological condition. The nuclear factor kappa B (NF-kB) cascade is an inflammatory pathway activated by many cytokines and inflammatory signals that are elevated following ischemic stroke, making it a central hub for post-stroke inflammation. While there are current therapies to treat the occlusion causing an ischemic stroke, they do not treat the inflammation induced injury that occurs. We have designed a novel inhibitor of the NF-kB cascade attached to the carrier protein elastin-like polypeptide (ELP) as an adjuvant to current revascularization therapies. ELP is based on the sequence of

human elastin, has a long plasma half-life, is thermally responsive, and has a tunable size. We hypothesize that ELPs can be used to deliver our inhibitory peptide SynB1-ELP-p50i to the infarcted region after ischemic stroke, reduce inflammation, and spare brain tissue. To begin, BV2 microglia, C8-D1A astrocytes, and SH-SY5Y neurons were treated with rhodamine labeled SynB1-ELP-p50i for 24 hours and imaged with confocal microscopy to determine if the protein was able to enter the cells. SynB1-ELP-p50i entered the cells and was primarily localized to the cytoplasm. Next, using the middle cerebral artery occlusion (MCAO) model of ischemic stroke in spontaneously hypertensive rats (SHRs), biodistribution and pharmacokinetics were assessed following a bolus administration of 50 mg/kg rhodamine labeled SynB1-ELP-p50i, using two routes of administration (intravenous (IV, femoral vein) and intraarterial (IA, carotid catheter)). SynB1-ELP-p50i accumulated in the ischemic hemisphere at levels nearly 8 fold higher than in the contralateral hemisphere following MCAO (two-way ANOVA $\mathbf{F}(1,12) = 63.08$; Sidak's $\mathbf{p} < 0.0001$). There was no difference in intrabrain deposition between IV and IA routes. To assess the efficacy of SynB1-ELP-p50i (50 mg/kg, IV) to reduce infarct size and inflammation following MCAO, the brains were stained, and infarct size was measured using Image J. There was no effect of SynB1-ELP-p50i treatment on infarct size compared to saline controls, and the baseline mean arterial pressures were the same between treatment groups. qPCR analysis of downstream targets of the NF-kB cascade are ongoing to determine if SynB1-ELP-p50i treatment affected the production of inflammatory cytokines following MCAO. Future studies will assess effects of SynB1-ELP-p50i treatment on behavior and neurological deficits following MCAO in SHRs.

O10.05

10:00 THE EFFECTS OF NALTREXONE AND BUPRENORPHINE ON SELF-ADMINISTRATION OF FENTANYL-ALPRAZOLAM COMBINATIONS IN RHESUS MONKEYS

Tanya Pareek[1], *James Rowlett*[1,2], *Lais Berro*[2]

[1]*Program in Neuroscience, University of Mississippi Medical Center, Jackson, Mississippi, USA.* [2]*Division of Neurobiology and Behavior Research, Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, Mississippi, USA*

Rationale: Opioid-use disorder (OUD) is commonly associated with a high degree of benzodiazepine co-abuse. While FDA-approved treatments for OUD exist (i.e., methadone, naltrexone, buprenorphine), the effectiveness of these treatments at reducing opioid-benzodiazepine co-abuse is currently unknown.

Objective: The objective of the present study was to evaluate the extent to which naltrexone and buprenorphine reduced i.v. self-administration of fentanyl and fentanyl-alprazolam combinations in rhesus monkeys.

Methods: Subjects were 6 (3m/3f) adult rhesus monkeys trained to self-administer remifentanil (0.0003 mg/kg/injection) under a progressive-ratio (PR) schedule of reinforcement. Test sessions were conducted within alternating remifentanil and saline baselines and evaluated the reinforcing effects of fentanyl (0.00056 mg/kg/injection for 5 animals and 0.0003 mg/kg/injection for 1 animal) and a combination of fentanyl and alprazolam following a pretreatment with naltrexone (0.0003 - 0.1 mg/kg; i.m), buprenorphine (0.003 - 0.3 mg/kg; i.m) or vehicle 10 minutes prior to the start of the session. Data were analyzed using one-way repeated-measures ANOVA and Bonferroni's multiple comparisons t-tests.

Results: All subjects self-administered fentanyl alone above vehicle levels. Additionally, four subjects self-administered the combination of fentanyl and alprazolam above vehicle levels. Both naltrexone ($\mathbf{p}<0.0001$) and buprenorphine ($\mathbf{p}<0.0001$) significantly blocked fentanyl self-administration, although the effective and ineffective doses for the pretreatments varied among the subjects. Naltrexone ($\mathbf{p}<0.0001$) and buprenorphine ($\mathbf{p}=0.0499$) significantly blocked self-administration of the fentanyl-alprazolam combination.

Conclusion: The current results suggest that naltrexone and buprenorphine, although showcasing individual variability, are effective treatments for reducing the reinforcing effects of opioid-benzodiazepine combinations in rhesus monkeys.

Funding: Funded by an ALKERMES PATHWAYS RESEARCH AWARDS® grant, an independent competitive grants program supported by Alkermes (to L.F.B.) and USPHS grant DA011792 (to J.K.R.).

O10.06

10:15 CONTRIBUTION OF BETA-AMYLOID ACCUMULATION TO CEREBRAL HYPOPERFUSION IN ALZHEIMER'S DISEASE

Xing Fang, Huawei Zhang, Jane Border, Patrice Rivers, Luke Strong, Jonita Cooper, Reece Crumpler, Kirby Thomas, Richard Roman, Fan Fan

University of Mississippi Medical Center, Jackson, Mississippi, USA

Alzheimer's Disease (AD) is an emerging global health care crisis. However, underlying mechanisms are not understood well enough to translate to precision medicine. There is increasing evidence suggesting that AD is associated with brain hypoperfusion. However, it is unclear whether amyloid-beta (Aβ) accumulation is a cause or consequence of AD, and how it contributes to cerebral hypoperfusion. The present study examined if Aβ accumulation induces cerebral hypoperfusion in AD by affecting cerebral vascular function via both anterograde (arteriole-to-capillary) and retrograde (capillary-to-arteriole) pathways in the TgF344-AD rat model of Alzheimer's disease. We first confirmed that AD rats displayed hippocampal-based cognitive dysfunction at 6 months of age using an eight-arm water maze. We then found that AD rats exhibited impaired myogenic response (MR) of middle cerebral arteries (MCAs) and penetrating and parenchymal arterioles (PAs) two months earlier than the onset of cognitive deficits using a Living System pressure myograph. AD rats displayed poor surface and deep cortical cerebral blood flow (CBF) autoregulation recorded by laser Doppler flowmetry, and reduced functional hyperemic response induced by whisker stimulation. Moreover, cell contractile capabilities, detected by collagen gel-based-cell contraction kit, were reduced in Aβ-treated cerebral VSMCs isolated from F344 rats, similar as seen in VSMCs isolated from AD rats. Furthermore, we found that the productions of reactive oxygen species (ROS) and mitochondrial superoxide in cerebral VSMCs isolated from AD rats were elevated using DHE staining and MitoSOX staining. Moreover, AD cells exhibited reduced mitochondrial respiration and ATP production detected by the Seahorse Cell Mito Stress Test kit. AD cerebral VSMCs also exhibited disrupted actin cytoskeleton and contractile units utilizing immunohistochemistry. Oxidative stress, mitochondrial dysfunction, and actin cytoskeleton disorganization are all factors that are associated with the reduced contractile capabilities of

cerebral VSMCs mediated MR and CBF autoregulation. In other studies, we found that capillary endothelial cell-derived inward rectifier potassium (Kir2.1) activity, which is responsible for retrograde CBF regulation, was reduced in the brain of AD rats using Western blot. PAs with capillaries isolated from AD rats dilated to a lesser degree than WT rats in response to moderately elevated extracellular K+ (10 mM) applied to capillaries. Inhibition of Kir2.1 channels with ML133 diminished the vasodilatory response to a greater extent in WT rats. These findings indicate that Aβ accumulation is associated with cerebral hypoperfusion in AD by affecting cerebral vascular function via both anterograde and retrograde pathways and provide novel insight into the vascular contribution to AD.

O10.07

10:30 NEONATAL EXPOSURE TO INTERLEUKIN-1B ENHANCES ADULT SUSCEPTIBILITY OF NIGROSTRIATAL DOPAMINERGIC SYSTEM TO ROTENONE NEUROTOXICITY

Jonathan W Lee[1], Silu Lu[1,2], Lu-Tai Tien[3], Shuying Lin[4], Yi Pang[1], Norma B Ojeda[1], Michelle A Tucci[5], Lir-Wan Fan[1]

[1]*Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS, USA.* [2]*Department of Neurology, University of Mississippi Medical Center, Jackson, MS, USA.* [3]*School of Medicine, Fu Jen Catholic University, Xinzhuang Dist, New Taipei City, Taiwan.* [4]*Department of Physical Therapy, University of Mississippi Medical Center, Jackson, MS, USA.* [5]*Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS, USA*

Early life brain inflammation has been proposed to play important roles in the development of neurodegenerative disorders in adult life. Our previous studies showed that interleukin-1β (IL-1β), a proinflammatory cytokine, plays an important role in mediating dopaminergic neuronal injury in the neonatal rat brain. To examine whether neonatal IL-1β exposure enhances dopaminergic neuron susceptibility to rotenone neurotoxicity at adult ages, Sprague-Dawley male rats at postnatal day 5 (P5) were pre-treated with IL-1β (1 μg/kg) via intracerebral injection, and then challenged with rotenone through subcutaneous mini-pump infusion (1.25 mg/kg per day for 14 days) at P70. A single IL-1β exposure resulted in motor function deficits during the developmental period but were spontaneously recoverable by P70. Single IL-1β exposure also suppressed tyrosine hydroxylase (TH) expression in the substantia nigra (SN) at P70. A low dose of rotenone treatment resulted in Parkinsonism-like symptoms including bradykinesia, akinesia and rigidity in rats with neonatal exposure to IL-1β, but not in those without the neonatal IL-1β exposure. Neonatal IL-1β exposure also enhanced adult susceptibility to rotenone-induced loss of dopaminergic neurons as indicated by reduced numbers of TH+ cells and Fluoro-Gold (FG)+ nigrostriatal projecting neurons in the SN of P98 rats. These results suggest that perinatal neuroinflammation may enhance adult susceptibility to develop neurodegenerative disorders triggered by environmental toxins at an ordinarily non-toxic or sub-toxic dose. Our model may be useful for studying mechanisms involved in the pathogenesis of nonfamilial Parkinson's disease.

10:45 BREAK

Thursday, March 31, 2022

MORNING

Room D8

O10.08

11:15 IDENTIFYING THE PREMOTOR POPULATIONS THAT FOCUS THE LENS

Paul J. May, Susan Warren

University of Mississippi Medical Center, Jackson, MS, USA

Introduction: As we look about the world, we direct our fovea at a variety of visual targets. These targets often lie at different distances from the viewer. In order to create a clear image of each target on the retina, we use the ciliary muscle to change the shape of the lens, accommodating the lens optics for the target distance of each object. This lens accommodation is controlled by a two neuron parasympathetic arc consisting of preganglionic motoneurons in the Edinger-Westphal nucleus found in the midbrain and postganglionic motoneurons in the ciliary ganglion, found behind the eyeball. At the beginning of this investigation, there was little anatomical information on the location of the neuronal populations that control the lens preganglionic motoneurons.

Methods: We examined this question using trans-synaptic retrograde transport of rabies virus in cynomolgus monkeys. To do this we used a 25G needle to injected the N2c variant of rabies virus into the ciliary muscle at multiple points along the circumference of the iris, and then let the animal survive so that the virus could transport through the circuit.

Results: At shorter survival times (58 hrs)(n=1) only the preganglionic motoneurons in the ipsilateral preganglionic Edinger-Westphal nucleus (EWpg) were labeled. At longer survival times (66-76 hrs) (n=5), several populations of premotor neurons were simultaneously labeled with the virus. At even longer survival times (84 hrs)(n=2) cells were labeled at numerous other sites, indicating the rabies virus had jumped another synapse, and was present in neurons supplying the premotor neurons. We found three populations of lens-related premotor neurons. The first was located bilaterally in the supraoculomotor area (SOA), which lies above the oculomotor nucleus, and which surrounds the EWpg. This group was denser in the caudal end of the SOA. The second population was found bilaterally in the central mesencephalic reticular formation (cMRF). The cMRF lies lateral to the oculomotor nucleus, and the populations in the SOA and cMRF appeared to be in continuity. In addition to these midbrain tegmental populations, a third bilateral population was observed in the midbrain tectum. It was located along the midline between the two superior colliculi, in a nucleus called the tectal longitudinal column (TLC).

Conclusions: Understanding these findings is complicated by the fact that the control of lens accommodation has rarely been studied. However, we know that lens accommodation is usually yoked with vergence eye movements; i.e., increased lens curvature and ciliary muscle contraction are paired with convergence when looking at a near target. Neurons with tonic activity that encodes vergence angle have been found in the SOA, where we observed lens premotor neurons. The medial cMRF contains cells that display a burst of activity initiating a vergence eye movement, while the lateral cMRF contains neurons that fire during disjunctive saccade between targets lying at different distances from the viewer. Both populations probably modulate

lens accommodation, in agreement with our anatomical findings. Currently, nothing is known about the role of the TLC, making it a target for future physiological investigation.

O10.09

11:30 USING WHITE-TAILED DEER SCRAPING NETWORKS TO PREDICT POTENTIAL SUPER SPREADERS OF COMMUNICABLE DISEASE AND LOCATED POTENTIAL DISEASE TRANSMISSION HOT SPOTS

Scoty Hearst, Bryant Johnson, Elijah Rummells, David Zetterholm

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

Odocoileus virginianus (White-tailed Deer) are social animals that thrive in rural and urban settings. Scraping behavior is an olfactory reproductive communication used by White-tailed Deer to establish breeding networks. Male scraping is a complex scent-marking behavior which advertises sociosexual status and location to potential females as well as to competing males. These scent markers are produced in body fluids such as urine, saliva, and glandular secretions released by males onto scrape sites. Chronic wasting disease (CWD) is a fatal, highly contagious, prion disease occurring in cervids. Infection rates for CWD in male White-tailed Deer are 3 times higher as compared to females. We speculate that the body fluids left at scrape sites are potential modes of CWD male transmission due to the fact that males scrape more often than females, and that multiple males visit the same scrape. In our previous work, we demonstrated disease transmission through an urban network of male White-tailed Deer. Here, we demonstrate the first rural scraping network by combining scraping data from multiple study sites in Yazoo County, MS, spread over 6 miles. Using social network analysis, we demonstrate the major types of potential super spreaders and rank individual male dee based upon potential to spread communicable disease. Using network analysis and QGIS software, we using heatmapping to predict areas of high social interaction and potential disease transmission hotspots. This work also demonstrates the future applications of this method for predicting the spread of communicable diseases like CWD or other infectious diseases in populations of White-tailed Deer.

O10.10

11:45 VALIDATING METHODS FOR ESTIMATING ENDOCRANIAL VOLUME IN MANAKINS (AVES, PIPRIDAE)

Lainy B. Day, Derrick Thornton

University of Mississippi, University, MS, USA

For 13 male manakin species, we found that acrobatic display complexity increased with increases in brain mass, body mass, and tarsus length suggesting sexual selection for brain and brawn in this family. Fresh brain tissues and Micro CT scans provide accurate brain volumes, but both are expensive and labor intensive. Measurements of endocranial volume from museum specimens provides an efficient alternative allowing us to extend analyses to all (~56) manakin species. Endocranial volume approximates brain volume for some species. However, methods vary and are infrequently validated by comparing with direct measures of brain size. Further, accuracy varies by species and sex within species. Thus, we compared endocranial volume to our previous measures of brain mass and to tarsus length and body mass, which are highly correlated with brain mass. We estimated endocranial volume ($6\pi(LxWxH)$ using specific skull markers for linear measures and a bead decanting method that provides the volume of shot that fills the cranium. While correlations between mass and both estimates of cranial volume were significant, they were rather low, 0.47 and 0.72 for bead and linear volume respectively and the two methods did not correlate highly with one another (0.47). We are in the process of determining relationships between brain mass, tarsus length, and cranial volume estimates. We will then determine if cranial volume estimates provide are associated with manakin display complexity in the same manner as brain mass.

12:00 - 1:00 GENERAL SESSION/LUNCH BREAK

Thursday March 31, 2022

AFTERNOON

Room D8

O10.11

1:15 REGULATION OF DENDRITIC SPINES BY SLEEP DEPRIVATION IN A FEAR MEMORY TRACE IN THE HIPPOCAMPUS

Matthew Tennin, Lindsey Rexrode, Siri Yarlagadda, Jake Valeri, Harry Pantazopoulos, Barbara Gisabella

UMMC, Jackson, MS, USA

Sleep and memory dysfunction are key features across many psychiatric disorders. For example, a majority of patients with schizophrenia display both decreased sleep spindles and memory consolidation deficits. In comparison, people suffering from post-traumatic stress disorder (PTSD) have sleep disruption and nightmares, associated with heightened strength of fear memories. Several studies support the theory that infrequently used dendritic spines are pruned during sleep, thus improving memories by enhancing the signal to noise ratio of frequently reinforced synaptic connections. However, other studies also claim that sleep deprivation impairs memory strength and results in decreased dendritic spines. These studies suggest that sleep may be necessary to strengthen some synapses while others are pruned. Recent studies suggest that specific subsets of dendritic spines are increased during sleep in selective hippocampus neurons that have been involved in recent learning. We tested the hypothesis that dendritic spines in a recent biologically relevant fear memory trace are upscaled during sleep in the presence of broad downscaling. We used ArcCreER^{T2} mice which allow for permanently labeling neurons that express Arc during fear learning. We used dual AAV viral vector labeling of dendritic spines in these mice to label Arc positive (Arc+) and Arc negative (Arc-) neurons. Dendritic branches were sampled from Arc+ and Arc- neurons using confocal imaging, and dendritic spine densities and spine properties were quantified using three-dimensional image analysis from sleep deprived and control C57/B16 mice (n=6/group). We observed an overall decrease of dendritic spine density in sleep deprived mice which was selective for mushroom spines, reflecting previous reports that mushroom spines are increased following fear conditioning. Arc+ dendrites representing the fear memory trace showed no overall difference in spine density between sleep deprived and control mice. However, mushroom spines in Arc+ branches showed the largest decreased density in sleep deprived mice, indicating that the upscaling of mushroom spines during sleep following fear learning is driven by neurons that encoded the recent contextual fear memory. In comparison, Arc- branches showed a decreased

spine density of thin spines in sleep deprived animals, indicating upscaling during sleep in these neurons that did not encode fear memory is driven by increases in immature plastic spines. Our findings indicate that sleep contributes to increases in dendritic spines following fear conditioning primarily driven by increases in stable mushroom spines in neurons that recently encoded fear memory. Our data suggests that recent fear memory is strengthened during sleep in the hippocampus by stabilization of dendritic spines in the fear memory circuit, and sleep deprivation impairs this process. Sleep deprivation following a traumatic experience thus may be a viable strategy in weakening the strength of contextual memories associated with the trauma and alleviate PTSD. Furthermore, differential regulation of dendritic spines following fear learning in neurons that encoded fear memory vs neurons that did not points to memory trace selective processing of memory consolidation during sleep. Understanding the molecular pathways that regulate this memory trace selective process may allow for development of novel therapeutic strategies for memory consolidation in psychiatric disorders.

O10.12

1:30 GLYCEMIC DYSREGULATION IN A RAT MODEL OF THORACIC SPINAL CONTUSION

Bernadette Grayson

University of Mississippi Medical Center, Jackson, MS, USA

Type 2 diabetes mellitus afflicts spinal cord-injured individuals at a much higher rate than able-bodied controls. The mechanisms driving this disparity remain poorly understood. The goal of the current study was to evaluate the impact of diet on glycemic regulation using a moderate contusion model of thoracic spinal cord injury (SCI). Male Long Evans rats were either T10 spinal contused or were naïve to surgery. The animals were provided with high–fat diet (HFD) or standard chow for 16 weeks. Following surgery, animals were analyzed via echoMRI to evaluate changes in body composition. At 13 weeks post-injury, a glucose tolerance test (GTT) was performed, and at 14 weeks, the animals were assessed using an insulin tolerance test. On week 15, the rats were given a mixed nutrient gavage, and blood samples were used to determine levels of insulin and GLP-1. Finally, 16 weeks post-injury, the animals were euthanized, and blood plasma, ileum, pancreas, and brain samples were excised. HFD-fed rats weighed more and had increased body fat and lean mass than chow-fed rats. Overall, SCI resulted in reduced body weight in comparison to naïve controls. HFD-fed rats were glucose intolerant, with elevated fasting and elicited glucose and insulin levels. SCI rats also had elevated fasting and elicited glucose and insulin levels. Paradoxically, fasted and elicited total GLP-1 were elevated and appeared uncoupled to improvements in glycemic control following a mixed-meal gavage. Pancreatic glucagon protein levels were reduced in SCI in comparison to naïve controls. This was accompanied by elevated glucagon mRNA and GLPR in the pancreas. Both in the hypothalamus and ileum, GLPR gene expression was elevated in SCI in comparison to naïve. In total, these data suggest GLP-1 signaling may be altered following SCI. More studies are needed to determine the mechanism of dysfunction.

O10.13

1:45 CHONDROITIN SULPHATE PROTEOGLYCAN EXPRESSION IN THE ADULT PRAIRIE VOLE BRAIN: IMPLICATIONS FOR NEURODEVELOPMENTAL PROCESSES UNDERLYING COMPLEX SOCIAL BEHAVIORS

Joshua Hartley[1], *Jon Person*[1], *Carolyn Jones*[2], *Miranda Lim*[2], *Barbara Gisabella*[1], *Harry Pantazopoulos*[1]

[1]*University of Mississippi Medical Center, Jackson, MS, USA.* [2]*2. Oregon Health & Sciences University, Portland, OR, USA*

Introduction: REM sleep peaks during infancy and declines with age in mammals. One of the proposed functions of REM sleep early in life is facilitating neurodevelopment underlying complex behaviors. Chondroitin sulphate proteoglycans (CSPGs) are extracellular matrix molecules that regulate neurodevelopment. During late adolescence, CSPGs form specialized structures called perineuronal nets (PNNs) that restrict synaptic plasticity. Previous work from our lab identified abnormalities in CPSG expression in people with Schizophrenia and Autism Spectrum Disorder (ASD). These changes consisted of PNN deficits and altered CSPG expression in glial cells labeled by Wisteria Floribunda agglutinin (WFA). WFA expression in glial cells was not present in mouse, rat, guinea pig, or non-human primate brains, suggesting human specific characteristics of glial CSPGs expression. Children with ASD are reported to experience disrupted sleep early in life. A defining characteristic of autism is social and communication impairment (complex behaviors). Sleep disturbances may disrupt CSPG expression and in turn impact neurodevelopment underlying social impairment in ASD. Oxytocin plays a critical role in social behaviors. Prairie voles display complex levels of social behavior in forming socially monogamous pairing and engage in biparental behavior. Previous work demonstrated that early life sleep deprivation (ELSD) impairs pair bond formation and object preference in adulthood. As a first step in testing the hypothesis that ELSD impacts CSPG regulation of neurodevelopment underlying social behaviors, we characterized the expression of CSPGs in the vole brain using WFA lectin labeling.

Methods: Brains were extracted from adult prairie voles, sectioned in thirty-micron slices and labeled with WFA lectin and either oxytocin, arginine vasopressin (AVP) or tyrosine hydroxylase (TH). WFA labeled cells were quantified in the supraoptic (SON) and paraventricular (PVN) nuclei using steroinvestigator software.

Results:WFA positive PNNs were observed across brain areas as previously reported in rodent studies. Surprisingly, intracellular WFA labeling was observed in glial cells with oligodendrocyte precursor morphology. These cells were distributed along white matter tracks in the corpus callosum and striatum, known areas of progenitor cell migration. Intracellular labeling was also detected in neurons in the PVN and SON. Co-immunolabeling with AVP and tyrosine hydroxylase showed no overlap of WFA labeled neurons with these populations. Co-labeling with oxytocin revealed a positive association of WFA with oxytocin. Intracellular WFA intensity showed an inverse relationship with oxytocin intensity.

Discussion: Our results suggest that prairie voles represent a unique rodent model for CSPG glial dysfunction observed in people with schizophrenia and ASD. Furthermore, intracellular WFA labeling in neuronal populations in the PVN and SON in adult vole brains suggest that ongoing neurodevelopmental in

oxytocin neurons in voles may contribute to social behaviors. Ongoing studies will test co-labeling of WFA with glial cell and neuronal progenitor markers and will test how early life sleep deprivation impacts CSPG expression and neurodevelopmental processes underlying social behavioral deficits in adult voles.

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O10.14

2:00 THE INFLUENCE OF OPTICAL FLOW ON THE PERCEPTION OF IMPOSSIBLE SPACES IN VIRTUAL REALITY

Dylan Devenny[1], *Harish Chander*[2], *J. Adam Jones*[2]

[1]*University of Mississippi (Formerly), Oxford, MS, USA.*
[2]*Mississippi State University, Mississippi State, MS, USA*

Virtual reality (VR) is a unique technology in that it interfaces directly with the user. As such, many aspects of VR rely on designing for the limitations of the technology and the limitations of the user, especially regarding visual and spatial perception. VR also allows us to manipulate visual information in ways that are not possible in reality. The present study examines the manipulation of optical flow cues as seen when walking through an environment. Specifically, we examine the decoupling of the geometric and textural components of optical flow in order to (1) detect whether or not these components are perceptually separable and (2) determine if such a decoupling may be used to produce unique spatial illusions that may aid in VR design. We employ a methodology first introduced by Suma et al. 2012 known as "Impossible Spaces" to determine whether or not the geometric and textural aspects of optical flow can be decoupled. If this is the case, we postulate that this decoupling can be used to improve the effectiveness of Impossible Spaces interactions. Our experiment involves running participants through a series of small buildings consisting of two rooms in which the percentage of overlap between the two rooms and the ratio of texture flow to geometric flow generated by the subjects' movement is altered. After each observation, subjects are presented with a two-alternative forced-choice (2AFC) task to determine the arrangement of the rooms is physically possible. Subjects were presented with five levels of textural flow gains including -150%, -50%, 0%, +50%, and +150%. The 0% condition served as our control as textual and geometric flow were matched. We found that relative to the control condition, the 150% slower condition increased the point of subjective equality (PSE) by 19.26%, the 50% slower condition increased the PSE by an overlap percentage of 12.3%. The 50% faster condition decreased the PSE by 10.21%, and the 150% condition decreased the PSE by 9.18%. The results of this study indicate that the textural and geometric components of optical flow are perceptually separable. Furthermore, this decoupling can be used to alter the perceived distance traversed in VR thus enabling the expansion of Impossible Spaces and similar interaction methodologies.

O10.15

2:15 PERCEPTION OF TARGET ECCENTRICITY AND DEPTH IN VIRTUAL REALITY

Jonathan Hopper[1], *David M. Krum*[2], *J. Adam Jones*[3]

[1]*University of Mississippi (Formerly), Oxford, MS, USA.*
[2]*California State, Los Angeles, Los Angeles, CA, USA.*
[3]*Mississippi State University, Mississippi State, MS, USA*

Over the past few decades, the body of scientific research dedicated to understanding and bettering virtual reality (VR) has grown tremendously. As VR hardware and applications grow cheaper and easier to produce, VR adoption becomes more widely spread. However, the creation of virtual environments (VEs) that accurately mimic the real world beyond the suspension of disbelief remains elusive. This is partially because the visual system, the senses most often leveraged by VR applications, is tremendously complicated. Recreating all the information the eyes take in when viewing the real world is daunting at best, and modern display technologies invariably introduce artifacts that often negatively impact the visual fidelity of the VE.

One of the more researched of these artifacts is distance errors in VEs. Much of this work examines medium-field, egocentric distance judgments using blind walking, as subjects are demonstrably quite accurate at this task in the real world. The majority of this research body indicates that users of head-mounted displays (HMDs) consistently underestimate distances in virtual environments, and various explanations have been advanced regarding this systematic underestimation.

Most of this research focuses on evaluating distance perception of objects placed along the ground plane directly in front of the observer. As such, most experimental procedures identify quite clearly the intended forward direction, and judgments are made roughly along that axis. This is generally reasonable as we typically interact with objects in the center of the field of vision, but often judgments must be made concerning multiple objects, which will not fit simultaneously within the center of our view. Peillard et al. 2019 recently found that objects placed to the side of the forward direction are systematically perceived to be farther away than objects placed in front of the observer in sparse cue environments. Though Peillard et al. were reporting the depth of a target relative to a reference; it is unclear if the errors seen in their study are due specifically to a misperception of depth or egocentric orientation. Either of these could hypothetically produce the results seen in their study. Our study aims to further inform this curious finding by attempting to isolate which factor is driving the observed errors.

We conduct two studies examining the perception of the egocentric orientation of objects relative to the observer in a full cue environment. The first involved showing subjects spheres located as varying eccentricities in the +/-50 degrees range. We found that subjects systematically overestimated all eccentricities but more so towards the forward direction. The second study involved aligning two objects to form a subjectively straight line at varying eccentricities. We found that subjects underestimated the depth of targets at increasing eccentricities. These findings imply that perhaps errors in depth judgments of eccentric targets may be due to a misperception in their eccentricity as opposed to their depth.

O10.16

2:30 A FACE OR NOT A FACE, THAT IS THE QUESTION.

Nicolas Brunet, Katelyn Norse

Millsaps College, Jackson, Mississippi, USA.

Neurons in the fusiform face area (FFA) respond more vigorously to faces than other visual stimuli. The N170, a negative component that is elicited about 130-200 ms after stimulus presentation is particular large in amplitude for faces; especially for responses recorded from electrodes placed over the occipito-temporal sites. This is consistent with the idea that the source of the observed activity primarily stems from FFA.

Here we investigate whether the interpretation of ambiguous

stimuli affects the magnitude of the N170. More specifically, we used face pareidolia images as visual stimuli while we recorded the EEG signals from 19 participants. Face pareidolia is the natural tendency of seeing faces in random objects or patterns. During a session participant viewed two times a sequence of 75 images, in random order, that could be perceived either as a house or object, or as a face. When viewing this sequence for the first time (block 1), the participants answered the question whether the object featured in the photograph appeared "old" or "new" (priming the participant to perceive the visual stimuli as objects); when seeing those same images a second time (block 2), participants answered the question whether the faces featured in the photograph looked "happy" or "sad" (priming the participant to perceive the visual stimuli as a faces). We hypothesized that images perceived as faces, as opposed to objects, would yield a larger N170. However, analysis of our data shows that the ERP's (0 to 300 ms after stimulus onset) recorded during block 1 and 2 do not differ from each other. One explanation for the results is that we failed in tricking the participants to perceive the same images first as objects (block 1) and then as faces (block 2); an alternative explanation is that the physical features of an image, rather than how we perceive it, are determinants of early ERP components. Further research is needed to discriminate between both explanations.

2:45 Business Meeting

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY
Hall B

5:00 GENERAL POSTER SESSION
Hall C (immediately following Dodgen Event)

P10.01

MICROSACCADE DIRECTION IS MODULATED BY COVERTLY ATTENDED, BUT NOT UNATTENDED, VISUAL STIMULI.

Rita Lacy[1], *Andrea Tall*[1], *Madelyn Abbott*[1], *Ashwin Venkatakrishnan*[2], *Susana Martinez-Conde*[2], *Stephen Macknik*[2], *Nicolas Brunet*[1]

[1]*Millsaps College, Jackson, Mississippi, USA.* [2]*State University of New York Downstate Medical Center, Brooklyn, New York, USA*

P10.02

A CLASS OF NON-FACE STIMULI THAT ELICIT A LARGE N170 COMPONENT

Aastha Banga, Sunny Jagdale, Nicolas Brunet

Millsaps College, Jackson, Mississippi, USA

P10.03

EVALUATION OF SYNTHETIC WHITE-TAILED DEER ATTRACTANTS USING BEHAVIORAL ANALYSIS

Caleb Young , William Yarbrough, Trent Selby, and Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS

Odocoileus virginianus (White-tailed Deer) are social animals that communicate using semiochemicals. Scraping behavior is an olfactory reproductive communication used by White-tailed Deer to establish social networks during the breeding season. Male scraping behavior is a complex scent-marking behavior which advertises sociosexual status and location to potential females as well as to competing males. Female scraping behavior is also a complex scent-marking behavior which signals mate interests, location, and sexual receptiveness. These semiochemical scent markers are produced in body fluids such as urine, saliva, and glandular secretions released on to tree branches or the ground at scrape sites. Chronic wasting disease (CWD) is a fatal, highly contagious, prion disease occurring in cervids, especially white-tailed deer. These chemical deer secretions are harvested on commercial deer farms and sold to deer hunters as deer attractants creating over a 100 million dollars in revenue each year for the deer-lure industry. Spreading CWD to uninfected areas is a potential risk when using these authentic deer scents. Using a full synthetic deer attractant would greatly reduce that potential risk of spreading CWD from authentic deer-lures. In this study, we created a range of fully synthetic deer attractants and assessed their ability to stimulate scraping behavior and attract deer to investigate. We sprayed our synthetic attractants on potential tree branches and recorded deer behavioral responses using motion activated wildlife cameras. We are currently analyzing the digital data and will used statistical analysis to determine the efficacy of our synthetic attractants as compared to negative and positive controls. Overall, we suggest that the data in this study could be used to generate full synthetic deer attractants and reduced the spread of the CWD neurodegenerative disease from commercial non-synthetic deer-lures.

P10.04

EFFECTS OF SELF-ADMINISTERED ALCOHOL ON ACTIGRAPHY-BASED SLEEP MEASURES IN RATS

Tia McDonald[1,2], *Jaren Reeves-Darby*[2], *Donna Platt*[2]

[1]*Jackson State University, Jackson, Mississippi, USA.* [2]*University of Mississippi Medical Center, Jackson, Mississippi, USA*

Purpose: Alcohol can cause sleep disruptions, and sleep disruptions can increase relapse risk in individuals with Alcohol Use Disorder (AUD). Preclinical studies can be used to investigate the relationship between alcohol intake and sleep disruption. The purpose of this study was to use actigraphy-based sleep measures and alcohol self-administration in rats to investigate the relationship between alcohol intake and sleep disruption.

Methods: Wistar rats (4 females, 3 males) were surgically implanted with E-mitter transponders to track activity. Rats then were trained to orally self-administer alcohol in operant chambers under a fixed-ratio 2 schedule of alcohol delivery using a step-wise sucrose fading procedure. For each rat, on the final stable day at each step of the sucrose fade, actigrams were generated. Several parameters associated with inactivity (defined as <10% of the maximum activity count) were determined in 5 min epochs during the acute dark phase (first 5h after self-administration), the light phase (12h), and the extended dark phase (6h before next drinking session).

Results: Alcohol's effects on inactivity parameters occurred predominantly during the rats' inactive (i.e., light) phase. In this phase, alcohol increased activity counts, defined as a significant percent change in area-under-the-curve, compared to sucrose alone. Notably, this increase in activity was not alcohol dose-related. During the inactive phase, exposure to alcohol specifically decreased the time spent inactive and shortened the longest bout of inactivity. Again, significant effects were not dose-related, but rather appeared to reflect days of exposure (i.e.,

significant effects emerged during the later steps of the sucrose fade procedure). Interestingly, alcohol did have dose-dependent and significant effects on two inactivity parameters during the active (i.e., dark) phase that preceded the start of the self-administration session. Alcohol dose-dependently decreased the absolute number of inactive bouts and dose-dependently increased the latency to the first inactive bout.

Conclusion: The results indicate that alcohol alters actigraphy-based sleep measures in phase-, time-, and dose-related ways. The net effect of the alterations is a disruption of multiple inactivity parameters that suggests alcohol significantly disturbs normal sleep patterns. Our results corroborate and extend clinical findings and reinforce the need for addressing alcohol-induced sleep problems as an aspect of AUD treatment.

Support: AA029023 and AA029306

P10.05

SUBACUTE CHANGES TO PEYER'S PATCHES IN A RAT MODEL OF THORACIC LEVEL SPINAL CONTUSION

Alicia Hulitt[1,2], Kwamie Harris[2], Bernadette Grayson[2]

[1]Tougaloo College, Tougaloo, MS, USA. [2]University of Mississippi Medical Center, Jackson, MS, USA

Injury to the spinal cord (SCI) results in debilitating sequelae to individuals. The initial spinal cord injury is marked by profound changes in the area of the trauma as well as systemic changes including the digestive system. Persons with SCI report altered gastric emptying, peristalsis, and solute absorption. Intestinal Peyer's Patches (PP) are the immune sentinels of the digestive tract; they act as sensors, sampling the contents of the intestinal lumen. The impact of SCI on PP remains unknown. In the present study, adult, male, Long Evans rats received thoracic level 10 contusion or sham laminectomy. Body weight, food intake, and adiposity were measured during the 4 weeks. PP were harvested from the proximal and distal small intestine after 4 weeks of recovery. We performed RT-PCR on common markers expressed within the PP. There was no difference by injury in markers for T-cells, macrophages, dendritic cells, or B-cells; however, macrophage marker CD68 was reduced overall in the distal intestine ($p<0.05$). Western blot analysis of CD68 protein in PP also showed reduced CD68 in both proximal and distal SCI PP in comparison to sham ($p<0.05$). Furthermore, the pro-inflammatory cytokine IL1α ($p<0.05$) was reduced in SCI PP. In addition, IL4 and 7, important in T-cell maturation, were reduced in SCI PP. Finally, TLR4, the immune receptor important in lipopolysaccharide translocation, was reduced in distal SCI PP in comparison to controls. Taken together, these data suggest reduced immune sensing in the SCI intestine during the subacute recovery period. Further work is necessary to determine the mechanism of action for these changes.

P10.06

THE ROLE OF MATRIX METALLOPROTEINASES IN THE NEURODEGENERATIVE POLYGLUTAMINE DISEASE SPINOCEREBELLAR ATAXIA TYPE 1

Madison Burton, Kathryn Carpenter, Sydney Melton, Lillian Sisson Scoty Hearst

The Department of Chemistry and Biochemistry, Mississippi College, Clinton, MS, USA

Spinocerebellar ataxia type 1 (SCA1) is a fatal neurodegenerative disease caused by a polyglutamine mutation in the ataxin-1 protein. Currently, there is no treatment for SCA1. SCA1 mice display similar neurodegeneration as SCA1 human patients and are the model of choice for exploring treatments for the SCA1 disease. Matrix metalloproteases (MMPs) are present in many cells of the central nervous system. MMPs are endopeptidases that once activated participate in the regulation of diverse physiological and pathological processes. MMPs have gained much attention as therapeutic targets in neurodegenerative disorders due their key role in neuroinflammation, and their destructive degradation of the blood brain barrier. MMPs have been shown to be a therapeutic target in other polyglutamine diseases such as Huntington's disease. MMPs have been shown to degrade the Huntingtin protein contributing to the neurodegenerative pathology. In this study, we explored the role of MMPs in the SCA1 disease using cell culture and the SCA1 mouse model. Cell culture experiments revealed a possible role of MMPs in the proteolysis of mutant atxin-1 aggregates. Transcriptome analysis of the SCA1 mouse cerebellum revealed significant upregulation of destructive MMPs as compared to WT mice. Currently, we are testing the efficacy of MMP inhibitors in SCA1 mice. As this study progresses, we will test for improvements in neurodegenerative behavior deficits, changes in key neuronal proteins, and a reduction in histological markers of SCA1 neurodegeneration. Completion of this study may reveal that MMPs are possible therapeutic targets that may play a pathogenic role in the SCA1 disease.

P10.07

TEST ANXIETY IS ASSOCIATED WITH A DECREASED ERROR-RELATED NEGATIVITY IN TASKS REQUIRING TOP-DOWN AND BOTTOM-UP ATTENTION

Hunter Matkins, Erick Bourassa

Mississippi College, Clinton, MS, USA

On electroencephalograph (EEG), an incorrect motor response is followed by a sharp negative deflection most prominent in the central cortex. This error-related negativity (ERN) has been shown to be more pronounced in people with anxiety. The attentional control theory of anxiety posits that a decrease in top-down attentional control (TDAC) causes an increase in bottom-up attentional capture (BUAC), and previous work in our lab has shown that this is true in students with test anxiety (TA). This study hypothesized that students with TA would have a larger ERN than students without TA and that the change in ERN would be larger in tasks requiring TDAC. EEG was measured from students with and without TA during a modified go/no-go task utilizing either TDAC or BUAC. The ERNs were smaller in participants with TA compared to participants without TA and in the BUAC compared to the TDAC condition. Event-related spectral perturbations (ERSPs) over the central cortex in students without TA showed that committing an error caused a significant decrease in early theta power followed by a decrease in alpha power compared to correct trials; these differences were not seen in students with TA. Also, on error trials, students with TA had decreased low-beta power compared to students without TA. These data suggest that in students with TA, conflict monitoring may be hypofunctional and therefore goal-oriented behavior may be less amenable to correction.

P10.08

EFFECTS OF EVENING ADMINISTRATION OF METHADONE, BUPRENORPHINE, AND NALTREXONE ON ACTIGRAPHY-BASED SLEEP PARAMETERS IN MALE RHESUS MONKEYS

Joseph Talley, Lais Berro, Austin Zamarripa, Kevin Freeman, James Rowlett

University of Mississippi Medical Center, Jackson, MS, USA

BACKGROUND: Opioid use disorder (OUD) has been associated with the emergence of sleep disturbances. Although effective treatments for OUD exist, evidence suggests that these treatments also may be associated with sleep impairment. The extent to which these effects are an effect of OUD treatment or a result of chronic opioid use remains unknown.

OBJECTIVE: We investigated the acute effects of methadone, buprenorphine, and naltrexone on actigraphy-based sleep parameters in opioid-naïve male rhesus monkeys (*Macaca mulatta*, n=5).

METHODS: Subjects were fitted with actigraphy monitors attached to primate collars to measure sleep parameters. Actigraphy recordings were conducted under baseline conditions, or following acute injections of vehicle, methadone (0.03–0.3 mg/kg, i.m.), buprenorphine (0.01–0.3 mg/kg, i.m.), or naltrexone (0.03–1.0 mg/kg, i.m.) in the evening (1.5h before "lights off").

RESULTS: Evening treatments with methadone or buprenorphine significantly increased sleep latency and decreased sleep efficiency. The effects of buprenorphine on sleep resulted in a biphasic dose-response function, with the highest doses not disrupting sleep. Buprenorphine induced a much more robust increase in sleep latency and decrease in sleep efficiency compared to methadone. Treatment with naltrexone, on the other hand, significantly improved both sleep latency and sleep efficiency.

CONCLUSIONS: Our findings show that the currently available pharmacotherapies for OUD significantly alter sleep parameters in opioid-naïve monkeys. Opioid-dependent mechanisms may play a significant role in sleep-wake regulation.

FUNDING: This work was supported by the National Institutes of Health (NIH) [DA011792, DA039167, DA043204, DA046778 and DA049886].

P10.09

PATIENT PERSPECTIVE OF PATIENT-CENTERED APPROACH VS BIOMEDICAL APPROACH

Lakynn Hillhouse, Carolyn Higdon, Rebecca Lowe

University of Mississippi, Oxford, Mississippi, USA

Evidence-based practice in audiology can consist of a Patient-Centered approach or a Biomedical approach when offering patients the results of their hearing evaluation. Boisvert et al., 2018 of the IDA Institute confirm that audiologists prefer one approach over another. The research question is: if an audiology patient is presented with two options of explaining the hearing health issues, which model/approach will be his or her preference?

The proposed study will occur electronically. Dr. Lowe and Dr. Messersmith are audiologists from the University of Mississippi. Dr. Lowe, co-investigator in this research project, played the role of the patient, and Dr. Messersmith, played the role of the audiologist in simulated video consultations of the patient-centered and biomedical approaches. The participants will consist of volunteers from undergraduate non-Communication Sciences and Disorders (CSD) classes. The sample size will be 40 subjects, twenty females and twenty males. Inclusion criteria for the study are students from the University of Mississippi, aged 18-25 years old. Excluded participants will be students in the CSD department, out of the intended age range, and non-college students. The criteria will be controlled and monitored by the questions on the survey asking the participants their age, gender, and what degree they are seeking. The survey will have the criteria information requesting the participants to confirm by accepting the survey.

The materials used in this experiment consist of two videos and a survey. Video A contains the Biomedical approach, lasting 3 minutes and 28 seconds. Video B is a patient-centered approach lasting 3 minutes and 19 seconds. The survey consists of five closed-ended questions referencing Videos A and B. The same audiologist (Dr. Messersmith) and patient (Dr. Lowe) will be present in both videos, and the videos are similar in length.

The study will begin as soon as IRB approval is obtained, with the conclusion of collecting data no later than February 1, 2022. The participants will remain anonymous with no personal identification information supplied in the survey. All subjects will watch Video A, and Video B. Resulting survey data will be analyzed using measures of central tendency.

Participants may have unconscious biases related to race or gender that will unknowingly impact their perception of the videos. It may be challenging to determine an individual's preference after watching videos and responding to the survey. Internal validity is limited because the participants are college-aged students who do not have a known hearing loss and are not experiencing the simulated consultation in real time. The information gained will help readers understand individual preferences regarding hearing aid recommendations leading to improved health outcomes.

In conclusion, this research project addresses the challenges patients and doctors may encounter specific to chosen approaches for interpreting hearing diagnostics to individuals. The question of preferred approaches for both patients and practitioners to hearing health care recommendations is emerging in the literature, and this proposed study begins to address the preferences. The researcher also hopes to discuss clinical implications, limitations, and the future direction of this topic.

P10.10

THE ROLE OF UNCERTAIN REINFORCER COST ON RESISTANCE TO PUNISHMENT AND EXTINCTION IN RHESUS MONKEYS

William Doyle, Kevin Freeman, Sally Huskinson

University of Mississippi Medical Center, Jackson, MS, USA

Uncertainty of drug access may be a significant environmental modulator of the relative reinforcing value of illicit drugs. Previous work has shown that punishment suppresses drug taking. However, little is known about the effectiveness of punishment on behavior maintained by unpredictable reinforcer cost. The goal of this study is to compare behavior maintained by variable- vs. fixed-ratio schedules of food or cocaine reinforcement during extinction and punishment. A group of rhesus monkeys (currently n=2, expected n=5) self-administered cocaine (0.03 and 0.1 mg/kg/infusion), saline, or a cocaine (0.03 and 0.1 mg/kg/infusion) + histamine (0.001-0.1 mg/kg/infusion) mixture under a single-lever access, fixed- (FR) or variable-ratio (VR) 200 schedule of

reinforcement. Food and food + histamine conditions will be conducted in each subject as well. Each session ended after 20 reinforcers were earned or a 3-h duration, whichever came first. Order of conditions were counterbalanced between subjects and the order of histamine doses were randomized within subjects. Under cocaine alone and the cocaine + histamine (0.001 mg/kg/infusion) conditions, all subjects took all 20 infusions. Response rate consistently decreased as histamine dose increased. Under the VR schedule, subjects took longer to reach extinction criteria than under the FR schedule for both cocaine doses. Behavior maintained by a VR 200 schedule was more resistant to punishment compared with the FR 200 schedule in terms of both total infusions taken and response rate. These results suggest that uncertainty in terms of drug cost may be an environmental factor that contributes not only to the development of a substance-use disorder, but also to more perseverative drug-taking behavior and increased ineffectiveness of negative outcomes as deterrents of drug taking and seeking.

P10.11

PERCEIVED STRESS DURING PREGNANCY AND SOCIAL DETERMINANTS OF HEALTH

Ashley Griffin[1], *Sarah Araji*[1], *Wondwosen Yimer*[1], *Laura Dixon*[2], *Sheila Belk*[1], *Kedra Wallace*[1]

[1]*University of Mississippi Medical Center, Jackson, MS, USA.* [2]*Unversity of Mississippi, Oxford, MS, USA*

Abstract

Social determinants of health (SDH), adverse experiences of pregnancy, or biological changes can have negative effects on the mood of women during pregnancy and the post-partum period. The most common changes in mood during this period are the development of anxiety or depression. SDH such as formal educational, employment, relationship status, and race are associated with health disparities. Mississippi has the 2nd highest ranking in the nation of women reporting feelings of post-partum depression with 15.9%. In order to determine if SDH are associated with changes in mood during pregnancy into early post-partum, women were recruited into the MOOD study. MOOD is an IRB approved clinical study aimed at determining if women with evidence of prenatal depression or anxiety develop post-partum depression or anxiety. We hypothesize that SDH will have a nonrandom association with perceived stress of women during pregnancy and into post-partum. Pregnant women without a history of anxiety/depression, hypertension or preterm birth were recruited between 20-26 weeks of gestation. Women (n=65) completed a series of validated questionnaires at enrollment, 10 weeks later and their post-partum visit. One of the questionnaires was the perceived stress scale (PSS), a 14- question survey designed to assess personal stress through a series of questions about your thoughts and feelings over the last month. Categorical data was analyzed via a fisher's exact test. At enrollment, relationship status was significantly associated with PSS (p=0.006) in which women who were married had higher PSS, however neither employment (p=0.34) or education (p=0.59) were. As pregnancy progressed (2nd visit) relationship status (p=0.01), employment (p=0.02), and education (p= 0.04) were all significantly associated with PSS. Again, married women were associated with high PSS scores. Also women who were employed had associations with higher PSS scores, and women with lower education background were associated with higher PSS scores. After pregnancy there were no associations between relationship (p=1.0), employment (p=0.77) and education (p=0.10) with PSS. This data suggests that there is a relationship between SDH and PSS that may increase as pregnancy develops.

P10.12

LORAZEPAM DECREASES MIDAZOLAM SELF-ADMINISTRATION BY RHESUS MONKEYS

Lais Berro, Heather Hembree

University of Mississippi Medical Center, Jackson, MS, USA

BACKGROUND: Benzodiazepine addiction is a widespread and complex problem. Patients can experience very serious withdrawal symptoms when coming off of the medication, especially if the process is too abrupt. To avoid withdrawal, the standard for treatment is gradually weaning patients by lowering benzodiazepine dosage, sometimes concurrently with lorazepam (Ativan®). Though using lorazepam for recovery from benzodiazepine addiction is common practice, the effects of lorazepam on direct benzodiazepine consumption have not been investigated.

OBJECTIVE: The aim of the present study was to investigate the effects of pretreatment with the benzodiazepine lorazepam on the self-administration of midazolam, another benzodiazepine similar to lorazepam, in adult rhesus monkeys.

METHODS: Four adult rhesus monkeys (*Macaca mulatta*, 3 females, 1 male) were trained to self-administer the benzodiazepine midazolam (0.3–0.056 mg/kg/injection, i.v.) under a progressive-ratio schedule of reinforcement. Test sessions evaluated the reinforcing effects of midazolam (0.056 mg/kg/injection, i.v.) following a 5-min i.v. pretreatment with vehicle or lorazepam (0.03–3.0 mg/kg).

RESULTS: Pretreatment with lorazepam dose-dependently attenuated midazolam self-administration in rhesus monkeys, with the doses of 1.0 and 3.0 mg/kg significantly decreasing midazolam self-administration compared to vehicle pretreatments.

CONCLUSIONS: The results show that pretreatments with lorazepam significantly reduced consumption of midazolam in nonhuman primates. These data suggest that lorazepam decreases the reinforcing effects of midazolam. Because of midazolam's similarity with other benzodiazepines, it is possible that the reinforcing effects of other common benzodiazepines also are counteracted by lorazepam, thereby supporting its clinical use as a recovery tool.

FUNDING: This work was supported by the National Institutes of Health [DA011792, DA043204, DA046778 and DA049886].

P10.13

EFFICACY OF TELE-THERAPY TRAINING PROGRAM FOR ADULT CAREGIVERS OF CHILDREN WHO USE SPEECH-GENERATING DEVICES

Mallory Robertson

University of Mississippi, Oxford, MS, USA

This presentation will discuss research conducted at the University of Mississippi during the spring and summer of 2021. The study centered on training given to caregivers of children who use speech-generating devices (SGD). The training consisted of weekly 'kits' containing toys and information on how to use the toys to teach a concept (big vs little, in vs. out, etc.) and how to integrate the use of the speech-generating device while teaching. The caregivers were given a pre-survey to gain an understanding of their views of their child's speech-generating device. Then, the caregivers participated in eight weekly training sessions focused on that week's concept and techniques on modeled language input. The training sessions included pre-

recorded instructional videos and live meetings over Zoom to answer caregiver questions and further explain concepts, if needed. At the conclusion of the eight sessions, caregivers completed a post-survey to gauge their feelings post-therapy regarding their child's speech-generating device as well as a chance for feedback on kit materials, virtual training sessions, and any needs for future training.

Caregivers reported an increase in their understanding of aided language input techniques and of general knowledge regarding their child's SGD, as shown by their pre-survey responses compared to their post-survey responses. Caregivers also confirmed that the training they received was valuable to them and that they would be interested in attending future training sessions provided.

In conclusion, virtual training sessions delivered via telephone-therapy can be considered an effective modality for caregiver training to increase use of aided language input methods.

Topics of discussion include the potential impact of weekly virtual training sessions attendance on post-survey responses, the potential impact of caregivers' racial and socioeconomic status homogeneity, and potential confounding effects of the variability of weekly kit materials.

It is our goal that attendees will gain a better understanding of how they can provide high quality, effective parent training in teletherapy and a modality of how to best convey pertinent information to caregivers about modeled language input methods.

P10.14

SPEECH FLUENCY CHANGES FOLLOWING DEEP BRAIN STIMULATION OF THE SUBTHALAMIC NUCLEUS IN PARKINSON'S DISEASE: A META-ANALYSIS

Emily Morphis, Myriam Kornisch, Tossi Ikuta, Hyejin Park

University of Mississippi, University, Mississippi, USA

Individuals with Parkinson's disease that have symptoms that are not well-managed by medication may undergo a neurosurgical procedure called deep brain stimulation (DBS). DBS helps control motor symptoms of Parkinson's disease such as tremor and gait disturbances. However, preliminary research shows a link between deep brain stimulation of the subthalamic nucleus and an increase in speech dysfluency, specifically neurogenic stuttering. Speech disturbances, such as neurogenic stuttering, are typically diagnosed and treated by speech-language pathologists. Nevertheless, the national licensure body for speech-language pathologists, the American Speech-Language Hearing Association (ASHA), does not acknowledge neurogenic stuttering in its educational database. Therefore, the purpose of the current meta-analysis is to (1) determine the incidence and severity of speech fluency decline following deep brain stimulation of the subthalamic nucleus in patients with Parkinson's disease and (2) explore whether individuals with Parkinson's disease sought speech-language pathology services following deep brain stimulation. Confirmation of the correlation between DBS and neurogenic stuttering will reinforce the need for researching treatment options for this subset of individuals with Parkinson's disease. The current meta-analysis was conducted using the PRISMA model. The literature search yielded 21 studies that recorded changes in speech fluency using both standardized assessments, such as the Stuttering Severity Instrument and Unified Parkinson's Disease Rating Scale, as well as informal assessments such as speech samples. All studies used the standardized measure of levodopa equivalent dose (LED) for recording pharmacological symptom management. Preliminary results show a correlation between DBS activation and a reduction in speech fluency.

P10.15

STRESS, DECISION-MAKING AND REWARD VALUE: EFFECTS OF INTERMITTENT SOCIAL STRESS ON DELAY DISCOUNTING BEHAVIOR

Alfonso Martinez, Alberto Del Arco

University of Mississippi, Oxford, MS, USA

The intermittent exposure to social defeat stress promotes drug-seeking behavior (i.e., cocaine), which ultimately can increase the risk for developing substance use disorders. Previous studies show that drug-seeking behavior is associated with an alteration of the subjective value of rewards. Here, based on these studies, we investigated whether intermittent social defeat stress (ISD) changes performance in a delay discounting task. This task involves a decision-making process in which the subjective value of a reward decreases as the delay to receive it increases. Male Long Evans rats (3 months of age) were trained to discriminate between a high-reward lever (HR) and a low-reward lever (LR) associated with a cue light. Pressing the HR delivered 3 sugar pellets while pressing the LR delivered 1 sugar pellet. The delay discounting task consisted of three blocks of 20 trials each (60 trials total per session). In each block, the first 10 trials were **forced choice trials** in which both levers were extended but only one of the two levers was active, HR or LR, pseudo-randomly. The remaining 10 trials of the block were **free choice trials** in which both levers were active, and animals had to make a choice between the HR and the LR. The three blocks were different in the delay to receive the high-reward after pressing the HR: 1 s (block 1), 10 s ((block 2) and 20 s (block 3). After stable performance, rats were divided in two groups (Control, n= 11; Stress, n= 12) and exposed to ISD (or handling) once every three days for ten days (four stress episodes in total). Rats were tested in the task 24 hours after every stress episode. The results showed that all rats acquired the delay discounting task and pressed the HR significantly more times when the delay to receive the reward was lowest (1 s; 90% HR), which indicates a preference for a high-reward. As expected, the rats decreased their preference for a high-reward (i.e., pressed the HR less times) as the delay to receive the reward increased (10 s and 20 s; 60% HR and 30% HR, respectively). The exposure to ISD further decreased the preference for a high-reward. In fact, stressed animals pressed the HR less times compared to controls at the highest delay (20 s). Importantly, the effects of stress depended on rat's basal preference for the HR being more affected by stress the rats with higher preference for the HR. These results suggest that intermittent social stress decreases the subjective value of rewards and changes the neurobiological substrates that regulate decision-making and reward-seeking behavior.

Supported by NIH/NIGMS P30GM122733-01.

P10.16

THE EFFECTS OF ENVIRONMENTAL ENRICHMENT ON CORTICOSTERONE, STRESS-RELATED BEHAVIORS, AND COGNITION IN JUVENILE AND ADULT ZEBRA FINCHES (Taeniopygia Guttata**) OF BOTH SEXES**

Laura West, Lainy Day

University of Mississippi, Oxford, Mississippi, USA

Providing captive animals more interactive environments that

encourage exercise and species-typical manipulative behaviors can reduce stress by meeting physical and psychological needs. The effects of such "environmental enrichment (EE)" have been heavily studied in rodents,where it reduces stress and anxiety, enhances cognition, and dampens reactions to stressful events. While there is evidence that EE is similarly effective in birds, few studies have been completed in zebra finches (ZFs), a common lab model. To address this, I compared adult (1-4 yrs) and juvenile (1 mo) ZFs of each sex housed in "standard" or "enriched" cages (n=8 per group). Beyond basic provisions, enriched cages had natural and swinging perches, as well as three commercial bird toys. Birds were moved from their aviary into experimental cages to habituate for at least 10 days prior to introducing enrichment. To measure baseline plasma levels of the stress hormone corticosterone (CORT), I took blood samples prior to addition of the enrichment (Day 0), at the midpoint (Day 30), prior to behavioral testing (Day 60), and after this testing. The last baseline sample was followed by a stressed-state sample. During the treatment, I recorded birds to quantify abnormal repetitive behaviors (ARBs). My behavioral tests included a novel object test and a novelty-suppressed feeding test (to measure anxiety); and a test of spatial memory (which is negatively affected by chronic stress). In adults, EE males spent a lesser proportion of time engaging in ARBs than non-enriched males; in the novel object test, EE birds were more active; and EE males were less direct in exiting the spatial maze. Beyond this, I aim to determine whether EE reduces baseline or event-induced stress, and if any behavioral measures differ between adults and juveniles, which may itself depend on sex. This work will inform whether this intervention can increase the quality of lives of the birds, and demonstrate that these methods allow ZFs to be used as scientifically valid models of healthy, relatively low stress animals.

P10.17

THE NEUROPROTECTIVE EFFECTS OF ESTRADIOL AND GENISTEIN IN ZEBRA FINCH CEREBELLUM

Renee Breaux[1], *Chloe Barber*[1], *Emily McFatridge*[1], *Sarah Chong*[2,1], *Ethan Garett Zadrozny*[2], *Estelle Blair*[1,3], *Belinda Bagwandeen*[1], *Chyna-Rae Dearman*[1], *Lainy Day*[1]

[1]*University of Mississippi, Oxford, Mississippi, USA.* [2]*Mississippi Research INBRE Scholar, Oxford, Mississippi, USA.* [3]*CORE NPN Research Scholar, Oxford, Mississippi, USA*

Steroidal pathways are involved with neuroprotection in the brain. Within one particular pathway, the enzyme aromatase (AROM) converts testosterone into the steroid estradiol (E_2). The function of E_2 is often associated with learning and memory, but recent studies have linked this steroid to prevention of further degeneration following neural injury. Similar to E_2, AROM is also associated with protective and reparative functions. In the cerebellum, constitutive expression of AROM is limited. However, in regions surrounding neural injury, an upregulation of AROM transcription and translation occurs within reactive glial cells. The upregulation of AROM that occurs at and near the site of injury leads to increased production of E_2. Recent studies have proven the neuroprotective effects of E_2 by injecting an AROM inhibitor along with E_2 at the site of injury. Within brains that received these injections in comparison with brains that were strictly given an AROM inhibitor, the extent of degeneration was limited, confirming the protective nature of E_2. AROM and E_2 prevent degeneration by limiting the process of apoptosis, or programmed cell death, surrounding the site of injury.

While E_2 has proven to be an effective form of neuroprotection, its potential for negative effects within the body complicate administration of E_2 to prevent further cell degeneration. In women, E_2 is known to increase the risk of cancer during menopause, and in men, E_2 is associated with a decrease in testes mass and a decreased presence of spermatozoa. Phytoestrogen, a plant-derived compound, may potentially serve as a replacement for E_2 in limiting the extent of neural degeneration at the site of injury while avoiding the negative effects of E_2. Both the structure and function of phytoestrogen within the brain are similar to that of E_2. Specifically, genistein (GEN), a type of phytoestrogen that is found in soy, binds to estrogen receptors within the brain and is proven to have neuroprotective functions by decreasing apoptosis during secondary degeneration.

The purpose of this study is to determine if GEN is an effective neuroprotective replacement for E_2. To do so, we are utilizing the cerebellum and testes of zebra finch, a type of songbird. ZF provide an adequate model because their brains are highly plastic and completely steroidogenic, meaning they produce all steroid hormones. We hypothesize that, when analyzing the lesion path with TUNEL and Fluorojade, GEN will limit the extent of secondary degeneration within the cerebellum, similar to E_2. In addition, we expect that, while the groups given an injection of E_2 will have decreased testes mass and spermatogenesis, groups given an injection of GEN will display increased testes mass and normal levels of spermatozoa production. For the groups receiving the AROM inhibitor, we expect to see higher amounts of brain tissue damage.

P10.18

EEG ELECTRODE LOCALIZATION USING OFF-THE-SHELF VIRTUAL REALITY SYSTEMS

ZacheryGarris, Maggie Pattus, Daniel Molsbarger, Harish Chander, J. Adam Jones

Mississippi State University, Mississippi State, MS, USA

Electroencephalography (EEG) is a robust and useful tool for better understanding function within the human brain. Though EEG is often used to analyze gross, time-course changes in brain activity with high temporal resolution, it can also be used to perform low resolution source localization of activity within the brain. However, for source localization to be accurate, the exact location of the system's electrodes must be known relative to each other and the user's head. Several approaches such as using MRI, professional motion capture, and 3D scanning have been employed to measure the position of electrodes with a high degree of accuracy. Unfortunately, these approaches are often time consuming and not cost-effective. In this poster, we propose a low cost, high accuracy method of measuring the position of electrodes for the purposes of source localization with EEG. Modern virtual reality (VR) systems have greatly decreased in cost and have become widely available to the public. These systems can be roughly generalized as being a hybrid of two distinct computational systems: a display device and a motion capture system. Our previous work has shown that these low-cost VR systems can provide motion capture and positional measurements comparable to professional motion capture systems while costing multiple orders of magnitude less. We demonstrate in the current work that, with no hardware modification, an off-the-shelf VR system can be repurposed to perform fast, accurate 3D localization of electrodes on a standard EEG cap.

P10.19

CO-ADMINISTRATION OF FENTANYL AND METHAMPHETAMINE ALTERS THE RESPIRATORY DEPRESSANT AND REINFORCING EFFECTS IN Rats

Haley Rooks, Ricardo Ungo, C. Austin Zamarripa, Loc Pharm, Kevin Freeman

UMMC, Jackson, MS, USA

Rationale: Recently, alarming spikes in the co-abuse of fentanyl (an opioid) and methamphetamine (a stimulant) have been reported. These increasing trends in use are also associated with increasing reports of overdose deaths involving both drugs.

Objectives: The goals of this study were to determine if combinations of fentanyl and methamphetamine produce a higher degree of drug reward than either drug alone, and increase the risk of producing respiratory depression relative to the effects of the single drugs.

Methods: Male and female Sprague-Dawley rats self-administered intravenous injections of fentanyl, methamphetamine, and combinations of the two under a progressive ratio-schedule of reinforcement. The respiratory-depressant effects of intravenous fentanyl alone or as a combination with methamphetamine were measured in rats using whole-body plethysmography.

Results: Methamphetamine and fentanyl each functioned as reinforcers in a dose-dependent manner. When maximally-reinforcing doses of fentanyl and methamphetamine were combined, subjects self-administered more infusions of the combination than either drug alone. Fentanyl alone produced dose-dependent reductions in minute volume. However, when fentanyl was combined with a fixed proportion of methamphetamine, the combination produced initial increases in minute volume that resulted in a precipitous decrease at the highest dose combination.

Conclusions: The results of the current study suggest that fentanyl and methamphetamine co-abuse is driven, at least in part, by an increased rewarding effect of the drug combination relative to either drug alone. Moreover, combinations of methamphetamine and fentanyl may increase the risk of overdose by causing precipitous changes in respiratory function.

P10.20

ENVIRONMENTAL ENRICHMENT PROVIDED TO ADULT ZEBRA FINCHES (TAENIOPYGIA GUTTATA) DIFFERENTIALLY INFLUENCES SEXES ON A SPATIAL LEARNING TASK

Arma'Rosa Mohead, Laura West

University of Mississippi, Oxford, MS, USA

In mammals, environmental enrichment (EE), providing mentally and physically stimulating objects, increases neuroprotection, synaptogenesis, and neurogenesis. This is conspicuously true of the hippocampus, a brain region associated with spatial cognition (distal cue-guided navigation). Hippocampal enlargement and superior spatial skills are found in the species and/or sex with the greatest ecological demands across vertebrates. EE has been studied in few avian species, despite birds such as the zebra finch (ZF) being a common lab model. In ZF, hippocampal lesions impair spatial learning and males tend to have a subtle advantage over females in spatial memory tasks, perhaps due to males' role in finding nesting materials. In rodents, EE sometimes has a stronger positive influence on females than males. Using a novel spatial maze designed with probe trials that confirm distal cue-guided navigation, we tested whether EE improves spatial cognition in a sex specific fashion in ZF. All groups except EE males learned to goal location. Due to a methodological error, we are uncertain if distal cues were used for goal orientation. Our results support rodent studies showing EE can produce decreased spatial skills in males, possibly due to overstimulation induced stress. We have measured stress hormone levels at baseline and after a stressor, and tested how EE influences anxiety and neophobia. Together, these experiments will indicate whether increased stress response in EE males might be a causal factor in cognitive impairments and show if results are generalizable to other tasks, which each implicate a brain region affected by EE.

High School Student Posters (Friday April, 1, 2022 Health Science High School Competition-11:45 Room TBA)

P10.21 AZITHROMYCIN REDUCES LIPOPOLYSACCHARIDE-INDUCED BRAIN AND SPINAL CORD INFLAMMATION AND NEUROBEHAVIORAL IMPAIRMENTS IN NEONATAL RATS

Jakota McMillan[1,2], Jonathan Lee[2], Malachi Morris[1,2], Nathaniel Lee[2], Ashton Castle[2], Valerie Quach[2], Michelle Tucci[3], Khushboo Patel[3], Norma Ojeda[2], Yi Pang[2], Lir-Wan Fan[2]

[1]Base Pair Program, University of Mississippi Medical Center/Murrah High Schoo, Jackson, MS, USA. [2]Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, MS, USA. [3]Department of Anesthesiology, University of Mississippi Medical Center, Jackson, MS, USA

Inflammation plays an important role in brain injury in neonatal human and animal models. Our previous studies have shown that systemic administration of endotoxin lipopolysaccharide (LPS) induces sensorimotor neurobehavioral dysfunction and brain inflammation in neonatal rats, which is associated with the production of pro-inflammatory cytokines by activated microglia. The objective of the current study was to determine whether azithromycin, a putative suppressor of microglial activation, ameliorates LPS-induced brain inflammation and neurobehavioral dysfunction. Intraperitoneal (i.p.) injection of LPS (2 mg/kg) was performed in P5 rat pups and azithromycin (40 mg/kg) or vehicle was administered (i.p.) 5 min after LPS injection. Control rats were injected (i.p.) with sterile saline. Neurobehavioral tests were performed and brain inflammation was examined on P6, 24 hours after LPS exposure. Our results showed that neonatal systemic LPS exposure results in hypothermia, allodynia, hyperalgesia, reduction in pre-social interaction (ultrasonic vocalization), and sensorimotor neurobehavioral deficits in righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension tests in P6 rats. LPS exposure also increased levels of microglia activation-related pro-inflammatory cytokines including interleukin-1β (IL-1β) in the P6 rat serum, brain and spinal cord. Azithromycin treatment significantly reduced LPS-induced neurobehavioral deficits and the increase in levels of pro-inflammatory cytokines in the P6 rat serum, brain and spinal cord. These results suggest that azithromycin may provide protection against systemic LPS exposure-induced brain inflammation and neurobehavioral disturbances, and that the protective effects are associated with its ability to attenuate LPS-induced microglia activation-related pro-inflammatory cytokines.

P10.22

INTRANASAL INSULIN ATTENUATES BRAIN INFLAMMATION AND LIPID PEROXIDATION AND IMPAIRED NEUROBEHAVIORAL PERFORMANCE FOLLOWING LIPOPOLYSACCHARIDE EXPOSURE IN NEONATAL RATS

Malachi Morris[1], *Jonathan Lee*[2], *Elizabeth White*[2], *Jakota McMillian*[1,2], *Jhanel Greene*[2], *Michelle Tucci*[3], *Khushboo Patel*[3], *Bryan Fan*[3], *Gene Bidwell III*[4], *Norma Ojeda*[2], *Yi Pang*[2], *Lir-Wan Fan*[2]

[1]*Base Pair Program, University of Mississippi Medical Center/Murrah High School, Jackson, Mississippi, USA.* [2]*Department of Pediatrics, Division of Newborn Medicine, University of Mississippi Medical Center, Jackson, Mississippi, USA.* [3]*Department of Anesthesiology, University of Mississippi Medical Center, Jackson, Mississippi, USA.* [4]*Department of Neurology, University of Mississippi Medical Center, Jackson, Mississippi, USA*

Inflammation and oxidative stress play important roles in neonatal brain damage. Previous studies from our lab showed that systemic administration of lipopolysaccharide (LPS) induces brain damage and neurobehavioral dysfunction in neonatal rats, which is associated with the production of pro-inflammatory cytokines and oxidative stress. Recent studies suggest that intranasal insulin treatment could be a neuroprotective agent in adult animals. Therefore, the objective of this study was to determine whether intranasal insulin treatment reduces LPS-induced brain inflammation and oxidative stress, as well as neurobehavioral dysfunction in neonatal rats. LPS (2 mg/kg) or sterile saline was administered via intraperitoneal (i.p.) injection in postnatal day 5 (P5) Sprague Dawley rat pups, and recombinant human insulin (25 μg) or vehicle was administered to each nostril 5 min after LPS injection. Sensorimotor behavioral tests were carried out 24 hours (P6) after LPS exposure and brain tissues were collected to determine pro-inflammatory cytokine interleukin-1β (IL-1β) and lipid peroxidation. Our results showed that intranasal insulin reduced LPS-induced sensorimotor disturbances, as indicated by improvement in righting reflex, negative geotaxis, wire hanging maneuver, and hind limb suspension tests at P6. Intranasal insulin also reduced LPS-induced increase in levels of IL-1β and thiobarbituric acid reactive substances (TBARS) contents, suggesting anti-inflammatory and anti-oxidative effects. Our study suggests that intranasal insulin affords a broad neuroprotection by targeting multiple signaling pathways including inflammation and oxidative stress.

P10.23

EXPOSURE TO REDUCED UTERO-PLACENTAL PERFUSION INDUCES MODEST SPATIAL MEMORY IMPAIRMENT IN ADULT MOUSE OFFSPRING

Kennedi Stancil[1,2], *Maria Jones-Muhammad*[1], *Qingmei Shao*[1], *Junie Warrington*[1]

[1]*University of Mississippi Medical Center, Jackson, MS, USA.* [2]*Murrah High School, Jackson, MS, USA*

Offspring born to women with preeclampsia, a hypertensive pregnancy disorder, have increased risk of cognitive impairment during childhood and adulthood. The underlying mechanisms are not fully understood. We hypothesized that offspring of mice subjected to reduced utero-placental perfusion (RUPP), used to model preeclampsia, will have impaired learning and memory function in adulthood compared to offspring from normal pregnancy.

Timed pregnant female SMA-GFP mice (n=1/ group) were subjected to normal pregnancy (no intervention) or surgical RUPP on gestational day 13.5. Mice were allowed to deliver and pups (n=7-8/ group) were weaned on postnatal day 21. At 6 months of age, offspring (males and females) were trained on the 20-hole Barnes maze task (4 trials/day over 4 days). The escape box was removed and memory was tested 24h (short-term) and 12 days (long-term) after the last training trial. The frequency of visits to each hole was recorded over a period of 90s.

No significant difference in body weight or learning acquisition on the Barnes maze was noted between groups ($p>0.05$). However, offspring exposed to RUPP had short-term memory (day 5) impairment as they made more errors visiting the holes adjacent to the target hole compared to the normal pregnancy-exposed offspring ($p<0.05$). No difference in long-term (day 12) memory impairment was noted between groups.

Our results indicate that **in utero** exposure to RUPP results in short-term memory impairment with no significant effect on learning in adult mouse offspring. This is a preliminary study and more mice are being added to increase the sample size. The underlying mechanisms and whether there are sex differences in learning and memory function are ongoing studies.

Physics and Engineering

Chair: Ramakalavathi Marapareddy

University of Southern Mississippi

Vice-Chair: Jason Griggs

University of Mississippi Medical Center

MARCH 31, 2022

AFTERNOON

Room L5

2:00 KEYNOTE PRESENTATION

IDENTIFYING CHARACTERISTIC LENGTH SCALES IN BRITTLE FRACTURE

John J. Mecholsky, Jr.

University of Florida, Gainesville, FL, USA

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P11.01

INDOOR AIR POLLUTION - MOLD AND AIR TIGHT BUILDING

Pao-Chiang Yuan[1], *Jao-Jia Horng*[2], *Richterica Ford*[1]

[1]*Jackson State University, Jackson, Mississippi, USA.* [2]*National Yulin University of Science & Technology, Doliu, Taiwan, Taiwan*

Molds have been on the Earth for millions of years. Generally, Mold growth is usually caused by warm and humid conditions. The appropriate response to an unplanned "water event"—such as a broken pipe, sewage back-up, or severe weather such as a hurricane—can mean the difference between a minor inconvenience and long-lasting damage to a home and its contents. After hurricane, flash thunder storm, floods and more situations with proper temperature it will be occurred. Since last several decades, high rise (airtight) buildings. It also cause mold problem. In United States we called mold and mildew, often seen as a discoloration, may be white, orange, green brown or black. They are surface conditions that may indicate decay and are often noticed as a musty odor. Water-carrying fungi look like a dirty white or slightly yellow fan with vine-like strands. The fungus can spread over moist or dry wood, and can be found under carpets, behind cupboards, on framing between subfloors or on damp concrete foundations. Wood swells when it becomes wet and warps, cups or cracks when allowed drying. Mold can cause many health effects. For some people, mold can cause a stuffy nose, sore throat, coughing or wheezing, burning eyes, or skin rash. People with asthma or who are allergic to mold may have severe reactions. Up to now, there is no evidence mold will cause death. In United States there are guidelines in EPA (Environmental Protection Agency), OSHA (Occupation Safety and Health Administration) and CDC (Center of Disease Control), only few States with act and regulation such as Texas. Indoor air is also important because populations spend a substantial fraction of time within buildings. Moisture promotes bacterial growth and the survival of viruses, but this has little attention for years. This paper is focus on mold, reference according to all federal and state agencies' fact sheets and published reports then reorganized them. We re-organized it and arouse people re-aware this old problem that happened everywhere in the world.

P11.02

CROSS SECTION MEASUREMENTS OF THE ^{12}C(alpha, gamma)^{16}O REACTION AT $E_{c.m.}$ = 3.7, 4.0, and 4.2 MeV

Rekam Giri

Holmes Community College, Ridgeland, MS, USA

The ^{12}C(alpha, gamma)^{16}O reaction is one of the most important nuclear reactions in astrophysics, as it determines the C/O ratio at the end of helium burning and it has a strong influence on the stellar evolution and final fate of red giant stars. We have used the DRAGON recoil separator for the measurements of the ^{12}C(alpha, gamma)^{16}O reaction at the higher energies of $E_{c.m.}$ = 3.7, 4.0, and 4.2 MeV. The measurements will constrain global R-Matrix fits by providing information on higher energy levels, aiding extrapolation to helium burning energies. The experiment was performed in inverse kinematics where a ^{12}C beam was impinged on windowless He gas target surrounded by 30 BGO detectors which detect the-rays. The ^{16}O recoils were detected by a Double-Sided Silicon Strip Detector (DSSSD) located at the end of the DRAGON separator. The array of BGO detectors is able to separate transitions to various ^{16}O final states.

P11.03

BIOERODIBLE DRUG DELIVERY SYSTEM FOR SEQUENTIAL, INTERMITTENT RELEASE OF PSYCHOACTIVE DRUGS

Jared Barnes, Mehjabeen Hossain, Thomas Werfel, Adam Smith

University of Mississippi, Oxford, MS, USA

Treatment-resistant depression (TRD) presents a significant medical need, with up to 50% of patients with depression qualifying for this diagnosis. Recently, the FDA granted "Breakthrough Therapy" designation to psilocybin for TRD marking an important step in the re-introduction of many 5HT2A agonist compounds (e.g., lysergic acid diethylamide (LSD) and psilocybin) to sanctioned use within psychiatry. Moreover, microsdosing has risen to prominence among the public, where 10-20% of a full dose of 5HT2A agonist are ingested every other day (Q48) or every third day (Q72). To overcome barriers such as low compliance, abuse, and medical cost associated with clinical follow-ups, we are developing a fully bioresorbable microdosing implant (MDI) that enables long-term, intermittent delivery of sub-perceptual doses of 5HT2A agonists. The MDIs are fabricated by layering surface-eroding polymer films composed of Cellulose Acetate Phthalate (CAP) and Pluronic F-127 (P) polymers. A wide range of compounds can be encapsulated within the CAPP films which are then released in a controlled manner as the films surface erode in aqueous environments. To enable with controlled, unidirectional release, we experimented with wax and parafilm coatings to prevent biodegradation of the films in all directions except for the top of the devices. By loading the CAPP polymers with Rhodamine B, we were able to take samples in eight-hour intervals measuring the amount of Rhodamine released using fluorescence measurements on a microplate reader. Parafilm and wax coating achieved … In sum, we prepared X-coated films and achieved Q72 microdosing in proof-of-concept drug release experiments. These results open the door to future studies into the value of microdosing 5HT 2A agonists to improve the treatment of TRD.

P11.04

THE EFFECT OF SCREW LENGTH ON TORQUE DURING INSERTION INTO SYNTHETIC BONE

Alexis Hughes, Loubna Ifqir, Logan Betts, Matthew Priddy, Lauren Priddy

Mississippi State University, Mississippi State, MS, USA

Orthopedic screws are used to stabilize bone fractures for healing purposes. Various biomechanical features affect the stability of the screw, such as stress shielding, overtightening, and screw loosening. Previously, parameters of reinsertion, angle of insertion, and pullout strength were used to predict screw stability, but torque may be a better indicator of stability. The purpose of this work was to examine the influence of screw length on max torque. We hypothesized that a 20mm-long buttress thread screw would have higher maximum torque than 16mm and 10mm length screws. To record the torque, axial load, and revolutions per minute (RPM), a custom apparatus was constructed utilizing four 3-D printed polymer pieces, FUTEK sensors with SENSIT software, and a combination vise. Before each test, synthetic Sawbonesmaterial (20 PCF) was cut in half, 2.5mm-diameter pilot holes were drilled, and the material was mounted on the combination vise into the apparatus. For all tests, monitoring of real-time data ensured the RPMs remained between 130 and 160, and the torque did not exceed 1.75 N-m. Maximum torque was between 0.1-0.14 N-m (10mm), 0.3-0.35 N-m (16mm), and 0.4-0.5 N-m (20mm). The slope of torque versus time curves was highest for the 20mm and lowest for the 10mm screw. To conclude, the longer-length screw required a higher torque to insert into the synthetic bone. This work provides insight into the utility of maximum torque as a predictor of screw fixation, to mitigate future complications associated with bone fixation surgeries.

P11.05

MEASURING IMPURITIES IN COMMERCIAL EGGSHELL MEMBRANE CAPSULES USING DUAL EXCITATION RAMAN SPECTROSCOPY

Kennedy Corey[1], Shan Yang[2]

[1]Tougaloo College, Tougaloo, MS, USA. [2]Jackson State University, Jackson, MS, USA

Osteoporosis is a very common disease that is characterized by the body constantly absorbing and replacing bone tissue. For those who are diagnosed with the disease, their new bone creation simply cannot keep up with old bone removal. Osteoporosis is very common in elders, for it is degenerative and increases in development by age. Because it effects more than 3 million people in the United States alone, research for slowing the disease is in very high demand. Recent data suggests that the proteins found in eggshell membranes not only can be digested, but support many functions of the body such as joint support and strengthening connective tissue. This has been a commonly used treatment for osteoporosis. Eggshell membranes found in their purest form yield the best nutrients. These nutrients include the fibrous protein, collagen type I and large amounts of hyaluronic acid. But, are these commercial eggshell membrane capsules given to osteoporosis patients as pure as they claim to be? A laser based optical spectroscopy method can be used to explore content analysis for the eggshell membranes. The use of this device measures samples for certain impurities. Data gathered through Raman spectroscopy tells the specific vibrations of a molecule and can be used to determine a substance. Because of their relationship with the egg shell, it is suspected that impurities can be found within the commercial eggshell membrane capsules. Experimental results also suggest that these commercial eggshell membrane capsules contain more egg shell than membrane. High ratios of egg shell to eggshell membrane refutes the viability of commercial eggshell membrane capsules.

Friday, April 1, 2022

MORNING

Room D8

8:20 Welcome

O11.01

8:30 MISSISSIPPI STATE UNIVERSITY ADVANCED COMPOSITES INSTITUTE -- THE ENGINEERING PROCESS

Wayne Huberty, Christopher Bounds

Mississippi State University, Starkville, MS, USA

Mississippi State University's Advanced Composites Institute (ACI) is equipped and positioned to support RDD&D, manufacturing innovation, and transdisciplinary programs that address fundamental upstream and broader downstream needs in automotive, aerospace, marine, energy, military, and other crucial markets and to spur job creation, and enhance manufacturing competitiveness. The 50,000 ft^2 facility also houses the distinguished Marvin B. Dow Stitched Composites Development Center, dedicated to R&D of stitched composite technologies that improve the efficiency of material structures. The ACI is home to an automated VARTM process with production-scale working volumes, a 50x20x10 ft^3 programmable curing oven up to 450°F, an automated robotic stitching system with 8 ft reach by 40 ft travel, a production scale CNC ply cutter, temperature and humidity-controlled layup rooms, 5-axis CNC machine, small-scale auto-injection system, advanced AM, walk-in freezers, and sophisticated NDI equipment. The ACI is a trusted partner of many major OEMs in multiple market segments for ideation, engineering, design, fabrication, scale-up, and evaluation of innovative solutions. The ACI has successfully executed hundreds of fabrication orders for tier-one partners providing the foundation for cutting-edge advanced material manufacturing, research, and development in valuable innovation portfolios. This includes multiple vehicle light weighting projects, full-scale vehicle parts manufacturing using VARTM, and copious amounts of aerospace parts. This presentation will highlight the integrated process used at the ACI to meet customer demands, ensure high quality, and cover the entire engineering process for producing composite materials.

O11.02

9:00 UNCERTAINTY IN CHARACTERISTIC STRENGTH FROM USING THE WEIBULL SIZE EFFECT

Jason Griggs

University of Mississippi Medical Center, Jackson, MS, USA

Objectives: The Weibull size effect can be used to predict the strength that specimens would have if tested in a different loading fixture. This calculation uses the Weibull modulus m, but there is often a large uncertainty in estimating m, which may cause additional uncertainty in translating the strength.

Methods: Weibull (1939) developed a power law, $\sigma_2=\sigma_1(V_2/V_1)^{(1/m)}$, which relates the strength σ_2 of a specimen having volume V_2 to the strength σ_1 of a specimen made from the

same material but having different volume V_1. This power law is also used to translate characteristic strength σ_0 of groups of specimens having the same volume but tested in different fixtures that concentrate stress over a larger or smaller portion of the specimen, the effective volume. Quinn (2003) previously determined the effective volumes for rectangular beam specimens when loaded in three-point and four-point flexure. These are functions of the specimen dimensions and the Weibull modulus, so calculating the resulting uncertainty is a complex problem that required MathCAD software (PTC). The partial derivatives of Weibull's power law ($d\sigma_2/d\sigma_1$ and $d\sigma_2/dm$) were calculated. These were multiplied by the size of the 95% confidence intervals for σ_{01} and m. Gong (1999) and Mahdi (2004) previously conducted monte carlo simulations to determine the size of 95% confidence intervals for σ_0 and m. The two products were summed to determine the uncertainty in estimating σ_{02}.

Results: The relative uncertainty in σ_{02} estimates was increased after translation and increased by the same ratio regardless of whether translating from three-point to four-point flexure or vice versa. The amount of increase was independent of strength and decreased with increasing n and decreasing m, ranging from 2.7X to 16.4X.

Conclusion: Using the ratio of effective volumes to translate the results of strength testing greatly increases the uncertainty in estimates of characteristic strength.

O11.03

9:15 INVESTIGATION OF PARAMETERS AFFECTING TRANSIENT VIBRATION OF A HELICAL COIL

Nathan Hill, Scott Chumley, Wayne Prather, Joel Mobley

University of Mississippi, Oxford, MS, USA

In an effort to model the response of a helical antenna to the stresses endured in low earth orbit, the vibrational modes of a helix subjected to impulsive forces are studied. In this work, the changes of the vibrational modes after the helix is subjected to repeated heat cycling and structural modifications are of particular interest. Modes are observed as longitudinal or transverse vibrations using a Laser Doppler Vibrometer, and the mode shapes are reconstructed using a custom Matlab program. The changes in response are quantified by the change in mode frequency, Q values, and vibration amplitudes. The collected data shows minimal effect due to the heat cycling in contrast to a drastic lowering of some of the Q values and vibrational amplitudes due to the added structural elements.

O11.04

9:30 GEANT4 SIMULATIONS OF NITROGEN/OXYGEN MIXTURES IN THE PRESENCE OF ALPHA RADIATION

Sidney Gautrau, Tyler Reese, Patrick Ables, Chris Winstead

The University of Southern Mississippi, Hattiesburg, MS, USA

GEANT4 is currently being used to model the spatial distribution of energy deposited by alpha radiation interactions in a nitrogen/oxygen mixture intended to represent the presence of an alpha source in dry air. GEANT4 is an open-source radiation transport toolkit that allows for fully customizable simulations. It has built-in physics lists of interaction cross sections and allows CAD files to be converted and read-in to create custom geometries. Preliminary measurements using Cavity Ringdown Spectroscopy (CRDS) for Abel inversion analysis have been performed to investigate the distribution of ozone along a variety of beam paths relative to a Polonium-210 alpha radiation source. CAD files have been created representing the experimental system and have been successfully imported into GEANT4. The GEANT4 results will be used with experimental ozone measurements to calculate G-values for ozone (number of molecules produced per 100eV of deposited energy).

This talk will briefly review ionizing radiation, Monte Carlo for radiation transport, why GEANT4 was chosen, and how GEANT4 was implemented. Preliminary results for the distribution of energy deposited in 1.0 mm^3 voxels will be presented as well as a comparison with experimental ozone results. Current work status as well as future works will also be discussed.

O11.05

9:45 INTEL-PATCHED VIT: INTELLIGENT PATCH-BASED VISION TRANSFORMER FOR IMAGE SEGMENTATION

Divya Nimma, Ramakalavathi Marapareddy

University of Southern Mississippi, Hattiesburg, MS, USA

In the field of Speech recognition and Natural Processing Language (NLP), the transformers have contributed significantly to development ever since in the history of machine learning. Recently, the transformers have been found to be outperformed over existing sequence modeling methods, such as RNN and LSTM. Not just confined to the sequence-oriented problems, the vision transformers also have started playing their role in the computer vision discipline. Nowadays, computer vision transformers are mainly being used for image classification, object detection, and semantic segmentation. The mechanism of multi-head self-attention being the power of transformers is used for different patches using NLP techniques and transformers, in which the size of the image is divided into a sequence of fixed-size patches. While compared to CNNs, the vision transformers are better capable to capture long-range sequence interdependencies and their extracted features are rich in more semantic information than that of CNNs. Although the transformers are considered as the best alternative to CNNs and NLP, there are still more aspects that need to improve. In T2T-ViT, the embedded patch is decomposed using the neighboring tokens iterative aggregation method to enhance local detection. The inside patch the grain level improvements are made using TNT methodology. The PVT architecture is divided into four steps along with an inclusion of a feature pyramid to perform dense prediction.

All the techniques use the same patching method called fixed-size patch embedding with the assumption that an image split into fixed patches is better suitable for a wide range of images. Besides its benefits, the fixed-size patching has two major drawbacks: (1) The undergone image loses its local structure. (2) The loss of semantic structure of the image. About the former, the fixed-sized patch, say (16 x 16) will not be sufficient to capture the whole object of different sizes within an image. In the former, say an image containing different instances of the same objects with different angles and dimensions maybe not get recognized by the fixed-size patch efficiently, hence causing a loss of semantic information. Moreover, the fixed-sized patch is not capable to capture a different scaled object within an image which reluctantly will affect the efficiency and performance of the model.

To access the problems, we shall propose a novel patching method called Intelligent-Patch, from hereafter will be called as

Intel-Patch, which will split an image into unfixed and semantic-based patches so that object semantic information can be preserved. The unfixed-sized patches with different aspect ratios in accordance with the object size will ensure the preservation of the object semantic contents. The Intel-Patch will be designed in the form of a complete module that can be attached, detached, and augmented to any form of vision transformer.

O11.06

10:00 SOIL CRACKS REMEDIATION THROUGH BIOPOLYMER TREATMENT

Glenn Misiak, Kejun Wen

Jackson State University, Jackson, MS, USA

Cracks on the upper surface of the geomaterials will affect the soil properties in various agricultural, geotechnical, and environmental sectors. Studies have concluded that the cracks may change the soil structures, worsen soil water quality, and affect several significant physicals, chemical, and biochemical processes in the soil. The desiccation cracks expose the interior of soil slopes to climatic changes, thereby allowing further cracking to occur. The failure of geomaterials is mainly caused by the accumulation of breaks/cracks. If the breaks/cracks can be identified when they just appeared, and immediate treatment could be applied before the case become worse. The failure of geomaterials might be prevented and additional treatment for repairing the failure could be avoided. Traditionally, the failure of geomaterials is usually repaired by adding adhesives such as cement, asphalt, sand slurry, etc. However, the repaired geomaterials can't retain their original characteristics. In recent years, many biopolymers have been exploited as soil stabilizers to improve the mechanical behaviors of different types of soil. In this project, non-toxic and biocompatible biopolymers such as Xanthan Gum, alginate, and Agar were proposed to use as a polymeric binder for soil stabilization. The soft-gel properties of the biopolymer present a great potential application in soil cracks remediation. The high-water content of biopolymer gel also benefits to maintain the moisture in the surface soil which may mitigate the surface cracks during the dry season. The crack observation test shows that the crack developed slower on biopolymer-treated soil. The erosion test results also indicated a better erosion resistance on the biopolymer-coated surface.

O11.07

10:15 EFFECT OF VARIOUS ELECTROSPRAYING PARAMETERS ON PRODUCTION OF PCL MICROPARTICLES

Lohitha Kalluri, Yuanyuan Duan

University of Mississippi Medical Center, Jackson, MS, USA

Objective – To investigate the effect of various electrospraying parameters on the morphology and mean particulate diameter (MPD) of polycaprolactone (PCL) microparticles.

Method – 2 wt% PCL was dissolved in chloroform using a bench rocker, and the resultant solution was loaded into syringe. An 18 gauge needle was attached and the electrospraying process was carried out. The specimens were collected at varied flow rates of 0.5, 0.7 and 0.9 ml/hr, while maintaining all other parameters constant. Likewise, specimens at varied spinneret-collector distances of 8, 12 and 16 cm, and at varied applied voltages of 10, 15 and 20 kV were collected. Morphology of all the specimens were observed using Field-Emission Scanning Electron Microscopy. The MPD was assessed using ImageJ software and results were compared using one-way ANOVA followed by Tukey Post-hoc.

Results – SEM analysis showed stable uniform particles at flow rates of 0.7 and 0.9 ml/hr, applied voltages of 15 and 20 kV, and at all spinneret-collector distances tested. Microparticles interspersed with fibers were observed at 0.5 ml/hr flow rate. Deformed and unstable particles were observed at 10 kV applied voltage. There is a significant variation in MPD on increasing the applied voltage to 15 and 20 kV from 10 kV, and on altering the spinneret-collector distance from 8 to 12 cm and from 12 to 16 cm.

Conclusion – The morphology of the particles altered with varying electrospraying parameters. There is a significant variation observed in mean particle diameter on increasing applied voltage to 15 kV and 20 kV from 10 kV and on increasing S-C distances

10:30 BREAK

O11.08

10:45 INVESTIGATION ON THE MECHANICAL BEHAVIOR OF THERMAL BIOPOLYMER TREATED SAND

Charles Spain, Kejun Wen

Jackson State University, Jackson, MS, USA

Soil erosion induced by flowing water tends to alter the stability of geotechnical engineering structures. Coastal areas keep changing with erosion and sand movement with time. Human activities may accelerate erosion and it may become a problem when the buildings and roadways are close enough to the ocean. This study employs environmentally friendly materials, biopolymers, to reinforce the coastal sand and improve the erosion resistance of the shoreline. The goal of this study is to investigate the mechanical behavior of biopolymer-treated sand. The biopolymer used in this study was agar. The impact of different concentrations of agar solution (2%,6%, 10%, and 14%) on the unconfined compression strength of treated sand was evaluated in this study. The results indicate that the unconfined compression strength increased with the increasing of the concentration of agar solution. The optimum concentration of the agar solution was found to be 10% since the unconfined compression strength did not show a significant improvement when the concentration exceeds 10%. The different moisture content of the treated sample was also studied, and the results showed 20% moisture content achieved the best strength performance. Three curing conditions, wet curing, air drying, and oven drying of the biopolymer treated samples were investigated in this study. Generally, the dry sample had better strength performance than the wet sample. The unconfined compression strength could reach 2700 kPa when oven drying the treated sample for 24 hrs. The bonding mechanism of the biopolymer treated sample was also evaluated through the Scanning Electron Microscope image analysis.

O11.09

11:00 FRAMING, TONE ANALYSIS OF TEXT IN COMPUTATIONAL SOCIAL SCIENCE

Krishna Chaitanya Nunna, Ramakalavathi Marapareddy

University of Southern Mississippi, Hattiesburg, MS, USA

With an ever-increasing advance in machine learning and natural language processing algorithms, textual data has become more promising ways for predictions in sociological, economical, and biological scenarios. Analyzing structured data with entities and

attributes is easy compared to large unstructured vocal data or text data. To extract the useful and meaningful data from text, it should be analyzed and converted into structured data to easily apply models to it to get efficient predictions or dynamics. Here in this project, we presented how to analyze the text, how to use text as data. As an example, we took the text which is framed, using annotations, or framing dimensions, analyze the tone and mood of the data and visualize the data to show the wide range of text taken. Further, we wanted to incorporate metadata and implement models to yield exploration and measurement.

Introduction:

• With increasing technology and availability of vast data like digital texts, audio, visual data is increasing because of human interaction and communication. Encoded information inside the text is a bonus to the structure's data for research or any prediction.

• Text from news and social media is playing a crucial in studying and analyzing businesses, finance, politics, and marketing. For example Text from a politician's debate is analyzed to get aspects of political agendas. Texts from product reviews are used for the decision-making of consumer goods. Text from the news is used for political, industrial, and economic impacts.

Data set:

- We are going to show the running implementation by taking the framing data set available.
- In this running example, 4600+ articles were taken from 1990 to 2012 new papers about immigration.
- In the first step they manually did annotations to the articles and framed the data
- So framing is done using 15 framing dimensions, data is taken.
- There is a data set where the rating of pro, anti and neutral was given for the positive, negative, and neutralism of the words in the article.
- Basically, we normalized the tone data set, by that can plot the tone score of the articles.
- run the data sets and trained to visualize the tone analysis and framing.
- We showed the visualization of tone analysis according to years, net tone, annotations to net tone, 15 frame dimensions to years of articles.

O11.10

11:15 IMAGE FORGERY DETECTION USING CONVOLUTIONAL NEURAL NETWORK

Krishnakanth Yachareni, Ramakalavathi Marapareddy

University of Southern Mississippi, Hattiesburg, MS, USA

For the past several years, social media like Facebook, Instagram, and SNS (Social Network Service) have been used by many people and still, the emerging of their use is increasing accordingly. They have become part of our lives. In particular, the development of smart devices such as smartphones has a remarkable role in uploading and downloading images to those social networks.

In the meantime, there has been a technique for manipulating an image using various methods with a specific purpose. Image tampering can be done by counterfeit criminals for the purpose of counterfeiting. Digital forensic techniques are needed to detect the tampering and manipulation of images for these illegal purposes and much research has been studied on these forensic techniques. However, they use features designed by human intervention and their performance is totally dependent on the differentiation of these features among original, tampered, and modified images.

This project proposes an image manipulation detection algorithm using deep learning technology. The model based on a convolutional neural network (CNN) is designed. Especially, a high pass filter is used to acquire hidden features in the image rather than semantic information in the image. The convolutional layer is composed of 2 layers having maximum pooling, ReLU (Rectified Linear Unit) activation, and local response normalization. The fully connected layer is composed of 2 layers.

For the experiments, modified images are generated using median filtering, Gaussian blurring, additive white Gaussian noise addition, and image resizing for 256x256 images that were divided into 4 equal parts of Boss Base 1.01 images.

Quantitative performance analysis is performed to test the performance of the proposed algorithm.

O11.11

11:30 COLOR BALANCE AND FUSION FOR UNDERWATER IMAGE ENHANCEMENT

Saikrishna Ramineni, Ramakalavathi Marapareddy

University of Southern Mississippi, Hattiesburg, MS, USA

The purpose of the project is to Color Balance and Fusion for Under Water Image Enhancement. We introduce an effective technique to enhance the image quality that is captured underwater. Our method is a single image approach. It builds on the combination of different techniques. Firstly, we use White Balance for the original Image later we use the Loss of Red channel to overcome this we use Gamma Correction and Image sharpening, and these are merged based on the multiscale fusion. Underwater images are of poor quality and are blurred. To reduce the blurriness of the image and to enhance the quality of underwater images through image enhancement techniques and improve the accuracy of several image processing applications, such as image segmentation and keypoint matching.

The underwater steganography environment offers many rare attractions such as marine animals and fishes, amazing landscapes, and mysterious shipwrecks. Besides underwater photography, underwater imaging has also been an important source of interest in different branches of technology and scientific research such as inspection of underwater infrastructures and cables, detection of manmade objects, control of underwater vehicles, marine biology research, and archaeology. Different from common images, underwater images suffer from poor visibility resulting from the attenuation of the propagated light, mainly due to absorption and scattering effects. The absorption substantially reduces the light energy, while the scattering causes changes in the light propagation direction. They result in foggy appearance and contrast degradation making distant objects misty. Practically, in common seawater images, the objects at more than 10 meters are almost unperceivable, and the colors are faded because their composing wavelengths are cut according to the water depth.

Image enhancement is a process of improving the quality of an image by improving its feature. The underwater image suffers from low contrast and resolution, due to Light Scattering and color change. Underwater images are of poor quality and are blurred. Underwater image enhancement reduces the blurriness of the image and enhances the quality of underwater images through

image enhancement techniques.

We have presented an alternative approach to enhance underwater videos and images. Our strategy builds on the fusion principle and does not require additional information than the single original image. We have shown in our experiments that our approach is able to enhance a wide range of underwater images (e.g., different cameras, depths, light conditions) with high accuracy, being able to recover important faded features and edges. Moreover, for the first time, we demonstrate the utility and relevance of the proposed image enhancement technique for several challenging underwater computer vision applications.

11:45 Business Meeting

Psychology and Social Science

Chair: Shaila Khan

Tougaloo College

Vice-Chair: Carmen Lewis

Tougaloo College

Thursday, March 31, 2022

MORNING

Room D4

8:50 Welcome

Special Session on COVID-19

O12.01

9:00 AN EXAMINATION OF THE PREVALENCE AND QUALITY OF STUDIES CONDUCTED ON THE PSYCHOLOGICAL EFFECTS OF COVID-19.

Pamela G. Banks, Keiosha I. Turner, Tyler Nelson

Jackson State University, Jackson, MS, USA

Covid-19 has affected the world in unprecedented ways. Loss of loved ones, isolation, unemployment/reduced employment, increased crime, increased substance use and abuse, threats to healthcare providers and services, impact on children, adolescents the and elderly, deterioration in interpersonal relationships and delays in goals, aspirations and need for adaptations are just a some of the significant stressors affecting individuals and society. The historic nature of the pandemic in itself provides a catalyst for igniting a plethora of scientific investigations on the psychological impact. The purpose of this investigation is to examine the prevalence and quality of studies conducted in 2020 – 2021. The review of the literature shows a much greater number of studies conducted outside of the United States. Some publications are topical and some are empirical investigations. The information disseminated about the coronavirus and the emergence of variants reflects changes over time in information, beliefs and behaviors. What is most telling is that research on the psychological impact of COVID-19 will likely be a topic for investigation for years to come.

O12.02

9:15 ASSESSING THE IMPACT OF ACADEMIC STRESS AND COVID-19 STRESSORS ON UNDERGRADUATE ACADEMIC PERFORMANCE AND ACHIEVEMENT

Diane Groat

Jackson State University, Jackson, MS, USA

Previous research has revealed that students' self-efficacy and coping style have a significant impact on their beliefs about stressors they encounter in the academic setting (Kamal, Fahd, Saleem & Afzal, 2021) . Furthermore, Covid-19 presented both students and universities with a unique set of additional stressors. Concern about students' health and safety forced universities to move to offering online education only with little time to prepare. This resulted in students making a sudden transition to online learning while dealing with the stress associated with fear of contracting Covid-19, and the isolation of shutdown restrictions. These challenges affected students' self-efficacy beliefs and

coping strategy use. The return to in-person class participation this year has revealed that the impact of these experiences on the students' mental health, self-efficacy beliefs and perceived stress related to academic requirements and experiences has been significant Selvi & Rajaprabha 2020).

The current study investigates the relationships that exist among Covid-19 experiences, perceptions of academic stress, mental health symptoms, and self-efficacy of undergraduate students in the United States. It is hypothesized that student's experiences with CoVid-19 have resulted in a range of mental health symptoms including depression, anxiety and stress which negatively impact their ability to manage stressors they encounter in daily life, including academic stress. It is further hypothesized that students' self-efficacy and coping strategy use are important factors in their perception of academic stress they experience. Levels of self-efficacy are argued to moderate the perception of academic stress. The survey was constructed using validated measures of self-efficacy, coping, perceptions of academic stress, and mental health symptoms as well as questions related to demographic and CoVid-19 experiences.

The data collection is being carried out online using a Qualtrics survey. Planned data analysis with multiple hierarchical regression will allow exploration of the relationships among the variables. Moderating and Mediating variables will be examined to identification of possible effects of self-efficacy and coping strategies on subjects' perception of academic stress.

O12.03

9:30 THE EFFECT OF COVID-19 ON NATURAL DIASTER SURVIVORS

Carmen Lewis, Zannie Montgomery, Qua'Meron Myer[2]

Tougaloo College, Tougaloo, MS, USA

O12.04

9:45 HEALTH DISASTER PREPAREDNESS DURING COVID-19 PANDEMIC IN MISSISSIPPI

Christy Griffith, Amaraha Payne, Akia Sherrod, Shaila khan

Tougaloo College, Tougaloo, MS, USA

State level health disaster management planning are in existence to combat sudden outbreak of a health crisis. State department of health and relevant emergency management organizations are equipped with management of such commonly expected disasters (e.g., influenza pandemic). However, the recent worldwide experience with COVID-19 outbreak suggests the necessity of a review of existing preparedness planning, simply because of the seriousness of impact of the virus and its highly contagious nature. In addition to the severe lack of physical resources available to the emergency management agencies and an absence of adequate knowledge of the unforeseen biological behavior of the virus, a substantial portion of people resisted the use and application of available effective measures to deal with the impact. A significant part of such preparedness involves evacuation of and providing shelter (during quarantine period) to citizens affected by the virus, especially for the minority members of the society who seem to be infected more compared to general population. Thus, it is important to examine how the existing social inequities challenges related to evacuation and sheltering in vulnerable communities are managed. It is proposed that a review is done of existing planning procedures in light of inclusion of any shifts as experienced and suggested by various management agencies in the state of Mississippi. This qualitative research will be completed in two phases: Phase 1 (August-December,2021) included: (a) literature review and building of questionnaire for interviews with evacuation managers from Mississippi Emergency Management Agency (MEMA), Red Cross, local officials, public health departments and human service providers of Mississippi. Phase 2 (January-March 2022) will include: (b) Transcriptions of the interviews, listing of shifts from the existing planning (if any), and suggestion of recommendations of evacuation plan to include any shifts. Health disaster management planning plays a key role in emergency preparedness and response efforts for all types of events, including the COVID-19 pandemic outbreak. The presentation will include examination of how the existing social inequities challenges related to evacuation and sheltering in vulnerable communities are managed. It will also discuss the questionnaire which was developed on three areas based on which evacuation managers will be interviewed. These include: 1.Strategies for Evacuation Planning during the COVID-19 Pandemic. 2. Strategies for Sheltering and Mass Care Operations during the COVID-19 Pandemic. 3. Strategies for Evacuation and Sheltering Risk Communication during COVID-19. The availability of evacuation and sheltering strategies is essential to accommodate the rise in demand that accompanies a disaster.

10:00 BREAK

O12.05

10:15 PUNISHING POLICE OFFICER CRIMINAL BEHAVIOR: PREDICTORS OF COURT AND DEPARTMENTAL DECISION-MAKING

Francis Boateng

University of Mississippi, University, MS, USA

The primary purpose of the current analysis was to examine departmental and court decision making in police crime. Specifically, the study aimed to achieve three objectives: 1) to examine variables that impact departmental decisions in officers' criminal cases, 2) to examine factors that influence charging decisions in these cases, and 3) to examine factors that affect final case disposition by the court. To achieve these objectives, a nationally representative arrest data was analyzed using multiple statistical approaches. Results obtained revealed important patterns that are critical to our understanding of how the courts and police departments decide in matters related to police criminality. For instance, victims' characteristics such as gender, relationship with the offending officer and whether the victim is a child significantly influenced decision making at all three levels – department, charging, and case disposition. Also, officer characteristics such as years of service and duty status were important indicators of how offending officers will be punished by the court or by their agencies. These results have important implications for policy and research in policing, especially police misconduct.

O12.06

10:30 CHILD, EARLY AND FORCED MARRIAGES (CEFM) IN BANGLADESH

Xhana Thompson, Shaila khan

Tougaloo College, Tougaloo, MS, USA

Child, early and forced marriage (CEFM) is a fundamental human rights violation. Most of the victims of CEFM, especially those subjected to forced marriage, end up in a perpetual cycle of abuses that are very often tantamount to a form of modern day slavery.

Girls subjected to CEFM suffer more as it increases her risk to violence and abuse, limits her opportunities and usually traps her into poverty (OXFAM, 2019). Bangladesh is one of the South and East Asian countries where violence against women and CEFM are on the rise. For example, 59% of girls are married before they are 18 and 22% are married before they are 15 (UNICEF, 2017) although the country has recently passed the Child Marriage Restrain Act, 2017 to eliminate it. The current status of CEFM, more specifically, forced marriage in Bangladesh will be reflective of a form of modern day slavery in existence. This study will focus on highlighting the current status of child, early and forced marriages (CEFM) with a special emphasis on forced marriages in Bangladesh. The objective of this study is to achieve a better understanding of CEFM and its impact on greater society in light of the prevailing perception of marriage. Effectiveness of existing social and legal infrastructure in implementing the recently adopted Child Marriage Restraining Act to bring forth any changes will also be explored. Past studies have focused on various aspects of this issue that includes identification of factors underlying CEFM from a social and institutional perspective (e.g., OXFAM, 2019), key factors of forced marriages (e.g., Bhuia, Rahman, Alam et al., 2015), socio-legal dimensions of the problem (e.g., Ferdousi, 2013), and purely legal boundaries and limitations of forced marriage (e.g., Begum, 2016). The prevailing inference as to the the contributing factors in continuing CEFM in society are the underlying social concepts of tradition and conformity, patriarchal values, education and gender inequality, and existence of dowry (although illegal) among others.

In Bangladesh, child marriage is considered a custom though it is legally prohibited. The girls forced into this marriage are typically under the age of 18. Forced marriages could be viewed as a form of contemporary slavery, also known as modern slavery or neo-slavery, since it is typically not consensual or voluntary. Studies have shown that majority of girls are married prior to the age of 18 in Bangladesh. It is also shown how about a quarter of girls in Bangladesh are married prior to the age of 15 years old. Most child brides reside in rural areas, are poorer, and may not have passed a secondary education. Many factors such as financial circumstance aide in the parent's decisions for marrying their child off. These children are in their pivotal prime years which could be detrimental to their mental health. This paper will discuss the culture of child, early forced marriages in Bangladesh along with ways to mitigate the situation

O12.07

10:45 THE INFLUENCE OF PARENTING STYLES ON ANXIETY SYMPTOMS IN AFRICAN AMERICAN COLLEGE STUDENTS

Akia Sherrod, Shaila Khan

Tougaloo College, Tougaloo, MS, USA

Parenting styles are prospectively associated with the development of children and adolescents in terms of their mental wellbeing. Styles of parenting can ultimately determine the experience children have grown up within their home environments. The authoritarian, authoritative, and permissive styles of parenting are perceived as the foundation for children's future outcomes and later mental health. Parenting styles may increase vulnerability for mental health issues among children and adolescents by increasing social dysfunction, anxiety symptoms, and depression. The current correlational study was designed to address the potential relationship between parenting style and anxiety symptoms in African American college students. It was hypothesized that mother's authoritarian parenting style will have positive relationship with anxiety symptoms among African American college students compared to permissive and authoritative styles of parenting. Eighty African American college students at a HBCU between the ages of 18 and 25 years were recruited via social media, Tougaloo College GroupMe school chat, and student emails invitation which included a link to the Microsoft Forms online survey. Participants were first be given information about the study and then asked to complete an informed consent section. If agreed to participate participants then completed some demographical variables, the Anxiety Symptoms Questionnaire (ASQ) and the Parental Authority Questionnaire (PAQ). The ASQ was used to assess general anxiety symptoms experienced in the past week. In the ASQ the participants rated the frequency and intensity which they experienced on 17 items related to anxiety symptoms using a 10-point Likert-type scale. High scores indicate intense and frequent experiences with anxiety symptoms and low scores indicate a lessened effect. The PAQ is a 60-item questionnaire in which participants rated the frequency of their experience with parenting styles across three different subscales which are permissive, authoritarian, and authoritative. Participants were asked to rate on a 5-point Likert scale how each statement applies to them regarding their mother and father during their years of growing up at home. Scores were calculated by summing the scores from responses to individual items in each of the three subscales. To test the research hypothesis a correlation co-efficient was conducted. The results confirmed the hypothesis. A significant positive correlation was found between mother's authoritarian parenting style and anxiety symptoms (r=.378, p=.003).This study is important as it will provide knowledge about how important parenting styles are in reducing anxiety symptoms in African American college students.

O12.08

11:00 THE INFLUENCE OF FAMILY FUNCTIONING ON ANXIETY AMONG AFRICAN AMERICAN COLLEGE STUDENTS

Nakiyah Hill, Shaila Khan

Tougaloo College, Tougaloo, MS, USA

Family structure and functioning has a large impact on anxiety, as childhood experiences and trauma negatively matriculates into adulthood. In recent times, mental health's importance has grown drastically due to the increase in diagnoses. With that said, certain experiences and stigmas are associated with illnesses such as anxiety, depression, or other illnesses. While families function in different ways, it is unclear how it hinders a child's growth, if change is present at all which begs the question: How does a family's structure affects an individual's anxiety within college students? Family structure and functioning has a large impact on anxiety, as childhood experiences and trauma negatively matriculates into adulthood. The purpose of the study was to investigate the influence of family functioning on anxiety among African Americans college students. It was hypothesized there will be a relationship between family functioning and anxiety. It was hypothesized that certain demographical variables will also affect anxiety and family assessment. Data was obtained from a sample of college students (N=100) who were recruited via social media, Tougaloo College GroupMe school chat, and student emails invitation which contained a link to the Microsoft Forms online survey. Participants completed some demographical variables, the Overall Anxiety Severity the Impairment Scale (OASIS) and the McMaster Family Assessment Device (FAD).

The OASIS consists of five questions on a five-point Likert scale. The FAD consists of 60 questions on a four-point scale and is comprised of seven subscales, such *as Problem Solving, Communication, Roles, Affective Response, Affective Involvement, Behavior Control and General functioning.* The correlation coefficient conducted to test the hypothesis revealed that there was a significant negative correlation between anxiety and family assessment sub scale *Roles* (r=-.233, p=.025) and between anxiety and family assessment subscale *Affective Response* (r=-.286, p=.007). The t tests results showed that females had higher anxiety compared to males with t=-2.850 (85) p=.003. Participants who had other siblings also scored higher in anxiety with t=-1.628.850 (87) p=.054, higher in family assessment subscale *Behavioral Control* with t=-1.83.(87) p=.035, and higher in family assessment subscale *General Functioning* with t=-1.59.(84) p=.05 compared to participants who had no siblings. ANOVA results showed that participants' number of siblings in the family significantly differed in family assessment *General Functioning* with F=3.531(5, 80) p=.006. Tukey tests showed that the mean of *General Functioning* is significantly higher for six children in the family compared to one, two, three, four or five siblings in the family. ANOVA results also showed that Currently Living standard significantly differed in family assessment *Problem solving* with F=2.643(3, 85) p=.05. This study will help to make those in a family more aware of their own behavior and will also shed light on the issues behind anxiety itself.

O12.09

11:15 THE RELATIONSHIP BETWEEN SOCIAL MEDIA AND STUDENTS' GRADE POINT AVERAGES

Brianna Richard, Carmen Lewis

Tougaloo College, Tougaloo, MS, USA

Social media has become one the most, if not the most popular means of communication due to its easy accessibility, global information, and social trends. As it relates to academics, social media is an educational tool that can attract students inside and outside of the classroom and can affect their overall success (Wakil et al., 2018). Consequently, students who overuse their social networks can cause a reduction in their grades or grade point averages (GPA), due to the lack of attentiveness in class and towards their studies (Wakil et al., 2018). It has been hypothesized that there is a relationship between social media and students' grade point averages (GPA) in universities or colleges in Mississippi. Therefore, the purpose of this study is to determine if social media use by undergraduate students affects their GPA. The final sample is 80 undergraduate students of all majors that attend universities in Mississippi aged 18 and older. To obtain data for this study, students are asked to participate in an online survey via Microsoft forms. Among other demographical questions, this survey asks students to report their current GPA and how much time they spend on social media networks. Data will be analyzed using SPSS

O12.10

11:30 THE IMPORTANCE OF MEMORY IN HEALING FROM TRAUMA IN COLLEGE STUDENTS

Zannie Montgomery, Shaila khan

Tougaloo College, Tougaloo, MS, USA

The purpose of the present study was to determine if memory was a significant factor in healing from traumatic experiences in College Students. It was hypothesized that not remembering all aspects of the traumatic events would be significantly related to healing from traumatic events. The target population of this study was current undergraduate students at Tougaloo College. The final sample of this study consisted of a minimum of 80 college students. Students were recruited using social media platforms such as Groupme, Instagram, and Facebook. Students were all recruited through text message as well. To limit the sample, students who qualified for this sample were men and women over the age of 18 who were currently pursuing an undergraduate degree at Tougaloo College. It was hypothesized that there will be a relationship between memory of traumatic events and healing from that Trauma events. Each participant was given a demographic questionnaire and The Childhood Trauma Questionnaire which is made up of two components-The Childhood Traumatic Events Scale, which is a six-item questionnaire and refers to traumatic events experienced before age 17 using a 7-point scale**,** and the Recent Events Traumatic Scale which is a seven-item questionnaire, also using a 7-point scale, and refers to traumatic events experienced within the last three years. Finally, the participants were given a three item Healing from Trauma questionnaire two of which had a Yes and No responses and one had a 7-point scale. To test the hypothesis correlation coefficient will be conducted. This research is important because trauma has the potential to impact individuals' lives in many ways that are aware and unaware of. This research is also significant in that it will help College students to identify any barriers that may exist that may prohibit them from being able to effectively be treated for their traumatic experiences and truly healing from them. The research is ongoing

O12.11

11:30 THE IMPACT OF MEDIA EXPOSURE ON AGGRESSION IN COLLEGE STUDENTS

Qua'Meron Myers, Shaila khan

Tougaloo College, Tougaloo, MS, USA

Much of the communication that today's society engages in revolves around the use of social media platforms. Social media platforms have become a major source of obtaining news regarding health, crime activity, politics, and pop culture. The creation of social media has served as both a positive and negative way of communication amongst a society. Positive aspects of social media include building connections. Downsides of social media would include how all media that is shared is not reliable and how some individuals may use social media as a way of anonymous bullying. Within college students, social media platforms find a good portion of their audience between age groups 18-23 that make up most college students. From social media, college students are not only able to share their viewpoints with other people but also view aspects of other people's lives that they can incorporate into their own life. Social media can have its negative effects however as it can have an impact on the individual's state of mind and could cause changes in mood or could make a person become aggressive. The purpose of this study aims to analyze the relationship between media exposure and aggression in college students. The first hypothesis stated was that there will be a correlation between an increased level of media exposure and highly aggressive behavior. The second hypothesis stated was that there will be a correlation between aggressive type of media exposure and highly aggressive behavior. The third hypothesis was that media exposure and aggression will vary according to gender and classification. Eighty undergraduate students with minimum eighteen years of age filled up some demographical information data, the Buss & Perry Aggression Questionnaire, and the Content-Based Media

Exposure Scale. Each instrument was scored from a low score of extremely uncharacteristic to a high score of extremely characteristic. Extremely characteristic will indicate a high level of aggression and high exposure to media as well as high level of aggressive type of media viewed while extremely uncharacteristic will indicate low levels of aggression and low media exposure as well as low level of aggressive type of media viewed. Results showed a significant correlation coefficient between level of media exposure and levels of aggression. T tests results showed that females have higher exposure to general media compared to males with t =-1.58 (80) p=.05. ANOVA results showed that level of aggression also varies according to classification with F=3.526 (3, 78) p=.019.Tukey test revealed sophomores to be more aggressive than seniors. Violent media proves to be a valuable variable when predicting and assessing aggressive behavior in undergraduate students. The application of this study could prove to be useful if it leads to the reduction of college students viewing excessive media (violent media in particular) which could correlate to the reduction of aggressive behavior in undergraduate students.

12:00 - 1:30 GENERAL SESSIONS

Thursday March 31, 2022

AFTERNOON

ROOM D4

O12.12

1:00 THE RELATIONSHIP BETWEEN BULLYING AND CONFIDENCE

Amaraha Payne, Carmen Lewis

Tougaloo College, Tougaloo, MS, USA

Bullying occurs in middle school and high school. Unfortunately, the effects of bullying does not end there. Some people's confidence and self-esteem suffers long after the time of bullying. Oftentimes, people carry that trauma into adulthood. The things we go through during tender ages, molds us into the person we will be in adulthood. Mara Brendgen and François Poulin conducted a study on bullying victimization and how someone readjust going into the big world. Their study talks about what participants need to perform in school, at work, and in relationships. The authors stated that "bullying victims may benefit from interventions aimed at reducing depression symptoms and fostering social skills to establish supportive friendships to help avoid the generation of new interpersonal stress such as workplace victimization in adulthood. This study examine the longitudinal association between peer victimization in school and victimization at work during young adulthood, the predictive link of reactive and proactive aggression and anxious-withdrawn behavior in childhood with victimization in school and at the workplace, the potential mediating role of depression symptoms, and the potential protective effect of friendship support (Brendgen & Poulin 2017). Bullying has a negative effect on self esteem. Therefore I am proposing a quantitative correlational study on the relationship between bullying and confidence. As a quantitative correlational study, data will be collected through surveys distributed through Microsoft Forms, an online survey tool. The target population of this study are college students who have experienced bullying throughout high school. The final sample of this study will be a minimum of 80 college students. Students will be recruited using convenience sampling by recruiting the participants myself. To limit the sample, the ideal participants would be between the ages of 18-24. All data will be analyzed using SPSS. Information obtained from this study will be kept confidential. All contact information for participants will be kept separate from the data. Data will be kept on a computer in a password-protected file and only the primary researcher and the advisor will have access to the data. Data will be destroyed after the researcher has concluded their study.

O12.13

1:15 THE CONSUMPTION OF EUROPEAN BEAUTY STANDARDS THAT PERMEATE HIP HOP IMPACTS THE EATING PATHOLOGY OF COLLEGE AGED BLACK WOMEN

Pierrerasha Goodwin, Shaila khan

Tougaloo College, Tougaloo, MS, USA

Given the permeation of European beauty ideals in Hip Hop music, this research aims to study the implication of consumption of Hip Hop by Black women on their eating pathologies. Black college aged women are one minority group that has historically been excluded from research concerning the impact of internalized standards on eating habits. Most recent research has concluded comparative relationships between Black women in college and other minority groups and Caucasians. A range of academia also fails to address any potential impacting factors of maladaptive eating behaviors in college women, mostly focused on the foundational internalization of beauty standards from mainstream society and the women's respective culture. This research synthesizes the existing examinations of the eating pathologies of Black women, their consumption and assessment of Hip-Hop music, and internalizations of beauty standards. It explored the role of European beauty ideals that permeate Hip Hop have in Black college aged women's relationship with food and their bodies. It was hypothesized that the consumption of European beauty standard that permeate hip hop does impact the eating pathology of Black Women in College. Black women, between the ages of 18 and 26 years old were the participants of this quantitative study sample of 80. Considering the gap in literature pertaining to risk factors prevalent within the demographic, participants within this sample would provide insightful feedback from the 68-item instrument. First participants will be given some demographical variables which will be followed by four questionnaires. (1) A thirty-three (33) item Rap-music Attitudes and Perception Scale (RAP) to measure consumption of European beauty ideals in music media with five-point Likert **(2)** A ten (10) item Perceived Sociocultural Pressure Scale (PSPS) to implicate opportunities of mediation for disordered eating pathologies with five-point Likert scale; (3) A fifteen (15) item Referencing the Sociocultural Attitudes Towards Appearance Questionnaire (SATAQ-4) with five point Likert scale and (4) a ten (10) item Body Dissatisfaction Scale (BDS) to measure eating pathology with five-point Likert scale**.** To test the hypothesis correlation coefficient will be conducted. The gap previously discussed in past academia will be thinned only minimally by this research but will continue to thin as future academia continues to explore impending threats to the public health of Black women by assessing the circumstances of their culture and exploring the implications of the conditions. The study is ongoing.

O12.14

1:30 CHILDHOOD EXPERIENCES AND RACIAL IDENTITY OF STUDENTS ATTENDING HISTORICALLY BLACK COLLEGES AND UNIVERSITIES

Xhana Thompson, Shaila khan

Tougaloo College, Tougaloo, MS, USA

Childhood experiences play a major role in how individual interact with one another as well as how they view societal concepts. Experiences cultivate a person into who they become. Racial identity, focusing on centrality and closeness, is a concept that could continuously increase and decrease over time. However, it is possible that childhood experience could be a factor of one's racial identity. Childhood adversities could also result in negative effects to the child. Childhood experiences vary from race/ethnicity; however, negative childhood experiences could cultivate the way a child view certain concept. The purpose of the present study was to investigate the impact of childhood experiences on the formation of racial identity of students attending HBCU. It was hypothesized that severe negative childhood experiences will result in lower racial identity compared to less traumatizing childhood experience. The participants of this study was 80 Black college students attending a HBCU. Students were recruited through convenience sampling via email and social media invitation. Each email and social media post included a link to the Microsoft Forms online survey. Basic demographic information included race/ethnicity, age, and gender. To measures the extent to which one identifies with their heritage participants were given The Race-Ethnic Identification Scale which is made up of eleven items using a 7-point Likert scale. The higher the score the lower the racial identity is, and the lower the score the higher the racial identity is. To measure eventful stressful/traumatic events that have occurred in one's life prior to 23 item, Eventful Stressors Questionnaire measures were given which is scored by answering *Yes* or *No*. The more No responses that the individual provides will reflect that they have had a less traumatizing childhood experience. The more Yes responses that the individual provides will reflect that they have had a more severe negative childhood experience. If answer is *Yes* to a particular question a follow up question was asked about the participant's feeling of the stressful incident in a three-point scale. To test the research hypothesis several t tests on racial identity scores were calculated between groups suffering from severe versus less childhood experiences. Five items were found to have significant results. These include Item # 4 (Were you ever abandoned by one or both of your parents) with t=2.09(77), p=.020; item# 5 (As a child , did you ever live in an orphanage, a foster home, a group home, or were you a ward of the state?) with t=1.93(77), p=.05; item #7 (did your parents ever divorce/separate?) with t=2.551 (56), p=.007 item #14(Were you regularly physically abused by one of your parents , step parents, grandparents, or guardians?) with t=1.67 (77), p=.04; and item #17(did you witness your mother or another close female relative being regularly physically or emotionally abused?) with t=1.934 (77), p=.02. This study will fill the gap of exploring how childhood adversity, racial identity and attending a HBCU are all connected as well as how each component impacts the other.

O12.15

1:45 RELATIONSHIP BETWEEN ADVERSE CHILDHOOD EXPERIENCES AND DEPRESSION IN COLLEGE STUDENTS

Genuice Crosby

Tougaloo College, Jackson, MS, USA

The study aims to determine the correlation between adverse childhood experiences and the potency of depression when in college. Depression is a common ailing problem that affects college students' general quality and life through their stay. The stress levels in colleges are not as harmful, but when coupled with prior information and background, the detrimental impacts are exemplified and massively affect the student's daily life. A few of the symptoms are prevalent drug use, poor academic performance, and withdrawal, culminating in fatalities through suicides. Quantitative research will be used. By determining the relationship, the information will then reveal potential solutions that can be applied to minimize the adverse childhood effects on college students. The target population will be college students while the sample population will be the college students attending historical black college. Results postulates that traumatic, complicated and painful childhood experience lead to higher stress levels among students.

O12.16

2:00 THE RELATIONSHIP BETWEEN PARENTING STYLES AND STUDENT'S ACADEMIC ACHIEVEMENT

Octavious Henderson, Shaila khan

Tougaloo College, Tougaloo, MS, USA

Parents play an important role in their children's life. In some cases, children obtain most of their lifestyle from their parents. An abundance of research has been done to discover the effects of parenting styles on a student's academic achievement and success. There are many factors that affect the academic performance of children and parenting styles is one of the significant factors. It is suggested that parenting styles that are used to rear a child will likely impact a child's future success in academic achievement, romantic relationship, peer and later parenting relationships. To gain a transparent understanding of this topic, this study was being conducted to examine the possible effects of parenting styles on a student's academic achievement and success. It has been hypothesized that indifference, abusive, and overcontrol parenting styles will have a negative effect in their child's academic achievement and success. The participants consisted of college students in the southern region of the United States. The sample included eighty (80) students that currently attend a HBCU. The participants' age range was from 18 to 25. The participants were contacted via email, messaging apps, where they were provided a link to the questionnaire located on a Microsoft Form. Each participant was given a questionnaire on parenting styles and a questionnaire on academic success. Measure of Parenting Styles (MOPS) questionnaire had 15 questions asked about both mother and father on a 4-point Likert scale and are scored as indifference, abuse, and overcontrol to describe the perceived parenting styles by the participant. The Academic Success Inventory for College Students (ACSICS) is composed of 50 questions and is composed of ten different sub-scales such as General Academic Skills Subscale, Internal Motivation/Confidence Subscale, Perceived Instructor Efficacy Subscale, Concentration Subscale, External Motivation/Future Subscale, Socializing Subscale, Career Decidedness Subscale, Lack of Anxiety Subscale, Personal Adjustment Subscale, and External Motivation/Current Time Subscale. The ACSICS questionnaires contain a 7-point Likert-type scale. High score indicates a positive functioning idea of students' academic achievement and success. A low score indicates a maladaptive functioning idea of their academic achievement and success. There are many pragmatics uses for the ASICS and

universities can find great utility for the inventory. The ASICS can be used as a screening instrument to identify a college student's strengths as well as weaknesses in academic performance. Since the ASICS is an online inventory, it can be administered to many individuals. Universities and Colleges can have their first-year students take the ASICS for early identification of weaknesses and prevent academic difficulties. Institutions can provide students with information about on-campus resources that can address difficulties in certain areas. The research is important to provide knowledge to students' how important parenting styles are and how it impacts their academic achievement and success. The study is ongoing.

2:30 Business Meeting

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE /AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P12.01

EFFECTS OF CHRONIC METHAMPHETAMINE ADMINISTRATION ON SLEEP IN EXPERIMENTALLY-NAÏVE RHESUS MONKEYS VS MONKEYS WITH A LONG-TERM HISTORY OF METHAMPHETAMINE SELF-ADMINISTRATION

Amia Green[1], *Joseph Talley*[2], *James Rowlett*[2], *Lais Berro*[2]

[1]*School of Medicine, University of Mississippi Medical Center, Jackson, MS, USA.* [2]*Department of Psychiatry and Human Behavior, University of Mississippi Medical Center, Jackson, MS, USA*

BACKGROUND: Methamphetamine is a central nervous system stimulant used in the treatment of conditions such as narcolepsy and attention-deficit/hyperactivity disorder (ADHD). Importantly, methamphetamine not only has a high potential for abuse, but it also affects a vital part of life, sleep. A sufficient amount of sleep is required for prime physical health, immune function, mental health, and cognition. Due to its sympathomimetic effects, methamphetamine has the potential to cause insomnia, putting those individuals who require this medication at increased risk for deleterious effects of lack of sleep. More research is required to understand the impact of methamphetamine on sleep.

OBJECTIVE: The aim of the present study was to compare the effects of chronic (14 days) methamphetamine administration on sleep in experimentally-naïve rhesus monkeys vs monkeys with a long-term history of methamphetamine self-administration.

METHODS: Sleep measures were evaluated using actigraphy monitors a week before (baseline parameters) and throughout each protocol in adult rhesus monkeys (*Macaca mulatta*). For subjects with a long-term history (~2.5 years) of intravenous methamphetamine self-administration (N=5, 3 males, 2 females), sleep parameters were evaluated during the 12-hour dark phase following morning (8-10am) sessions of methamphetamine (0.03 mg/kg/inf, i.v.) self-administration for 14 consecutive days . For naïve monkeys (N=5, 3 males, 2 females), sleep parameters were evaluated during the 12-hour dark phase following morning (10am) injections of methamphetamine (0.3 mg/kg, i.m.) for 14 consecutive days.

RESULTS: In experienced monkeys, methamphetamine self-administration markedly disrupted sleep-like measures, significantly increasing sleep latency and fragmentation and decreasing sleep efficiency during the first 5 days of drug intake. Tolerance developed to those effects with repeated methamphetamine intake exceeding 5 consecutive days. In naïve monkeys, methamphetamine administration also impaired actigraphy-based sleep measures. This effect was significant for most treatment days, with a significant difference between baseline and the first and last 5 days of methamphetamine administration, i.e., no evidence of tolerance to the sleep-disrupting effects of methamphetamine.

CONCLUSIONS: The findings show that methamphetamine has a greater impact on sleep in naïve monkeys than those with long-term history of use. It can be concluded that monkeys with a long-term history of methamphetamine self-administration develop tolerance to the effects of the drug on sleep, whereas the naïve monkeys show drastic changes in their sleep patterns that continue over time. These effects include increased sleep latency, increased sleep fragmentation, and overall decreased sleep efficiency. This research can be used to extrapolate the consequences of methamphetamine use on sleep in humans.

FUNDING: This work was supported by the National Institutes of Health [DA011792, DA043204, DA046778 and DA049886].

P12.02

EXAMINING THE IMPACT OF CARDIOVASCULAR ILLNESS AND DIABETES ON THE PSYCHOLOGICAL WELLBEING OF OLDER ADULTS

Sree Saroj Sainath Panchagnula, Bryman Williams, Melvin Davis

Jackson State University, Jackson, MS, USA

As the world's population ages and healthcare costs associated with the care of the elderly rise, it is pertinent to understand how to help older adults (NRC, 2001). This study examines how aging older adults' mental health is affected by chronic medical illnesses. Cardiovascular illnesses include high blood pressure, coronary artery disease, myocardial infarction, arrhythmia, stroke, and type II diabetes mellitus. A thorough review of literature was conducted to examine the mental health in older adults struggling with cardiovascular illnesses, diabetes mellitus type II, cognitive decline, poor sleep hygiene, limited social networks, and frequent falls. It is hypothesized that minority older adults, on average, have worse mental and physical health outcomes than their majority counterparts. This study is a secondary data analysis from the National Health and Aging Trends Study, which is a nationally representative sample of Medicare beneficiaries ages 65 and older. The sample consists of 3,863 White, non-Hispanic individuals, 1,147 Black, non-Hispanic individuals, 305 Hispanic individuals, and 138 individuals from other races. The sample is 59.2% female and 40.8% male. The data was analyzed using SPSS version 26. It was found that older minority adults experience higher rates of depression than non-minority older adults, as measured by the Patient Health Questionnaire – 2 (PHQ-2). European-Americans significantly differ from African Americans and Hispanics regarding their level of anxiety, as measured by the Generalized Anxiety Disorder – 2 (GAD-2). African Americans and Hispanics are significantly more likely to exhibit anxiety than their European-American counterparts. Minority older adults with a higher rate of surgeries are not substantially more likely to be depressed, according to the PHQ-2. Minority older adults who reported having a difficult time falling asleep are considerably more depressed than older minority adults who did not endorse depressive symptomatology on the PHQ-2. Minority older adults who had two or more social supports in their lives have lower

levels of anxiety compared to older minority adults who have less than two social supports in their lives. A between-subjects ANOVA, one-way ANOVA, and a two-tailed independent samples t-test were used to analyze these findings. A post-hoc analysis using the Least Significant Difference was also conducted. The findings from this study will lead to more policies that promote equity between majority and minority older adults, which will improve their abilities to perform independent activities of daily living successfully. Also, it will help them successfully manage their mental health. There are three limitations of this study. The first is the use of an archival dataset that has limited instruments. The second limitation is the limited proportionality of races in the study. The third limitation and the inability to assess the directionality of some of the relationships between some variables.

P12.03

AN EXPLORATION OF UNIQUE STRESSORS, SUBSTANCE USE OUTCOMES, AND COLLEGE ADJUSTMENT IN COLLEGE STUDENTS

Chloe O'Dell, Nora Charles

University of Southern Mississippi, Hattiesburg, MS, USA

The college experience is often a formative time for young people, given the many novel experiences and stressors introduced and sustained during this time. This exploratory study seeks to better quantify this formative experience by assessing the prevalence of different domains of stress, college adjustment, and indicators of substance misuse in a sample of college students. This study also seeks to evaluate associations between these constructs in this sample. College students completed the Stressful Life Events Schedule (SLES), in which they described the number of different stressful life experiences (e.g., school-related, work-related, relationship-related, etc.) they had encountered during the previous six months and their appraisal of how stressful these experiences were. They also completed the College Adjustment Test (CAT) and measures assessing substance use behaviors, including consequences they had experienced as a result of alcohol, marijuana, and other drug use (an indicator of substance misuse). Exploratory analyses revealed a number of associations between adjustment to college (measured by the domains of the CAT) and different stressor types in this sample as a whole. These results also revealed that people who had experienced alcohol-related consequences, marijuana-related consequences, and drug-related consequences reported a different pattern of stressors and their subjective impact than did those without indicators of substance misuse. Further, while those who had experienced substance use-related consequences did not differ from those who had not on adjustment domains, unique associations were found between adjustment domains and stressor types experienced between students who had these consequences and those who had not. More elaborate description of these results, as well as discussion of limitations and possibilities for future research, will be discussed within. These findings expand our understanding of the stressors college students experience as well as better delineate how these unique stressors may be associated with adjustment in college students

P12.04

A MENTORSHIP MIXED METHODS STUDY TO ENHANCE RETENTION OF FRESHMEN STUDENTS AND DEGREE ATTAINMENT IN STEM

Martha Tchounwou, Joseph McBride

Jackson State University, Jackson, Mississippi, USA

The purpose of this study was to advance the literature by addressing mentorship best practices that enabled the retention of freshmen college student's completion gap in Science, Technology, Engineering, and Mathematics (STEM). Using a mixed-methods design, this article delineates College of Science, Engineering and Technology Scholars Academy mentoring program experiences, in instructional strategies, peer-learning, institutional practices and students' persistence. Five main factors were constant. (1) A sense of community, and peer- support; (2) Hands on involvement and academic intervention activities; (3) Measures of accountability and intentionality requirements (4) Institutional environment and infrastructural support; and (5) Financial incentives. The results of this mixed method mentorship approach are still ongoing. However, instructional practices and learning strategies that enhance student learning and retention include mentoring, intrusive and intentional intervention, opportunities for students to show case their skills through attending professional conferences, faculty advising, tutoring/study sessions, peer tutoring, interactive lectures, and student opportunities to connect prior learning to new lecture content.

12.05

KEY BARRIERS TO UNIVERSITY-ENROLLED STUDENT PARENTS ENHANCED BY THE COVID-19 PANDEMIC

Khadeejah Franklin, Alexa Saval, Anne Cafer, Dana Reinemann

University of Mississippi, University, MS, USA

The COVID-19 pandemic has changed the lives of many student parents. Student parents have had the difficult task of balancing the rigorous acts of raising children and keeping up with their studies -- even before the COVID-19 pandemic. The pandemic has enhanced issues that student parents have to face, such as daycare costs and closings, lack of local support system, staying home due to illness in themselves or their children, and many others. Further, students who are performing laboratory research to fulfill their STEM educational requirements had their research progress come to a halt when the country locked down. We have conducted research to help identify the struggles that student parents faced prior to the COVID-19 pandemic, issues that have been exacerbated by the pandemic, and what new problems have since arisen. First, we conducted a focus group with student parents that were able to take the time out of their busy schedules to meet with us and discuss these issues. After hearing their stories and suggestions, we created an IRB-approved survey to be administered anonymously to peer institutions throughout the Southeastern Conference. The main question categories included consequences of being a student parent during the pandemic, coping resources, effects on mental health, and demographic information. In analyzing this data, we hope to (1) inform higher education administrations about the unique problems student parents face and (2) formulate a set of recommendations to help mitigate these issues.

P12.06

STUDENTS WITH NON-APPARENT PSYCHIATRIC DISABILITIES NAVIGATING HIGHER EDUCATION: A QUALITATIVE PROPOSAL

Sarah Lawrence

University of Mississippi, Oxford, MS, USA

Students with mental disabilities complete college at lower rates

than their physically disabled or non-disabled counterparts (Carroll et.al 2020). Eighty-six percent of students with psychiatric disabilities do not complete college once they begin (Collins & Mowbray 2005). Quantitative research has been conducted that notes these aforementioned discrepancies in student experience and retention rate, however, there has been minimal qualitative research done to understand these processes and student experience. By conducting qualitative research, the goal is to understand and expand upon the processes that students with non-apparent disabilities go through in relationship to their respective institution. Main themes of data collection are understanding perception of self/services, relationships within the institution as well as accommodations. Within this research design I am using a purposive sampling strategy. Through this strategy this research proposal aims to gain data from students who have and have not sought accommodations through their institution. Preliminary research conducted that there are students at the University of Mississippi who fall into the population of non-apparent psychiatric disabilities affecting cognition and face significant barriers. A preliminary interview conducted with a student with a non-apparent psychiatric disability suggests that there is a need for more research to be executed. Conducting exploratory research not only allows for greater progress to be made in terms of understanding and awareness but policy change and implementation.

P12.07

THE IMPACT OF PHOTO-BASED SOCIAL MEDIA ON APPEARANCE PREOCCUPATION

Mary Beth Brook, Cordarius Miller, Savannah Sumrall, Justin Kelly

The purpose of this study was to analyze the impact that active social media use had on appearance preoccupation. The sample included 191 traditional college students at Belhaven University. Participants completed the Social Media Appearance Preoccupation Scale (SMAPS) and a questionnaire assessing for active and passive social media use as well as frequency of social media usage. The SMAPS provides 3 subscales of appearance preoccupation – online self-presentation, appearance related activity, and appearance comparison. Multiple regression analyses were conducted to analyze the data. Results from the study showed that higher frequencies of photo-based social media use and active social media use both impacted online self-presentation. Appearance related activity was impacted by active social media use but not higher frequencies of social media use. Appearance comparison was impacted by higher frequencies of photo-based social media use but not by active social media use. Findings, limitations, and recommendations for future research are discussed.

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Science Education

Chair: Johnny Mattox

Blue Mountain College

Vice-Chair: Renee Clary

Mississippi State University

Vice-Chair: Lydia Lytal

Blue Mountain College

Thursday, March 31, 2022

MORNING

Room D12

8:50 Welcome

O13.01

9:00 SPREADING AWARENESS AND PREVENTION OF MARINE DEBRIS THROUGH COASTAL COMMUNITY CLEANUP EVENTS

Jessi James[1], *Mandy Sartain*[1,2], *Eric Sparks*[1,2]

[1]*Mississippi State University Coastal Research and Extension Center, Biloxi, MS, USA.* [2]*Mississippi-Alabama Sea Grant Consortium, Biloxi, MS, USA*

Marine debris constitutes as any persistent solid material that is manufactured or processed and, directly or indirectly, disposed of or abandoned in the marine environment. The presence of marine debris has been shown to have significant environmental and economic impacts. Unfortunately, the quantity of marine debris is increasing at accelerating rates due to increased production of single-use items and poor stewardship practices. To address these issues, a team of coastal Extension specialists founded the Mississippi Coastal Cleanup Program (MSCCP) in 2016. The mission of the MSCCP is to prevent and remove litter from the coastal environment through education, outreach, research, and cleanup events. During cleanup events, thousands of citizen scientists collect marine debris data that is then used to inform decision-making and the development of outreach programs. In 2019 alone, over 8,500 citizen scientists removed and categorized over 17.8 tons of marine debris from coastal Mississippi. Cigarette butts have been by far the most numerous item collected during these events with over 205,420 gathered to date. Plastic items made up over 77% of the collected marine debris by count. This locally relevant information is utilized to create marine debris-focused outreach materials that are distributed through a variety of methods, including social media and direct presentations. Feedback gathered during outreach events has led to several additional activities and materials for the program in 2020 and beyond. These activities include the addition of a July 5th Star-Spangled cleanup, monthly cleanups at peer-suggested sites, as well as the creation of the Mississippi Inland Cleanup Program (MSICP). This new program will extend the cleanup efforts inland to serve a total of twenty-one counties across the southeastern region of Mississippi by promoting trash-free education and additional cleanup events.

O13.02

9:15 STUDENT REACTIONS TO USE OF THE COVID-19 VACCINATION

Johnny Mattox

Blue Mountain College, Blue Mountain, MS, USA

A survey concerning the COVID-19 vaccination was administered to the Microbiology class at Blue Mountain College during the fall semester of 2021. Twenty-one students participated in the survey. Of the students responding, 52% indicated that they had taken vaccinations for the COVID-19 virus. 91% indicated that they believed that the vaccination would result in an improved immunity against infection by the virus. 81% of the students indicated that they believed that having taken the vaccination would decrease side effects of viral infection if they became infected at a later date. 29% believed that there possibly could be severe side effects from taking the vaccination while 19% did not think that there would be severe side effects. 52% of the students indicated that they had encouraged other individuals to take the vaccination. 100% of the students did not believe that taking the vaccination would change their DNA and 86% did not believe that taking the vaccination would result in their becoming sterile.

O13.03

9:30 STUDENT SUCCESS IN A TRADITIONAL STEM COURSE TAUGHT ONLINE

Abu Khan

Jackson State University, Jackson, MS, USA

Academic environment created by recent pandemic forced most institutions of higher learning to instinctive adoption of online teaching including the courses that are traditionally offered through face-to-face meetings. Most STEM courses, especially the ones with laboratory components, are believed to be more effective when taught in-person because certain teacher-initiated steps to reduce student deficiencies may not be easily accessible in an online teaching approach. This study summarizes measures implemented to overcome problems commonly faced by students taking a calculus-based introductory physics course and provides a comparative overview of observed student performances. Frequently encountered challenges of students include (a) insufficient mathematical background, (b) inability to follow textbook mainly because the concepts are presented there with the assumption that students are able to recall the essential background mathematics right away, (c) inefficient extraction of information from the statements of problems and inability to formulate a proper strategy for solution as demanded by most physics problems, and (d) inefficiency in applying appropriate mathematical steps to carry out the adopted strategy for solution. In online teaching of this course several steps were followed to reduce and/or eliminate student limitations that included (a) adoption of a synchronized online classification of the course where students are mandated to attend and take part in regularly scheduled conference sessions using Canvas platform, (b) rewriting the concept material in simple language using simple diagrams supplemented by concurrent recalling of basics of background mathematics, (c) explaining the concepts with additional drawings using whiteboard during conference sessions, (d) answering students' questions and attending to their concerns, (e) arranging an additional 2-hour long problem-solving session every week for this 4-credit hour course, (f) ensuring that during problem-solving sessions students extract information from the problem statements as to what are given and what to find out and formulate a strategy for solution, (g) making sure that students discuss these with their fellow classmates attending these sessions, and share their views and results, (h) providing immediate feedback, and (a) creating individualized questions (of the same degree of difficulty) for each student for testing purposes. None of the conference discussions were recorded with audio and made available to students to ensure regular attendance. This step was designed to prevent students from remaining absent during the sessions and hoping to understand the concepts from listening to the recordings later. To follow this approach the instructor was required to spend significantly greater amount of time. Overall performances (percentage of overall grade) of 833 students (Mean=72.9, SD=25.6) who took the course in-person from the same instructor from 2007 to 2019 were compared to those of 133 students (Mean=73.2, SD=19.7) who took the course online since 2020. Results from a comparison of means using independent sample t-test showed no statistically significant difference between overall performances of these two groups ($t=0.143$, $df=964$, $p=0.443$).

O13.04

9:45 SOMETIMES CHANGE CAN BE A GOOD THING

Lydia Lytal

Blue Mountain College, Blue Mountain, Mississippi, USA

When changes to class structure (size, location, format) had to be made to abide by the COVID-19 guidelines, I also changed the way I presented information to meet the needs of the students at that time. What I have found is that sometimes change is a good thing. It was difficult to change my mindset, but I can vividly see the positive outcome of the changes. So vivid, that I decided not to fully go back to my old way of teaching once the guidelines were lifted. In this session, I will talk about what changes I made in my college biology class and the effect they have had on the class atmosphere, the students, and their grades.

10:00 BREAK

10:15-11:45WORKSHOP

On-line Teaching Pre-Pandemic and Pandemic

Mrs. Lytal is a biology instructor at Blue Mountain College in Blue Mountain, MS. Prior to teaching in higher education, she taught 9^{th}-12^{th} grade science courses. She is a current graduate student in the Ph.D. Secondary Science Education program at the University of Mississippi. Her research interest involves the Mississippi Science Curriculum and art/science integration. She resides in Pontotoc, MS with her husband, Jeremy, and two sons, Greyson and Max.

Many teachers have had to move to online teaching over the last two years due to the pandemic. While there are a variety of ways online teaching can occur, there are some tips and tricks that could help you make the online experience more effective for you and the students. Mrs. Lytal will share some of these tips she has learned through experience of teaching online pre-pandemic and from quickly switching to online teaching during the pandemic. Whether you teach online synchronously or asynchronously, this

session can benefit you.

11:45-12:00 Divisional Business Meeting

12:00 - 1:30 GENERAL SESSIONS

Thursday March 31, 2022

AFTERNOON

Room D12

Symposia: Research Mentorship and University Outreach: The Mississippi Base Pair Consortium

Faculty at Mississippi Institutions of Higher Learning have a proud tradition of mentoring young students in the basics of scientific research. This outreach has demonstrable positive outcomes in improving science identity in precollege students, particularly of non-traditional and underserved populations. Further, it provides significant advantages for recruitment into higher education as well as enhancing diversity within the STEMM (Science, Technology, Engineering, Mathematics, and Medicine) workforce. This presentation illustrates the nature and degree of research mentorship opportunities across six research-intensive Mississippi universities (Delta State University, Jackson State University, Mississippi State University, University of Mississippi, University of Mississippi Medical Center (UMMC), and University of Southern Mississippi), and highlights the nature of campus-specific mentorship activities, along with outcomes for student recruitment and career advancement. It also serves to introduce a new cross-campus research mentorship initiative aimed specifically at high school students, the Mississippi Base Pair Consortium (MBPC). A keynote address from a national outreach expert will highlight important principles in mentoring high school students in STEMM. Following the presentations, a round table discussion will initiate conversations for best practices for implementation of the MBPC moving forward. The MBPC is an evolution of a biomedical research mentorship program, called Base Pair, that originated between UMMC and Murrah High school in the Jackson Public School District. Funded by an award from the Phil Hardin Foundation, the MBPC will replicate key elements of the Base Pair model while introducing unique, campus-specific collaborations with local secondary schools. The MBPC is envisioned as the core of a potentially state-wide effort to enhance STEMM education and establish best practices for mentorship of high school students in a research-intensive university environment.

Time	Title	Authors
1:00	Welcome and Introductions	Rob Rockhold
1:10	Overview – Mississippi Base Pair Consortium	Rob Rockhold
1:20	Achieving Health Care and STEM Workforce Diversity: A Pipeline for Success	Catherine Morton
1:40	Questions	
1:45	Break	
1:55	OKRADiscovery: Delta State University K-12 STEM Outreach	Tanya McKinney
2:05	Challenging Minds, Changing Lives: STEM Outreach, Mississippi Schools, Jackson State University	Mehri Fadavi Cary Smith
2:15	MSU Partnership School and Outreach Initiatives	Amanda Tullos
2:25	University of Mississippi Outreach	Ellen Shelton
2:35	Discovery U	Sydney Murphy
2:45	University of Southern Mississippi Health Sciences and Wellness Academy	Janet Donaldson
2:55	Break	
3:05	Panel Discussion – University Outreach and Mentorship	Donaldson, Fadavi, McKinney, Morton, Murphy, Shelton, Smith, Stray, Tullos
3:30	Concluding Remarks	Rockhold

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P13.01

EDUCATION AND OUTREACH AT THE LIGO LOUISIANA SCIENCE EDUCATION CENTER

Sumeet Kulkarni

University of Mississippi, Oxford, MS, USA

The Laser Interferometer Gravitational-wave Observatory (LIGO) is a multi-national experiment that detects gravitational waves emitted by the merger of compact astrophysical objects such as neutron stars and black holes. It comprises of 2 detectors in the US, one in Hanford, WA and the other in Livingston, LA. Since the first direct detection of gravitational waves in 2015, LIGO has helped extend the frontiers of fundamental research in general relativity, astrophysics, and cosmology. LIGO Livingston, close to Baton Rouge, Louisiana, is also home to a wonderful Science Education Center (SEC), which "seeks to use the cutting edge science and engineering happening at LIGO to inspire the scientist in every visitor." In this poster, I will be presenting activities at the SEC such as school field trips to the

numerous LIGO-physics related exhibits, undergraduate training programs to promote Diversity, Equality and Inclusion (DEI) in science, and teacher professional development in teaching cutting-edge science such as the research carried out at LIGO. I will also highlight opportunities for STEM graduate students to be involved in Education and Outreach efforts at LIGO through the Visiting Fellows program.

P13.02

SUPPORTING MARINE SCIENCE EDUDATION PROGRAMS ABOUT OCEAN POLLUTION AND THE DEEP WATER HORIZON OIL SPILL USING BOOKS FOR GRADES 5-12

Megan Le[1], *Jessica Kastler*[2], *Joyce Shaw*[1]

[1]*Gunter Library Gulf Coast Research Laboratory, Ocean Springs, MS, USA.* [2]*Marine Education Center Gulf Coast Research Laboratory, Ocean Springs, MS, USA*

Gunter Library at the Gulf Coast Research Laboratory (GCRL) partnered with GCRL's Marine Education Center (MEC) to create a reading list to supplement the MEC's education programs about the Deep-Water Horizon (DWH) oil spill and ocean pollution. Books were reviewed based on five points recommended by the NOAA Office of Response and Restoration: https://response.restoration.noaa.gov/about/media/what-are-kids-reading-about-oil-spills.html and standard library evaluation resources. These materials make a foundation and are an introduction to the impacts of the oil disaster and ocean pollution and are suitable for placement in a classroom or school library. The reading list includes a brief description of the book subject, age appropriateness, and awards and honors with weblinks. A bibliography of online and print resources about DWH and ocean pollution for educators and school and public librarians is part of the work.

P13.03

GCRL SCIENCE CAFE: TEN YEARS OF SCIENCE BASED OUTREACH TO THE COMMUNITY

Joyce Shaw, Martha Brown

Gunter Library Gulf Coast Research Laboratory, Ocean Springs, MS, USA

Since August 2011, the GCRL Science Café has captured the best of science from anthropology to zoology while engaging with the public in a lively and informal evening event. As a part of the national Science Café program created by Nova Science Now, the GCRL Science Café has become an Ocean Springs favorite and the place to meet up with friends while increasing science literacy. In 2020 in response to the covid-19 pandemic shut down, the GCRL Science Café pivoted to a virtual program with the assistance of the GCRL Marine Education Center which hosts the recorded events on their Facebook page. This project continues over two decades of work devoted to documenting the history of the Gulf Coast Research Laboratory.

P13.04

YOUTH ENGAGEMENT IN INFORMAL STEM LEARNING: A FOCUS GROUP ASSESSMENT

Vanessa Hoffman, Leslie Burger

Mississippi State University, Mississippi State, MS, USA

This project aims to assess attitudes, interest, and engagement in nature and conservation programming among middle school youth of different genders and races. The current literature heavily focuses on stakeholder perception of youth involvement and interest in outdoor recreation. However, there is a need for information obtained directly from youth regarding their attitudes toward nature and engagement in conservation education programs. 26 students (11 females, 15 males; 25 Black, 1 white) between the ages of 10-14 participated in one of three focus groups conducted in 2021. Initial findings suggest that when outside, youth have a high concern with health and safety, high interest in sports and time with friends/family, but low interest in nature-related programs. Although pandemic concerns create challenges, additional data collection is planned to increase sample diversity and size.

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

Zoology and Entomology

Chair: Daniel Oygui

Mississippi Valley State University

Vice-Chair: Alex Acholonu

Alcorn State University

Thursday, March 31, 2022

MORNING

Room L5

8:50 Welcome

O14.01

9:00 ROLE OF HDAC INHIBITOR ON NKG2DL ACTIVATION IN HCT-116 CELLS

Daniel Oyugi

Mississippi Valley State University, Itta Bena, MS, USA

Colorectal cancer is one of the most aggressive cancers, with fewer potent treatment options. In this study, cellular and molecular mechanisms contributing to colorectal cancer's aggressiveness and metastasis are reviewed. Mouse-derived HCT-116 and human-derived NK92 immune cells were co-cultured to examine direct killing of HCT-116. Additionally, tumor volume was monitored in mice xenografts generated from HCT-116 patients. Ligand expression levels in cells, tissue and tumors were analyzed. Results show reduced expression of genes for ligand in HCT-116 than in adenocarcinoma. Tumor volume was significantly reduced in mice xenografts that expressed ligands. Levels of ligand expression were reduced in blood sample from HCT-116 patients. Inhibition of Histone deacetylase (HDAC) causes transcription and expression of genes for ligand, thereby enabling recognition and binding of NK activating receptor and triggering apoptotic death in HCT-116. These results suggest that HCT-116's aggressiveness is due the cancer's ability to evade NK cells by downregulating its NK-activating ligand (NKG2DL). Inhibition of HDAC specific for the ligand restores the ligand, reactivates NK-cell recognition, and reduces tumor growth and metastasis by triggering apoptosis. This review provides a basis for potential use of immune-based therapy in treating aggressive forms of cancers.

O14.02

9:15 RETROSPECTIVE STUDY ON HUMAN CRYPTOSPORIDIUM AND OTHER ENTERIC PROTOZON PARASITES COMMONLY ASSOCIATED WITH HUMAN DIARRHEA IN OWERRI, IMO STATE, NIGERIA

Alex D.W. Acholonu

Alcorn State University, Lorman, MS, USA

Parasitological and epidemiological study to determine the association of *Cryptosporidium* and other enteric protozoan parasites with diarrhea in Owerri and its environs of Imo state, Nigeria was carried out between September 2002 and May 2005. Further determined was the relationship among these enteric parasites, especially *Cryptosporidium* with HIV/AIDS and the environmental factors that affect their distribution. A total of 3054 stool samples from patients attending various health institutions in the study area was examined. Of these, 1204 (39.4%) were diarrheic while 1850 (60.6%) were non-diarrheic. Enteric parasites were detected in 572 (47.5%) of the diarrheic stool samples. Enteric parasites identified in diarrheic stool samples include protozoans 28.7% helminths 4.9% and in mixed infections 1.8%. The enteric protozoans identified include: *E. histolytica* (10.1%), *Giardia lamblia* (7.9%), *Cryptosporidium* species (4.9%) and *E.coli* (5.8%). *E.histolytica* showed the highest prevalence. Age related *Cryptosporidium* infection was higher in children aged <1-5 years and higher in those of 21-60 years. Of the 3054 stool samples examined, 356 were from HIV^{+ve} patients. 52 (14.6%) had *Cryptosporidium* oocysts in their stools while 14 (0.5%) of 2698 stool samples from non- HIV^{+ve} patients had *Cryptosporidium* oocysts. *Cryptosporidium* has a high pathogenicity and was found in association with diarrhea and only rarely in non-diarrhea samples. From this study *Cryptosporidium* is associated with diarrhea as much as *Giardia lamblia* and *E.histolytica* especially in HIV^{+ve} patients and children. The parasitological and epidemiological significance of these results are discussed especially in the context of control measure.

O14.03

9:30 INCREASED INCIDENCES OF CANCER ASSOCIATED WITH NUTRITIONAL IMBALANCES AND HEALTH DISPARITY IN THE STATE OF MISSISSIPPI

Annyasha Mukherjee[1], *Martha ravola*[2], *Rajarshii Ray*[3], *Debarshi Roy*[2]

[1]*Mississippi College, Clinton, MS, USA.* [2]*alcorn State University, Lorman, MS, USA.* [3]*system On Silicon Corp, Austin, TX, USA*

Health disparities in different ethnicities in the United States are associated with various factors including high-calorie diet, lack of access to health insurance, lack of health education and genetic diversity. Cancer disparities are also evident within the different ethnic groups. Recent studies suggest that metabolic alterations could trigger oncogenic pathways and promote tumorigenesis. Obesity is one of the most critical metabolic diseases which affect the immune system, glucose metabolism and lipid metabolism in the individuals. Cancer epidemiological data reflects that the African American population suffers from a higher incidence rate (~1.2 fold, ACS, 2017) and mortality rate (~1.4 fold, ACS, 2017) of colorectal cancer (CRC) compared to Caucasian population. African American population is also experiencing a 1.4 fold higher incidence rate of obesity (CDC, 2017) compared to the white population. It is also to be noted that African American population are experiences higher incidence of triple negative breast cancer (TNBC) and prostate cancer incidences as well compared to the white population. Mississippi has the highest African American population (37%, ACS) compared to overall US statistics (12.1%). Mississippi is also suffering with an elevated incidence and mortality rate of CRC, TNBC and prostate cancer with an increased number of obese people (Mississippi is ranked second in adult obesity and ranked third in child obesity). Epidemiological data indicates a possible association between cancer and metabolic diseases in African-Americans which could be directly or indirectly linked to the nutritional factors. Our research will also promote the importance of a healthy diet which would protect individual from potential threats such as obesity and colorectal cancer. Further studies are underway.

O14.04

9:45 PERSPECTIVE HONEY PLANTS FOR BEEKEEPING IN THE STATE OF MISSISSIPPI

Elena Kostyleva, Kierra Hayes, Taina Turner

Alcorn State University, Lorman, MS, USA

Of more than 180 species of honey and pollen plants found by the authors in the state of Mississippi only some of them have the importance for regional beekeeping. Only 25 species widely distributed in the region, characterized by the availability and abundance of nectar, well visited by bees and able to provide a surplus of honey under favorable environmental conditions are prospective. By the life forms, 36% of them are trees, 28% - shrubs and vines, 36% - herbaceous plants. The majority (80%) are aboriginal, mainly endemics. The most productive of them are black locust (*Robinia pseudoacacia*) and tulip tree (*Liriodendron tulipifera).* The overwhelming majority (20 species or 80%) are biennials and perennials, 5 species (20%) are annuals. Our annual observations and records made it possible to determine the average terms and duration of flowering of the main honey plants on the studied territory and group them by flowering periods, according to the classification adopted in beekeeping, as follows: early spring group includes 2 species (8%), spring - 7 (28%), early summer - 6 (24%), summer - 6 (24%), late summer - 2 (8%) and fall - 2 species (8%). The shortest flowering period is usually typical for spring species of honey plants, the longest - for summer and late summer species or the ones having long lasting flowering period. So, the diversity of honey plant species, their distribution, and places of vegetation available for bees provide good opportunities for the regional beekeeping.

O14.05

10:00 EXPRESSION PROFILES OF THE RYANODINE RECEPTOR, A TARGET OF DIAMIDE INSECTICIDES, IN SOYBEAN LOOPER, *Chrysodeixis includens*

Sena Isbilir, Beverly Catchot, Fred Musser, Seung-Joon Ahn

Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS, USA

The soybean looper (*Chrysodeixis includens*) (*Lepidoptera: Noctuidae*) is one of the most deteriorating pests of soybean due to its defoliation damage. The pest migrates from southern latitudes up through Mississippi. Diamide insecticides such as flubendiamide and chlorantraniliprole have been successful to manage the pest for more than a decade since their introduction to the market. However, the resistance cases that had been reported from field studies might result in a failure of the soybean looper management with diamide insecticides. Those resistance cases had encouraged us to study the molecular mechanism of the diamide resistance in soybean looper, focusing on ryanodine receptors (RyR), a target of diamide insecticides. RyR is an intracellular calcium channel playing an important role in muscle and nerve functions in insects. We cloned the full-length sequence of RyR gene from soybean looper, using a strategy to subclone partial sequences and then to combine them into a full-length sequence, resulting in an extraordinarily long coding sequence (15,360 kb). Then, we screened genotypes of the field populations from Puerto Rico as well as from five southern states including Mississippi to find out potential mutation sites in the resistant strains. Interestingly, no mutation was detected at both I4790M and G4946E loci that are known as the RyR resistant sites in other lepidopteran insects. Finally, we assessed RyR gene expression levels in different treatments, resulting in dynamic gene expression profiles in response to noxious compounds in the soybean looper.

O14.06

10:15 THE OMICS APPROACH TO BEE PHYSIOLOGY

Priyadarshini Chakrabarti[1,2]*, Ramesh Sagili*[2]

[1]*Mississippi State University, Mississippi State, MS, USA.* [2]*Oregon State University, Corvallis, OR, USA*

Multiomics is a new tool for studying the developmental and other physiological underpinnings in bee pollinators. Techniques such as lipidomics, metabolomics and proteomics have become valuable for understanding the impacts and physiological responses of various stressors on native and managed bees. This presentation will talk about some recent transdisciplinary research using multiomics tools for studying pollinator health.

10:30 BREAK

10:45 Business Meeting

MARCH 31, 2022

EVENING

3:30 DODGEN LECTURE and AWARDS CEREMONY

5:00 GENERAL POSTER SESSION

P14.01

TRANSCRIPTOMIC INSIGHTS INTO MECHANISM OF INHIBITION OF OVARIAN DEVELOPMENT IN LYGUS LINEOLARIS **UPON FEEDING ON A CHROMOSOME SUBSTITUTION LINE OF COTTON.**

Chance Anderson[1]*, Sukumar Saha*[2]*, Johnie Jenkins*[2]*, Natraj Krishnan*[1]

[1]*Mississippi State University, Mississippi State, MS, USA.* [2]*USDA/ARS, Mississippi State, MS, USA*

Plant-insect interactions are not just influenced by interactions between plants and the actively feeding stage, but also by a close relationship whereby the plant's defense extends to reducing the number of eggs laid by the herbivorous insect to impairing the development of the embryo inside the egg of even inhibiting ovarian development. The tarnished plant bug (TPB), Lygus lineolaris (Palisot de Beauvois), has emerged as the number-one insect pest of cotton, Gossypium hirsutum L., in the mid-South following the adoption of Bt cotton. Management of TPB has always been a very difficult task for the farmers due to the lack of suitable resistance germplasm in Upland cotton **(***G. hirsutum L.).* Chromosome substitution lines can be used as an alternative approach to complement conventional pedigreed or population-based interspecific introgression for generating cotton lines with improved resistance characteristics. A set of CS lines from *G. tomentosum* (CS-T), was created in an identical genetic background of Upland Cotton. Each CS line is nearly isogenic to the recurrent parent, TM-1 for 25 chromosome pairs, and to each other for 24 chromosome pairs except the substituted chromosomes or chromosome segments. We reported previously that TPB feeding on CST-04-15 exhibits significantly reduced fecundity compared to the isogenic recurrent parent TM-1. To

uncover the mechanisms underlying the reduced fecundity observed in TPB upon feeding on the chromosome substitution line CST-04-15, a transcriptomic analysis of ovarian tissues of female TPB fed on CST-04-15 vs TM1 was undertaken. Based on the transcriptome analysis of ovarian tissue of **L. lineolaris** feeding on CST-04-15 (resistant) compared to TM-1 (Check), an overall downregulation of genes involved in chitin biosynthesis as well as an up-regulation of genes involved in chitin degradation was noted in ovaries of CST-04-15 fed groups. Future studies will focus on a functional analysis of these genes by using RNAi techniques.

P14.02

WHY BATS CARRY DISEASES THAT AFFECTS HUMANS WITHOUT AFFECTING THEM.

Oluwatosin Adeyemi[1]*, Daniel Oyugi*[2]

[1]*Mississippi Valley State University, Dallas, MS, USA.* [2]*Mississippi Valley State University, Itta Bena, MS, USA*

Much more study is needed to understand bats' innate and acquired immune responses during acute and chronic viral infections. To investigate lymphocyte proliferation, antibody and cytokine generation, bat cell culture-based assays and bat-specific reagents would be required. Bats that are significant repositories of emerging viruses have cell-mediated immune responses and a variety of other immunologic activities. The apparent absence of inbred bat strains is a key barrier in investigating T-cell responses in bats. Because matching major histocompatibility complex molecules on T cells and antigen-presenting cells are required for long-term T-cell investigations, such mice are required. Because captive bat colonies may harbor zoonotic viruses that can infect people, studies on the bats and their cells may necessitate biological containment. The growth factors necessary for the in vitro multiplication and maturation of bone marrow stem cells into competent cells in rats Partially defined antigen-presenting cells led to the creation of cell culture assays for intermediate-term proliferation of rodent T cells from several species of bats may most likely be propagated using similar methods.

P14.03

'SWEET' SILK GLANDS: A GLUCOSE-CONJUGATING ENZYME IS HIGHLY EXPRESSED IN THE SILK GLANDS OF MOTHS

Courtney Wynn, Seung-Joon Ahn

Department of Biochemistry, Molecular Biology, Entomology and Plant Pathology, Mississippi State University, Mississippi State, MS, USA

Detoxification of xenobiotics and biotransformation of endobiotics are important processes in insects, in which glucose conjugation plays a vital role by increasing the water solubility of lipophilic aglycone compounds. Glycosylation is catalyzed by uridine diphosphate glycosyltransferase (UGT) enzymes. Recently, a study identified over 45 UGT genes within the genome of, a serious agricultural pest species that feasts on several economically important plants, the corn earworm (*Helicoverpa zea*). We found that a UGT gene named UGT34 showed high levels of expression exclusively in the silk gland tissue, but not in the other tissues, such as central nervous system, guts, fat body, and Malpighian tubules. Quantitative PCR analyses revealed that UGT34 is expressed only in larval stage with an exclusively high level in silk glands compared among other UGT genes in this species. Expression levels within the silk gland were concentrated in the middle and posterior compartments, rather than the anterior one. Additionally, the same analysis was carried out on a different Noctuidae moth species, the soybean looper (*Chrysodeixis includens*), resulting in similar gene expression tendencies. Silk is crucial in feeding, protecting, and metamorphosis in many lepidopteran insect species. Altogether, the present study implies that UGT34 plays an important role in silk glands, but its molecular and physiological function remains unknown. Further investigation is required on the novel role of the sugar-conjugating enzyme in relation to silk production and other functions in caterpillars.

P14.04

AN INVESTIGATION OF THE SOLVENT FOR EXTRACTION OF Lentinula edodes **DURING ANTIMICROBIAL INVESTIGATION**

Andrela Adebayo, Precious Orji, Jennifer Laifa

Mississippi Valley State University, Itta Bena, MS, USA

*Lentinula edodes (*Shiitake) is a mushroom that can be used as food and supplement. The study hypothesized that water, ethanol, and methanol can be used for extraction of *L. edodes* during the antimicrobial investigation. In the present study, *L. edodes* spawn plugs were purchased and grown on Petri dishes containing potato dextrose agar. Ten µg of the mycelium was mixed in 1 ml of either water, ethanol, or methanol. The mycelium was mixed in either water, ethanol, or methanol for few minutes. After few minutes, the crude extracts were screened for antibacterial activities using a modified Kirby-Bauer disc method on *Escherichia coli* and *Bacillus subtilis*. The screening of the extracts was repeated using the same extracts after 10 days. The results revealed that the growth of *E. coli* and *B. subtilis* was not inhibited by the extracts using either water, ethanol, or methanol. In conclusion, water, ethanol, and methanol were not the effective solvents in extracting antimicrobial compounds from *L. edodes*.

Friday, April 1, 2022

AFTERNOON

12:00-3:00 Mississippi INBRE/ Millsaps Symposia

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In Memory

Dr. Sukumar Saha (January 23, 1952-September 3, 2021). Dr. Saha was born January 23, 1952, in Calcutta, India to the late Sushma Saha and Jaladhar Saha. He was a Research Scientist for the USDA/ARS. Dr. Saha was a beloved father, husband, dog lover, and friend to all that he met. He was a beautiful human being with a golden heart and a true inspiration to those who knew and admired him. He was a very humble person who enjoyed traveling, social gatherings and had a joy for eating. He loved everyone including his life long companion, Milo. He enjoyed interacting with others and was a socialite who treated everyone like his own.

Dr. Saha is survived by his wife- Tripti Halder Saha of Starkville, MS; daughters- Sulagna (Kamal) Saha, Satabdi Saha; grandchild- Avik Lamichhane; brothers- Subrata Saha, Sukamal Saha, Kunal Saha, Sukalyan Saha, Bapi Saha; sister- Bonasree Choudhury.

The MAS Leadership, and the MAS Agriculture and Plant Sciences Division extends condolences to the Family, Friends and Colleagues of Dr. Sukumar Saha. The loss of such an extraordinary scientist and friend is immeasureable. Dr. Saha was a world renowned cotton geneticists/reseracher who has touched the lives of all those who have worked with him. He was an MAS life member, an MAS president, and MAS Fellow. He was passionate about mentoring at all levels from high school through post-doc, and he encouraged many students to reach their potential. The scientific world will never forget his contributions. His tireless service to our academy will be a void that is hard to fill. Rest in Peace My Friend! Dr. Saha's family in conjunction with the MAS has established the Saha MS Junior Academy of Science Award. If anyone would like to contribute to this fund please contact the MAS office msacademyofscience@comcast.net

"He was a gentle, humble man. Like cotton, he was comfortable to know and to work with."
(Ed Lubbers , Coworker, Tifton, GA)

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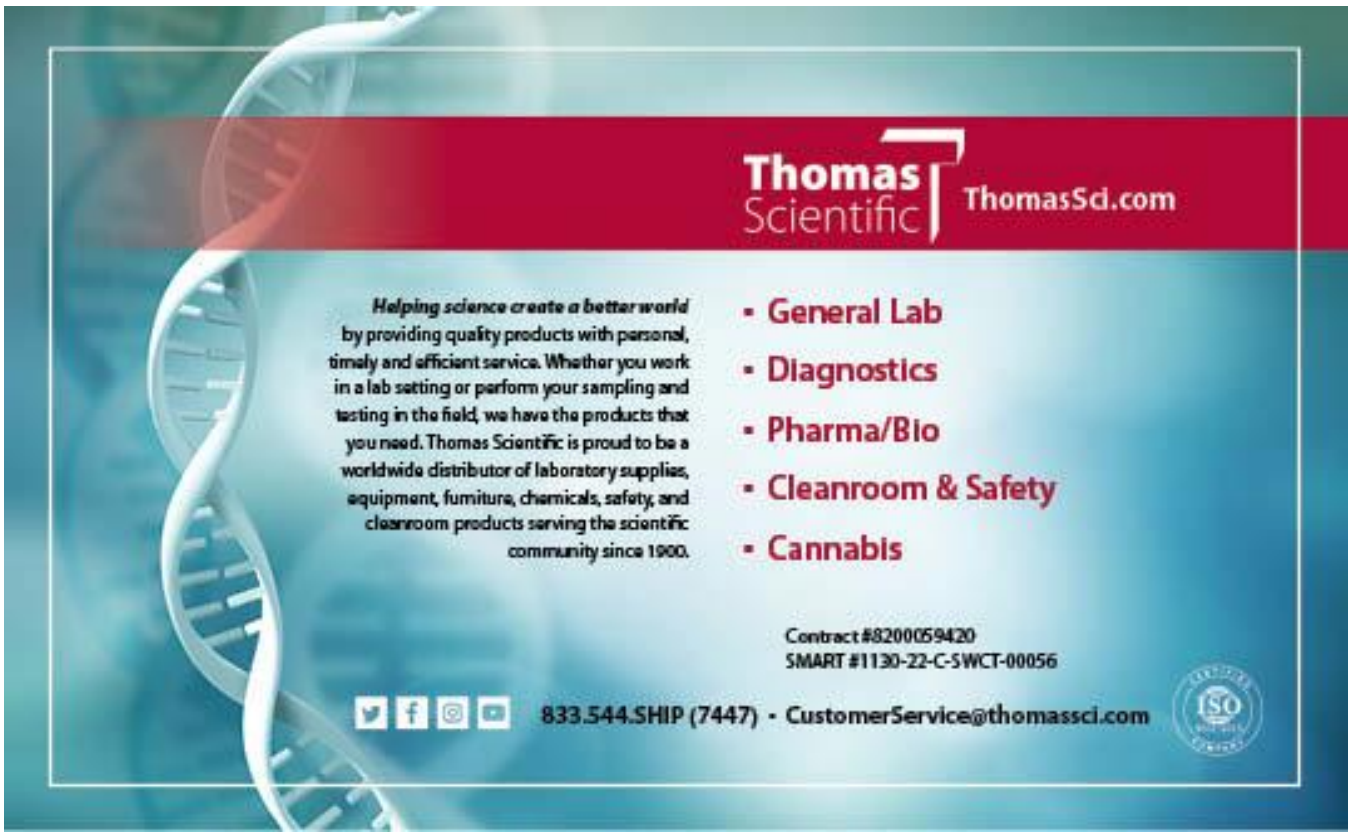

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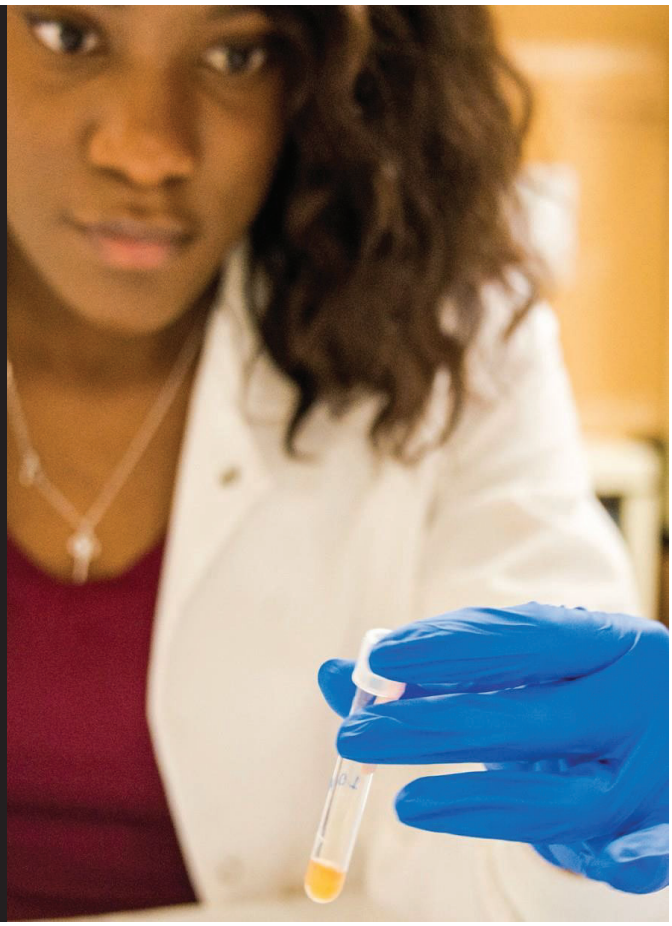

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- Food Safety and Quality
- Sustainable Agriculture
- Human Health and Well-being
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- Horticulture

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- Horticulture
- Weed Science

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- Row-crop, Forage and Environmental Studies
- Fruit, Vegetable and Flower Production

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humansci. msstate. edu

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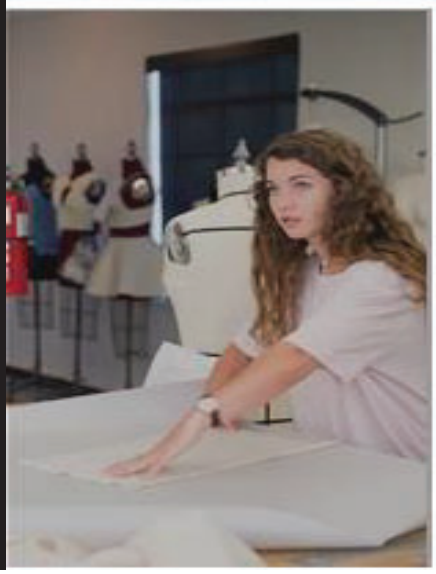

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MWRRI

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The MBPC is a consortium of six Institutions of Higher Learning with a common purpose of enhancing STEMM education in Mississippi public high schools through authentic, faculty-guided research experiences.

Sponsored by the Science Education Division

Thursday afternoon, March 31, 1:00 p.m.—3:30 p.m.

A keynote address will be given by Dr. Catherine Morton

Assistant Vice President for Health Sciences

Director, Health Sciences & Technology Academy

Director, Health Careers Opportunity Program

Robert C Byrd Health Sciences Center

West Virginia University

Presentations by campus coordinators will follow Dr. Morton's address and a general panel discussion of STEMM education needs and the role of the MBPC will conclude the session.

Supported by a generous award from the Phil Hardin Foundation

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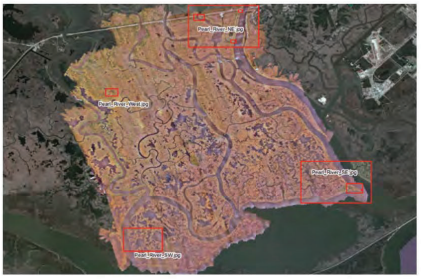

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