UNIVERSITY OF SOUTH ALABAMA
UNDERGRADUATE RESEARCH

UNDERGRADUATE RESEARCH SYMPOSIUM

2021

University of South Alabama
Office of Undergraduate Research

23rd Annual Undergraduate Symposium
Thursday, October 28, 2021

Welcome: Dr. Christy Wheeler West
Director of the Office of Undergraduate Research
Welcome: Dr. Harold Pardue
Dean of the Graduate School and Associate Vice-President for Academic Affairs

Invited Student Presentations
Katie Akers, Speech and Hearing Sciences
Rebecca Bivins, Chemical Engineering
Rebecca Clark, Computer Science
Noel Godang, Biomedical Sciences
India Hughes, Biology
Joshua Yang, Electrical Engineering

Phi Kappa Phi Best Poster Award
Sigma Xi Best Poster Award

Poster Session – Student Center 2nd floor lobby
1:00 Odd-number posters
3:00 Even-numbered posters

Sponsored by:
Alabama Space Grant Consortium, University of South Alabama Academic Affairs, University of South Alabama Graduate School, College of Arts and Sciences, Mitchell College of Business, College of Medicine, School of Computing, College of Education, College of Engineering, and Pat Capps Covey College of Allied Health Professions

Welcome!

At this 23rd Annual Undergraduate Research Symposium at the University of South Alabama, we gather to celebrate the efforts and achievements of 67 budding scholars. Whether you join us as a proud mentor or parent, a curious student or faculty member, or a University administrator or other guest, I know you will be impressed with all that these outstanding student researchers have accomplished, especially through the challenges faced in the last couple of years.

The Office of Undergraduate Research (OUR) seeks to promote scholarly and creative activity and to thereby enhancecritical thinking, problem-solving skills,and communication. We take pride in our foundational role in developing thescholars and scientists of tomorrow. Still, our work would be empty withoutthe tremendous commitment of the faculty mentors who not only foster the progress of the research projects but also nurture the undergraduateresearchers in their scholarly development.

We are grateful for the generous sponsorship of the Alabama Space Grant Consortium, the Academic Affairs Office, and individual colleges and departments. We also express our appreciation to the members of the University Committee on Undergraduate Research especially for their time and insight in support of the Summer Undergraduate Research Fellowship (SURF) program.

Dr. Christy Wheeler West
Director, Office of Undergraduate Research

Dear Colleagues and Students,

Welcome to the 23rd Annual Undergraduate Research Symposium at the University of South Alabama. The benefits of embracing undergraduate research are well documented. Not only does engaging in research under the tutelage of a faculty mentor enhance students' critical thinking and foster verbal and written communication skills, it also increases their time to degree completion and enhances career prospects. Ultimately, these students are well prepared for their professional career. It has also been well documented that undergraduate research programs benefit, not only the participating students and faculty, but the university as a whole. The institution thrives on the dissemination of the research that occurs as students and faculty collaborate to share their work in the scholarly community. We are very proud of our students and extraordinary faculty who participate in the research endeavor through the Office of Undergraduate Research. We know that this is only the beginning of great things that are in the future for these talented individuals. Enjoy the symposium!

Andrea (Andi) M. Kent, Ph.D.
Interim Provost and Senior Vice President
Academic Affairs

Welcome to the Undergraduate Research Symposium.

Research is, in part, about learning more and more about less and less. A willingness to do this is what sets all of you apart from the vast majority of people who are quite content to merely accept the benefits and influence of "magic" on their lives. When they use their smartphone for example, it is for them, magic. They accept there are mysterious forces bey[illegible] that daily conjures phenomena indispensable to their very existence. But this magic is only possible because someone like you was willing to learn a great deal about a very specific aspect of say, the physics of electromagnetic waves. It is with this knowledge and the sudden clarity of understanding that the real magic occurs, the magic of discovery. We recognize and applaud the long hours you spent to fully understand the sometimes incomprehensible minutia that, in the larger progression of humanity, enables the magic of science. Thank you for joining us today, and enjoy the Symposium!

Dr. Harold Pardue
Dean of the Graduate School

Oral Presentations

Katie Akers
Major: Speech and Hearing Sciences
Mentor: Dr. Dahye Choi, Department of Speech PathologyCovey
College of Allied Health Professions

Temperament as a Risk or Protective Factor for Stuttering

Rebecca Bivins
Major: Chemical Engineering
Mentor: Dr. Christy Wheeler West
Department of Chemical and Biomolecular Engineering
College of Engineering

Capturing Sunlight to Drive Chemical Reactions

Rebecca Clark
Major: Computer Science
Mentor: Dr. J. Todd McDonald
Department of Computer Science
School of Computing

Malware Detection Based on Power Consumption

Noel Godang
Major: Biomedical Sciences
Mentor: Dr. Glen Borchert
Department of Pharmacology
College of Medicine

Identification of New Genes Contributing to Prostate Cancer

India Hughes
Major: Biology
Mentor: Dr. Jason Strickland
Department of Biology
College of Arts and Sciences

Sequencing Snail-Eating Snake Genes to Identify New Species

University Committee on Undergraduate Research
Program Director: Dr. Christy Wheeler West

College	Member, Department
Pat Capps Covey College of Allied Health	**Robin Mockett**, Biomedical Sciences
College of Arts and Sciences	**Jason Coym**, Chemistry **Lesley Gregoricka**, Sociology, Anthropology, and Social Work **Zoya Khan**, Foreign Languages **Christina Lindemann,** Art and Art History **Steven Schultze,** Earth Sciences **Jack Shelley-Tremblay**, Psychology
Mitchell College of Business	**Al Chow**, Marketing **Kelly Woodford**, Management
School of Computing	**Tom Johnsten**, Computer Science
College of Education and Professional Studies	**Ryon McDermott**, Professional Studies
College of Engineering	**Na Gong**, Electrical Computer Engineering **Silas Leavesley**, Chemical and Biomolecular Engineering
Honors College	**Doug Marshall**, Sociology
College of Medicine	**Thomas Rich,** Pharmacology
College of Nursing	**Rebecca Graves**, Research, Development, and Evaluation

The Office of Undergraduate Research is located in the Department of Chemical and Biomolecular Engineering Shelby Hall, Room 4135.
(251) 341-3078

Research Abstracts

Aaron, De'Asia
Major: Psychology (BA)

Mentor: Dr. Martha Jane Brazy
Department of History Department
College of Arts and Sciences
Funding Source(s): SURF
Poster #1

The Liminal Space: Exploring the Historical Constructs of Black Identity/Identities

History reveals that there is no monolithic construction of "Black identity," and the lived experiences of those who identify as "Black" are multifaceted. This research project will use the disciplinary lenses of History, African American History, and Folklore to examine the concept of "Black identity." Black intellectuals such as W.E.B. DuBois, Elsa Barkley Brown, Evelyn Brooks Higginbotham, Henry Louis Gates, Nellie McKay, and others will help guide the theoretical and practical ideologies of Black identities occupying liminal spaces. I was thoroughly influenced by themes of Elsa Barkley Brown's theoretical frameworks of decolonized education, research, and methodologies. With their guidance, I will travel through time allowing the lived experience of Black people to speak for themselves while grounding these experiences in the theoretical frameworks of History, Folklore, African American Studies, and Psychology. Primary sources, such as interviews from Alabama natives, along with secondary peer reviewed articles and books will be heavily utilized to examine the discourse of liminal spaces. Using generational oral narratives, this project explores these questions revolving around "identity/identities" across time and space. Many of my findings involve the family structure and effects of spiritual beliefs. Across interviews, the same moralsand values were found to be at the center of how each person interviewed thinks and acts. I have concluded that a topic such as identity is very dense and complicated to produce a definitive answer which explains the grey areas of root issues within families. This research will contribute to unpacking the numerous layers of Black identity/identities within the interdisciplinary field of African American Studies. I would like to thank the SURF program for funding my source of transcription.

Agrawal, Trisha
Major: Psychology (BA)

Mentor: Dr. Dhananjay T. Tambe
Department of Biomedical Engineering,
Department of Mechanical Aerospace,
Department of Pharmacology in College of Medicine
College of Engineering
Funding Source(s): SURF
Poster #2

Dynamic Mechanical Analyzer for Tissues (DMAT)

The tissue in your knee or the walls of your blood vessels continuously withstand heavy mechanical loads. These tissues hold their shape under such a loading due to the mechanical property called stiffness. Being able to examine stiffness and other mechanical properties relevant to the dynamic loading of tissues is important to better understand the effects of aging,infection, and other acute and chronic injuries. These properties are also important to develop new treatment strategies including artificial tissues.

The purpose of this project was to invent a unified technology that can measure the mechanicalproperties of a variety of tissues in response to a variety of loadings. Following a terminology from experimental material science, our aim can be rephrased as building a Dynamic Mechanical Analyzer for Tissues (DMAT).

We developed a DMAT with desired form and function and used rubber bands to test its capabilities to measure the mechanical properties with non-linearities similar to that of biological tissues. At the heart of this new DMAT is the voice-coil technology of audio speakers. We engaged a voice-coil actuator that allows our DMAT to have minimal frictionlessand noise which enables stable and precise stretching of the tissues at a wide range of frequencies for extended periods of time. Our design also enables us to adapt the technology toportable clinical applications.

Here we present the quasi-static and dynamic mechanical properties of two types of rubberbands and novel cloud-computing-based data analysis and data visualization tools that we developed in the process.

Akers, Katie
Major: Speech and Hearing Sciences (BS)

Mentor: Dr. Dahye Choi
Department of Speech Pathology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #3

Resilient, Over-controlled, and Under-controlled Temperament Typology in Children Who Do and Do Not Stutter

Traditionally, low behavioral inhibition (BI) has been considered a protective factor for stuttering while high BI has been considered a risk factor for increased stuttering. Recent studies show mixed findings suggesting that both high and low BI may be associated with increased stuttering. With the current BI classification system, it is hard to determine what aspect of low BI or high BI is attributable to increased stuttering. Rather, the temperament classification system suggested by Asendorph and van Aken (1999) anticipates a more accurate relation between temperament and stuttering. The purpose of this study was to examine the impact of BI on the development of stuttering using this broader range temperament scale including a well-adjusted â€˜resilient' comparison group. Participants' temperament types were assessed through behavioral observations and parent reports. The participants who do (CWS) and do not stutter (CWNS) were then separated into three temperamental type subgroups: over-controlled, under-controlled, and resilient. Stuttering rateswere compared among temperament typology groups. The findings did not suggest a link between temperament typologies and the presence of a stuttering disorder. Findings did not report a significant difference in stuttering rates between the over-controlled and resilient groups as well as between the under-controlled and resilient groups. However, when comparing only the over-controlled and under-controlled groups, findings indicated the under- controlled group stuttered more. Findings suggest under-controlled CWS are at a greater risk of a higher stuttering rate than over-controlled CWS. More research with a larger sample size is needed to support or refute these findings.

Atchison, Anna
Major: Biology (BS)

Mentor: Dr. Hana Zickgraf
Department of Psychology
College of Arts and Sciences
Funding Source(s): SURF
Poster #4

Orthorexia Nervosa and Eating Disorder Behaviors: A Review of the Literature

Orthorexia nervosa (ON) involves obsessive thoughts about healthy eating and distress relatedto this obsession. There is still dispute over whether ON should be considered on the obsessive-compulsive spectrum, the eating disorder (ED) spectrum, or as its own disorder.
Based on current research, orthorexia behaviors seem to be closely related to ED behaviors. However, given the range of instruments used to measure ED and ON, and the lack of consistency in the specific ED domains explored, a review of the current literature is warranted. The objective of this study was to investigate the existing literature relating ON andED symptoms in an effort to understand the nature of their relationship, and to highlight the ED symptom domains most closely related to ON. A web-based search was conducted on PubMed, Science Direct, and Web of Science using the search term “orthorexia” and at least one of the following: “anorexia nervosa,” “bulimia nervosa,” “eating disorder,” “arfid,” “restrictive,” “body image,” “weight,” “shape concern,” (“perfection” or “perfectionism” or “perfectionist”), or (“obsess” or “obsession” or “obsessive”). Out of 458 initial Journal Articles, 36 were retained for analysis. The results indicated that orthorexia nervosa is consistently related to the following disordered symptoms/features: restraint, drive for thinness, and weight control motivations for food choice. However, ON appears not to be related to emotional eating, uncontrolled eating, or body dissatisfaction. Further research should be conducted to further understand the relationship between orthorexia nervosa and body image issues, as well as how individuals that test high on measures of orthorexia nervosadefine “health”.

Baker, Noah
Major: Biomedical Sciences (BS)

Mentor: Dr. David Forbes
Department of Chemistry
College of Arts and Sciences
Funding Source(s): SURF; USA: Department of Biochemistry-College of Medicine, Department of Chemistry-College of Arts and Sciences
Poster #5

The Synthesis and Testing of Potent and Selective Protein Phosphatase Inhibitors

This research offered a novel approach to antitumor therapy. Research suggests that inhibition of protein phosphatase 5 (PP5) functions is an attractive goal for antitumor applications due to the role of PP5 in cell proliferation. Co-crystal structures of synthesized PP5 inhibitors within the active site identified contacts between the bridgehead oxygen of the inhibitors and the enzyme. It is hypothesized that exploitation of grooves near the active site through covalent bonding with a tethered reactive moiety will enhance the inhibitor's selectivity without limiting potency. Current synthetic goals include the attachment of an epoxide moiety. The inherent ring strain of the three-membered ring consisting of two carbon atoms and one oxygenatom offers an attractive target to study given the breadth of nucleophiles capable of acting upon a ring-opening event. It is hypothesized that upon ring opening, the next generation norcantharidin derivative will be covalently bound to an amino acid residue within the groovesof the phosphatase, thereby inhibiting the enzyme. The goal of the summer period was to synthesize the next generation of norcantharidin-based inhibitors with tethered functionalities. Due to the instability of certain derivatives, only basic acetal derivatives could be confirmed assynthesized using NMR spectroscopy. New synthetic directions are aimed toward the addition of an epoxide using an isocyanate intermediate. Upon synthesis of these compounds, acetal derivatives and new derivatives synthesized via isocyanates will be tested for their inhibitive potency and selectivity of protein phosphatases.

Barnes, Sarah
Major: Economics & Finance (BSBA) - Finance Concentration

Mentor: Dr. Misty Sabol
Department of Marketing and Quantitative Methods
Mitchell College of Business
Funding Source(s): SURF
Poster #6

Examining the Economic Impact of United Way of Southwest Alabama on the Regional Economy of Four Alabama Counties

This research examines the economic impact of nonprofit partnerships between United Way ofSouthwest Alabama and regional agencies of four Alabama counties: Mobile, Clarke, Choctaw, and Washington. This study ultimately examines the variation in funding provided tothe different counties, both in sum and per capita. This allows a nonprofit organization to understand the full scope of their outgoing funding and the ways in which this relates to their economic impact on the relevant communities. By obtaining a greater understanding of the wealth and population of the different counties, as well as the funds donated to them by UnitedWay of Southwest Alabama, the researcher was able to ascertain the impact of this nonprofit on the local community. Ultimately, the findings and principles of this research apply to all nonprofit organizations and could help other nonprofits improve their impact. Nonprofit organizations provide necessary support and aid for many communities, and their ability to provide this aid relies on their ability to generate support and financial resources. This study analyzes the factors that impact a nonprofit organization's ability to generate this support and promote sustainability through partnerships. Because the aid nonprofits provide is necessary, understanding the factors that impact a nonprofit organization's effectiveness and sustainability will provide insight into the ways that nonprofit aid to different communities could be improved.

Bivins, Rebecca
Major: Chemical Engineering

Mentor: Dr. Christy Wheeler West
Department of Chemical and Biomolecular Engineering
College of Engineering
Funding Source(s): SURF
Poster #7

Effectiveness of Copper-Loaded Titania Nanofibers as Photocatalysts

Titania (TiO_2) photocatalysts have many applications in the environmental and energy fields, including air and water purification and hydrogen evolution. Titania is a common photocatalyst because it is abundant, non-toxic, and inexpensive. As a reference for comparingphotocatalytic activity, Degussa P25 microparticles have become the standard for TiO_2 photocatalysts. Altering the morphology into nanofibers could potentially increase the photocatalytic activity of the catalyst. Proposed advantages of nanofibers include increased surface area and improved electron transfer. These characteristics are due to the mesoporous structure and the highly aligned structure of densely packed nanoparticles. As a model reaction, the degradation of methyl orange was used to evaluate the photocatalytic activity of copper-modified P25 and copper-modified TiO_2 nanofibers. Based on the literature, the degradation of methyl orange was assumed to follow first-order Langmuir-Hinshelwood kinetics. Contrasting to the hypothesis, the copper-loaded nanofibers exhibited lower rate constants than blank and copper-loaded P25. Blank P25 and 0.2% Cu P25 showed the highest rate constants (0.0128 min^{-1}). These results may arise from the difference in phase crystallinity of the P25 and nanofibers. For nanofibers of higher dopant concentration (0.5% and 1% Cu), lower rate constants were observed at 0.0060 and 0.0041 min^{-1}, respectively.

These results might be attributed to shadowing of the titania by the copper. More conclusionscan be drawn once the surface properties are examined by x-ray diffraction (XRD) and scanning electron microscopy (SEM).

Bivins, Brion
Major: Computer Science (BSCS)

Mentor: Dr. Ketan Maheshwari
Department of Oak Ridge National Lab
Funding Source(s): Oak Ridge Institute for Science and Education (ORISE)
Poster #9

Usage Data Collection and Analysis on the Summit Supercomputer at Oak Ridge National Laboratory

Summit, housed at the Oak Ridge National Lab, is the second fastest supercomputer in the world. The supercomputer gathers data from all its user from around the world and is used in amultitude of multidisciplinary projects. Summit has 5 login nodes and data have been gatheredhourly since January 1, 2020. Using bash scripts and the python coding language, we collectedusage data and performance readings. With this data, we intend to better understand how Summit is used by looking into patterns in collected data. After collecting the data using a bash script, we focused on geolocating Summit users using IP addresses and determining the most and least busy days. Using python libraries and modules, we were able to create a map of connection locations of Summit users and create graphs of the average number of daily users over an eight-month period. Our data is useful for insights into user behavior, especially for most and least busy days. Pre-pandemic, we can see a pattern in productivity; increased duringthe workweek and decreased during the weekend. During the pandemic, the pattern slowly begins to fade, which can be attributed to more people working from home. Later, we plan to use geolocation to detect if user distance from Summit affects command runtime.

Carpenter, Kelsey
Major: Biology (BS)

Mentor: Dr. Ryan Littlefield
Department of Biology
College of Arts and Sciences
Funding Source(s): University of South Alabama Biology Department, 2020 Synthego Genome Engineering Innovation Grant
Poster #8

Effect of inheritance and expression of mCh- and GFP-encoding genes on the function and assemblage of muscle fibers in pharynx of C. elegans

The intention of the research described here is to understand the arrangement of myofibril proteins within *Caenorhabditis elegans* pharynx muscle. In preparation, we used CRISPR-Cas9 gene editing to generate a series of transgenic strains that have fluorescently-tagged endogenous myofibril proteins.

In one strain, RSL 84, the mCherry (mCh) red fluorescent was inserted at the beginning of themyo-2 gene, which codes for the main myosin heavy chain isoform expressed in the pharynx. This strain was made to test the hypothesis that expression of the mCh insert would not impactthe expression or myo-2 or the myofibril proteins produced by that gene.

RSL 84 strain has now been implemented in further research into the function and organizationof the myofibrils in the pharynx. We mated male worms expressing mCh-myo-2 with strain RSL 86, which expresses a GFP marker on the C-terminus of the myo-2 gene. After this cross, offspring that expressed both the mCh and GFP fluorescent tags were isolated and maintained. We hypothesize that expression of these fluorescent genes will not affect the expression of the myo-2 gene, and we expect unaltered muscle fibers in the pharynx of the RSL 84/RSL 86 offspring. Pumping assays will be conducted on these subjects as well as on wild-type genotype *C. elegans* to observe any effect on pharynx function.

The information gathered from this research will further our understanding of the function andassemblage of the myo-2-encoded myofibrils in the pharynx, ultimately deepening our comprehension of *C. elegans* on the whole.

Clark, Rebecca
Major: Computer Science (BSCS)

Mentor: Dr. J. Todd McDonald
Department of Computer Science
School of Computing
Funding Source(s): SURF
Poster #10

Exploring Side Channel Data for Detecting Malicious Software

Rootkits are pernicious types of malware with administrative level privileges that obtain accessor control of a computer system. They often hide themselves effectively against detection mechanisms because they have the ability to alter system data and essentially lie to an end user. Side channel data such as CPU power and temperature, however, are outside the scope ofa rootkit to alter. In this research, we use CPU power analyzed by a nonlinear phase space algorithm to detect rootkit execution. We collect CPU power measurements with a Data Acquisition System (DAQ) while test computers are in various states of activity (normal, stressed, and manually controlled) and in either infected or uninfected states. We also compareresults of our novel nonlinear phase space approach to common machine learning algorithms used in similar research. We train our algorithm using various phase space graph features that identify optimal threshold levels for graph dissimilarity and the optimal successive occurrencesabove threshold that produce the best detection accuracy. Our initial results indicate demonstrate that certain rootkits can be detected through our phase space algorithm using low-frequency power signatures.

Coppinger, Grace
Major: Biology (BS)

Mentor: Dr. Jason Strickland, Mr. Joel Borden
Department of Biology
College of Arts and Sciences
Poster #11

Reptile and Amphibian Diversity on the University of South Alabama's Campus

Reptile and amphibian species are declining worldwide and they face a variety of challenges, including habitat fragmentation, pollution, and increased pathogen prevalence. Because of the global decline, small natural areas are becoming more important to maintain biodiversity, particularly for reptiles and amphibians. The University of South Alabama's main campus has 95 acres of natural area accessible via the Glen Sebastian Nature Trail. Our goal was to document the reptile and amphibian diversity on campus using a variety of survey techniques. From 2008 to present, we used PVC pipes attached to trees to capture treefrogs and pitfall traps, funnel traps, and drift fence arrays to catch ground-dwelling reptiles and amphibians including snakes, lizards, and toads. To supplement our trapping effort, we used visual encounter surveys and hand captures to target additional species. We found 28 reptile species (6 lizards, 12 snakes, 9 turtles, 1 crocodilian) and 12 amphibian species (8 frogs and 4 salamanders). The most abundant reptiles were Little Brown Skinks and the most abundant amphibians were Southern Toads. The state of Alabama is home to 93 different reptile species and 132 different amphibian species. While the species richness on the University of South Alabama's campus is only a fraction of the total for the state, our records indicate that species richness and abundance have remained stable across multiple years. The campus natural area isa positive refuge for reptiles and amphibians and small habitat patches like the one on the University of South Alabama campus will take on increased importance to maintain biodiversity in the future.

Crone, Makenna
Major: Secondary Education Social Science (BS)

Mentor: Dr. David Meola
Department of History
College of Arts and Sciences
Funding Source(s): SURF
Poster #13

Reimagining "Reacting to the Past" as a Tool Accessible to High School Classrooms

The use of Reacting to the Past pedagogy has become popular amongst many college-level instructors due to its proven success with student engagement, primary source analysis, and inquiry-based learning. Proven through extensive literature review, there has been no comparable tool developed with the secondary classroom in mind. This project seeks to develop a comparable role-playing game to be used in a high school US History course. The game, which is entitled The Question of Representation-The Constitutional Convention of 1787, will prompt students to conduct their own primary source research, practice formal writing, give formal speeches, and participate in informal debates. By participating in the game, students will definitively meet the Alabama State Department of Education standard of [SS2010] US10 (10) 4 and may meet the standards for [DLIT] (9-12) 5 and [DLIT] (9-12) 6 iftechnology is used as suggested throughout the materials. Not only will students better engagewith the material, but this game specifically caters to high school teachers by modifying the traditional RTTP style to better fit within the curriculum calendar. Teachers are often held to astrict schedule by which they must meet each standard in their classroom, and this allows themto meet these standards in just two class days. It also presents the teacher with many opportunities to formally and informally assess their students throughout both days. A study isbeing developed to judge the efficacy of utilizing this tool in the classroom and using the process to create games on other topics.

Edwards, Elizabeth
Major: Exercise Science (BS) - Pre-Professional Concentration

Mentor: Dr. Caitlyn Hauff
Department of Health, Kinesiology, and Sport
College of Education and Professional Studies
Funding Source(s): SURF
Poster #12

Exploring the Use of Sport Psychology in Rehabilitation: Client and Practitioner Perspectives

Introduction: Mentality and physical development work hand in hand during long-term rehabilitation and it is important to understand both in order to best help clients. The purposeof this study was to explore how sport psychology can enhance a person's rehabilitation experience and how clinicians can better serve their patients holistically by using a sport psychology approach.
Methods: Interviews were completed with two Occupational Therapists, two Physical Therapists, and two clients. Subjects were interviewed regarding their experience in long-termrehabilitation. Areas covered included experiences in long-term rehabilitation, familiarity and use of sport psychology, building relationships, setting goals, and working through mental barriers. The interviews were recorded and transcribed verbatim. The research team coded thedata separately, then met to discuss findings and create themes.
Results: Four themes and subthemes were found: Sport Psychology (subthemes: somatic andcognitive); Self-Actualization (subthemes: quality of life, increased functionality, and independence); Trust (subthemes: communication and body language); and Psychological Barriers (subthemes: personal and rehabilitation).
Conclusion: There is a positive correlation between mentality and physical performance. When treating a client with a chronic condition, sport psychology can be an effective addition to physical/occupational therapy.

Edwards, Mallory
Major: Speech and Hearing Sciences (BS)

Mentor: Dr. Victoria Henbest
Department of Speech Pathology & Audiology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #14

The Impact of Covid-19 on Individuals who use Augmentative and Alternative Communication (AAC): Perspectives from Parents

Augmentative and Alternative Communication devices (AAC) is a field of practice that assists with impairments of the spoken and written modes of communication of speech-language production and/or comprehension and can include: gestures, tangible objects, picture and letterboards, speech-generating devices (SGDs) and more. Because the people who use AAC have some difficulty communicating, they are often left out of their community and have limited communication partners. The Covid-19 pandemic has affected the way everyone communicates, limiting face-to-face interactions with family, friends, and the community. The children who use AAC also had to switch from receiving educational and therapeutic services in-person to virtual therapy at home. Very few studies have researched the experience of AAC users in the virtual world. To our knowledge there have been no studies about the impact of Covid-19 on AAC users. The purpose of this study was to find the impact of Covid-19 on childAAC users. As part of a larger study seventeen mothers (16 coded) and three fathers (2 coded) were asked a variety of questions about their experiences with their child's AAC device. For this study only one question was analyzed, "How has Covid-19 affected your AAC user?" Their responses were categorized into the following themes: positive, negative, and neutral.
The responses of the positive results include: increased device usage (17%), increased modeling opportunities (17%), received more attention (6%), and increased spelling abilities (6%). The negative results included: decreased device usage (26%), lack of support from school system (11%), decreased community interaction (17%), struggling to catch up in peer communication (6%), lots of anxiety about contracting Covid-19 (6%), interruption of therapy(11%). The neutral results were caused by a strong support system (6%) and no changes to daily routine (11%). Although no two experiences of Covid-19 are unique, speech-language pathologists need to take this new information into consideration when providing services for clients. These results will also be useful in the case of another lockdown.

Everitt, Keegan
Major: Chemistry (BS)

Mentor: Edward Duranty
Department of Physical Chemistry
College of Arts and Sciences
Poster #15

Observing Belousov-Zhabotinsky Oscillating Reactions in Acoustically-Levitated Droplets

Reactions occurring in small volumes have recently been found in the literature to exhibit reaction characteristics different from those occurring in the bulk. Our group is investigating these possible effects in a unique class of oscillating Belousov-Zhabotinsky (BZ) reactions within 2 ÂµL acoustically-levitated droplets. This particular reaction has been studied by Steinbock et. al. where the minimum critical concentrations of these reactants in bulk reactionswere determined via UV-vis spectroscopy. Our group's work has centered on determining the minimum concentrations for each of the reactants required for the reaction in an acoustic levitator compared to Steinbock et. al. observed critical concentrations.
Preliminary results have shown that the reactant concentrations are not completely correlated with one another and lowering the concentration of potassium bromate by 0.0375M below the value reported by Steinbock does not inhibit the reaction. This result suggests that the increased surface-to-air ratio of the droplet (as compared to a bulk solution within glassware), and the resulting increase in oxygen transport across the droplet/air interface, does not effectively scavenge radical intermediates within a levitated droplet as expected. This observation runs counter to the inhibition effect of oxygen on BZ reactions reported in the literature. Continued research is required to identify the critical concentrations for all of the BZ reactants within a levitated droplet. This data will further the understanding of how reactantconcentrations affect the dynamics of chemical reactions in general within small volumes as compared to the bulk.

Ezell, Maddie
Major: Mechanical Engineering
College of Engineering Mentor: Drs. Dhananjay T. Tambe &Sarah Sayner
Department of Mechanical Engineering
College of Engineering
Funding Source(s): SURF
Poster #16

Framework for quantitative assessment of the cAMP-associated functional responses in the Pulmonary Endothelial Cells

In collaboration with Drs. Sayner and Tambe, I assessed the cyclic adenosine monophosphate (cAMP)-associated changes in the mechanical properties of pulmonaryendothelial cells. cAMP is a molecule produced in a wide variety of biochemical processes that cells engage in, including various structural and functional changes in the endothelial cells. One of the functional changes relevant to endothelial function is alteration in barrier properties, which is the ability of endothelial cells to keep the bloodfrom leaking through the vessel wall. While alterations in barrier function have been studied extensively, observations from Dr. Sayner's lab point to distinct outcomes fromactivating a cAMP pool in the upper side of the cells versus that from the lower side of the cells. The physical mechanisms of how these pools exhibit distinct outcomes remains unclear. The central goal of my project was to establish the measurement of mechanical forces within the cells as a novel and quantitative functional outcome of changes in cAMP signaling.

I used an existing cellular force measurement technique called Monolayer Stress Microscopy from Dr. Tambe's lab and adapted it to three key needs of my central goal. The needs included straightforward quantitative assessment of changes in (1) cellular tension, (2) strength of cell-extracellular matrix adhesion, and (3) cellular tendency to move. For each of these needs, I respectively chose to measure across the imaged region (1) average cytoskeletal tension of the cells, (2) traction forces exerted by the cells on the extracellular matrix, and (3) cellular tension anisotropy. While these measurements were motivated by recent research, these properties were never quantified as an average number over the entire imaged area. In addition, my data acquisition plan was most effective with an approach that was never used in the lab before. Altogether, analysis of the data I acquired led us to develop four new data analysis programs. These programs are a significant contribution to the automated cellular force measurement technology - Integrative Toolkit to Analyze Cellular Signals(iTACS) - developed in Dr. Tambe's lab.

Fay, Alexondria
Major: Biomedical Sciences (BS)

Mentor: Dr. Terrence Ravine
Department of Biomedical Sciences
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #18

Evaluating Reflectance Spectroscopy as a Method to Measure the Amount of Bacterial Pigment Present on Fabric Samples

Reflectance spectrophotometry measures the amount of light reflected from a colored surface as a function of its wavelength. The amount of reflected light is quantified using a reflectance probe held at a 30° angle coupled to a spectrophotometer. The purpose of this study was to assess the utility of the reflectance method in measuring the amount of color present on white fabric samples inoculated with either *Serratia marcescens* or *Chromobacterium violaceum* bacteria suspended in nutrient broth after 24 hours incubation. Both bacteria produce a solublepigment that is released as part of their normal metabolic activity. Subsequent spectral analysissuggested that a direct relationship existed between bacterial numbers applied to fabric samples and amount of color (pigment) present. This study determined that reflectance photometry could reproducibly quantify the amount of color (pigment) present on nonfunctionalized white fabric. However, effective measurement of pigment amounts on each fabric sample using a handheld reflectance probe required a certain amount of skill that is onlypossessed by trained competent personnel. Consequently, this method may be appropriate to use under conditions where personnel taking reflectance measurements have a large degree of familiarity with the operation of detection equipment and associated analysis software. It is notwell suited for a person of ordinary skill. Furthermore, the cost of required equipment (e.g., reflectance probe) may be prohibitive for most investigators. A different quantitative method should be sought that produces reproducible results but requires less technical skill to make bacterial pigment measurements more accessible.

Foret, Marie
Major: Biomedical Sciences (BS)

Mentor: Dr. Padmamalini Thulasiraman
Department of Biomedical Sciences
Covey College of Allied Health Professions
Funding Source(s): This project was made possible through the Pat Capps Covey College of Allied Health Professions Start Up Fund and the BMD Quick Grant.
Poster #20

Understanding the role of GLUT1 on chemoresistance in triple negative breast cancer cells

The most common type of cancer in women is breast cancer and it is the second most commoncancer in the world. While advances have been made in cancer therapy, drug resistance remains to be one of the challenges that cause relapses in patients. Development of chemoresistance leads to an increase in tumor metastasis and promotes cancer recurrence.

Therefore, it is important to understand the mechanisms of drug resistance to improve the efficacy of chemotherapeutic agents. Altered metabolic processes in cancer cells is one of the leading forces that cause resistance to chemotherapeutic drugs and this contributes to tumor growth. Glucose transporter 1 (GLUT1) is a transmembrane protein that facilitates the transport of glucose across the plasma membrane. GLUT1 is an important target in cancer therapy since it is overexpressed in cancer cells and promotes chemoresistance. The purpose ofthis project was to understand how GLUT1 induces drug resistance in triple negative breast cancer cells, MDA-MB-231. Our data demonstrated high levels of GLUT1 protein expression in the aggressive cell line, MDA-MB-231 compared to luminal MCF-7 breast cancer cells.

Suppressing GLUT1 with the chemical inhibitor WZB117 suppressed growth of MDA-MB- 231 cells but it did not affect doxorubicin-mediated growth suppression. However, silencing GLUT1 with GLUT1 siRNA enhanced doxorubicin-mediated growth suppression. For furtherstudies, we used GLUT1 siRNA to examine the expression of p-Akt and we observed that theknock-down of GLUT1 reduced p-Akt in MDA-MB-231 cells. These results demonstrate thatGLUT1 can be used as a diagnostic marker for targeted cancer therapy.

Foster, Anna
Major: Biology (BS)

Mentor: Dr. Sinéad Ní Chadhain
Department of Biology
College of Arts and Sciences
Funding Source(s): Biology Department
Poster #17

Characterization of Napthalene Degrading Bacteria from Midtown Mobile, AL

Polycyclic aromatic hydrocarbons (PAHs) are components of crude oil that can enter terrestrialand aquatic ecosystems due to human activity. They are toxic, chemical pollutants that have been shown to cause cancer and inhibit mitochondrial respiration. Due to their aromatic structure, they are persistent pollutants and are difficult to break down. Bioremediation is one method for removal of PAHs from the environment. Many bacterial species have been described that use PAHs as a carbon and energy source, completely oxidizing the PAH to CO_2.The goal of my study was to characterize 4 naphthalene degrading Acinetobacter strains isolated in the fall 2020 BLY 314 class. The bacteria samples were isolated from midtown Mobile soils and characterized morphologically and biochemically. The isolates were identified by sequencing the 16S rRNA gene with most isolates belonging to the genus *Acinetobacter*. *Acinetobacter* is a well-known, Gram-negative pathogen, but not much is known about PAH degradation by *Acinetobacter.* I am currently quantifying the growth of 4 *Acinetobacter* strains on naphthalene as a sole carbon and energy source. In addition, the genomes of the 4 isolates are currently being sequenced. The combination of physiological andgenomic data will provide insight into PAH degradation by this genus.

Francis, Zachary
Major: Psychology (BA)

Mentor: Dr. Krista Mehari
Department of Psychology
College of Arts and Sciences
Funding Source(s): YAC Lab
Poster #22

Relation between Hope and Physical Aggression in Adolescents

Hope is an important factor for the positive well-being of an individual, particularly vulnerable youth. According to Snyder's Hope Theory, hope is a framework to develop the motivations and drive to create personal goals and achieve positive self-agency. However, little research has been done regarding the relation between hope and physical aggression. Understanding this relation could lead to effective interventions and preventative measures for those inclined to physical aggression.

The data was pulled from a national survey using a Qualtrics Panel. The Qualtrics survey consisted of 311 youths aged 11 to 15. The demographics of this survey was 62 % White, 33% African American, and 5 % other. The Adolescent hopefulness scale (Mehari, 2021) was used to measure respondents' levels of hope, and the Problem behavior frequency scale was used to measure respondents' levels of physical aggression.

A hierarchical linear regression was conducted to investigate if hope predicted physical aggression, after controlling for gender and age. Hope significantly predicted physical aggression $\{F(4,306)\} = 3.33$; $p = .011$; $R2\Delta = .04$). Adolescents who reported lower levels of hope reported higher levels of physical aggression ($\beta = -.21$; $p = .005$).

Hope is a significant predictor of physical aggression and was found to have a negative relation. This information could lead to hope related therapies or interventions that could lead to reduced chance of physical aggression in youth.

Ghobar, Nicol
Major: Biology (BS)

Mentor: Dr. Glen Borchert
Department of Pharmacology / Biology
College of Arts and Sciences
Funding Source(s): SURF
Poster #24

Characterization of Novel SARS-CoV-2 Small RNA Genes Contributing to Infection

It is unclear which elements of SARS-CoV-2 (SC2) are responsible for eliciting the severe immune dysregulation driving COVID-19. Much like with SC2, SARS-CoV-1 (SC1) infection frequently results inan exaggerated inflammatory response, significant lung pathology and is associated with a high rate of mortality. The relevance of specific small viral-encoded RNAs (svRNAs) in SC1 pathology was previously established when ten ~20 nucleotide svRNAs were discovered in infected mice lungs.

Importantly, antagomiR-based inhibition of one of these, svRNA-N, significantly reduces pro-inflammatory cytokine expression and lung pathology in vivo. As this demonstrates that (at least) this svRNA directly contributes to SC1 pathogenesis, it also suggests that antagomiRs targeting other coronavirus svRNAs could potentially prove of value as a novel form of potent antiviral.

Notably, we recently developed a real-time NGS transcriptomic analysis platform (SURViral) for directly identifying novel svRNAs from small noncoding RNA (sncRNA) datasets. SURViral represents the first-ever sncRNAannotation tool specifically designed for identifying svRNAs. Our analysis of datasets generated from sncRNAs collected from SC1-infected cells correctly identified the 10 SC1 svRNAs previously reported and verified by small transcript northern blotting. That said, while several SC1 svRNAs generated during viral replication have now been shown to directly contribute to lung pathogenesis through targeting host immune genes, to date, neither the identities nor functions of any SC2 svRNAs similarly contributing to infection have been reported. Excitingly, although SC1 svRNA sequences are not conserved in the SC2 genome, we recently identified and confirmed the expressions of 12 miRNA-like svRNAs expressed from SC2 during infection.

Preliminary attempts to identify endogenous targets of these SC2 svRNAs yielded 4 highly notable candidates involved in SC2 infection and/or viral immunity/replication all of which carry striking complementarities to “small transcript northern blotting confirmed” svRNA-3179 (e.g. TMPRSS4 a mucosa-specific serine protease that enhances SC2 spike fusogenic activity and mediates viral entry into host cells). Importantly, our initial experimental evaluations of SC2 svRNA:target predictions confirm the ability of SC2 svRNAs to regulate targets through an RNAi-like mechanism although further experimentation is required to fully substantiate putative svRNA:target interactions and discern their mechanisms of action/roles in infection. Finally of note, we used antisense oligos to block SC2 svRNA function in vitro and assessed impacts on viral replication. Excitingly, we find SC2 plaque formation is repressed in A549-hACE2 cells transfected with an antagomiR targeting svRNA-3179 confirming that disruption of svRNA activity can inhibit SC2 replication in cultured cells. As such, we suggest an antagomiR-based strategy, much like the one that proved effective in reducing lung damage caused by immune dysregulation during SC1 infection in mice, could potentially be utilized to treat SC2 once the svRNA(s) driving innate immune dysregulation are fully characterized.

Glenn, Courtney
Major: Chemistry (BS)

Mentor: Dr. David S. Williams and Ms. Pamela Clevenger
Department of Innovation in Learning Center (ILC) and Department of Chemistry
College of Arts and Sciences
Funding Source(s): SURF
Poster #26

An Observation of Student Attitude and Performance in General Chemistry I (CH-131)

Introductory STEM courses are a stepping stone for numerous students in hopes of pursuing their ultimate career goals. However, these courses can be challenging possibly due to the depth of information covered or the student's attitude toward the STEM course. Previous studies vary with the potential correlation between student attitude and academic achievementwithin STEM courses, and primarily focus on cognitive behavior rather than non-cognitive, such as attitude. This project is a continuation of an ongoing collaboration between the Department of Chemistry and the Innovation in Learning Center (ILC) at the University of South Alabama to determine if there is a correlation between student attitude and academic achievement. To test this theory, students enrolled in Spring 2021 CH-131 were given an Attitude toward the Subject of Chemistry Inventory (ACSI) survey pre- and post- semester. The survey allows the student to rank their emotional response on a Likert scale towards five subsets: anxiety, intellectual accessibility, fear, interest and utility, and emotional satisfaction.Using statistical analysis, the emotional response students had toward chemistry was recordedand compared to their initial and final emotional state after course completion. It can be concluded, from the results, that there were no negative changes in emotional state in any of the five subsets. Unfortunately, the low participation within the survey, confined the research project to minimal statistical analysis.

Godang, Noel
Major: Biomedical Sciences (BS)

Mentor: Dr. Glen Borchert
Department of Biology
College of Arts and Sciences
Funding Source(s): SURF
Poster #19

Novel Small RNA Contributors to Prostate Cancer

Prostate cancer is the second most frequent cancer diagnosis globally, accounting for more than 1.2 million new cases in 2018. Prostate cancer is mainly asymptomatic at its early stages, making the detection process difficult. The potential for noninvasive determination of non- coding RNA levels in plasma samples to serve as a novel biomarker strategy capable of detecting prostate malignancy characteristics prior to the onset of symptoms is highly attractiveand becomes more and more plausible. While microRNAs have been primarily examined as putative biomarkers to date, recent studies of small nucleolar RNAs (snoRNA) have shown that these non-coding RNAs can be processed into smaller microRNA-like fragments known as sno-derived RNA (sdRNA). We recently identified sdRNA-19b and sdRNA-24 as having significant differential expression in prostate cancer vs. control tissue, and we also find that thetargets for sdRNA-19b and sdRNA-24 are well-known tumor suppressors and oncogenes. In addition, we find that over-expressions of sdRNA-19b and sdRNA-24 lead to increased cell proliferation, and the over-expression of sdRNA-19b leads to increased cell migration. We alsofind that when sdRNA-19b and sdRNA-24 are inhibited, they are significantly less likely to survive chemotherapeutic agents. In summary, our results indicate that sdRNA-19b and sdRNA-24 actively contribute to the malignant phenotype of prostate cancer through miRNA- like regulations.

Haider, David
Major: Chemical Engineering (BSChE)

Mentor: Dr. Glen Borchert
Department of Pharmacology, University of South Alabama Collage of Medicine
College of Engineering
Funding Source(s): SURF; Department ofEnergy
Poster #28

Secreted human small RNAs constitute potent, broad-spectrum antivirals

Our team recently profiled the microRNA (miRNA) compositions of nearly 500 human and ratexosomes, and surprisingly, found these transcriptomes contain a strikingly large percentage (~25%) of tRNA fragments (tRFs) (typically exceeding that of miRNAs) despite tRFs generally constituting <2% of normal intracellular small RNA populations. In addition, our group and others have now shown specific tRF cellular expressions are induced by viral infection and that exosomes isolated from viral-infected cells also contain markedly increased tRF levels. Even more interestingly, roles for specific tRFs in facilitating/inhibiting viral replication have recently been reported, and in agreement with this, we find cellular transfection with specific exosomal tRFs inhibits subsequent RNA respiratory virus replicationin a concentration dependent manner. Accordingly, we hypothesize that tRF exosomal deliveryconstitutes a novel mechanism of innate antiviral immunity in which tRFs enhance the viral immunity of recipient cells by priming them for a more rapid, robust interferon (IFN) responsein the event of viral infection. As tRFs have been reported to silence mRNAs through an RNAimechanism much like miRNAs, and since exosomal miRNAs had been shown to regulate target mRNAs in recipient cells, we attempted to identify potential targets of the five most prominent exosomal tRFs. Employing a combination of standard miRNA targeting programs, we screened our most abundant exRNA tRF sequences against the body of publicly available viral genomes. Strikingly, we identified a large number of viruses (primarily ssRNA respiratory viruses including SARS-CoV-2) with high complementarity to the 5 most prevalenttRFs found in human respiratory exosomes. Importantly our work suggests defining patient tRF profiles has the potential to provide powerful new prognostic biomarkers for assessing infected patient prognosis. If successful, relevant tRF profiles could easily be determined in parallel with initial qRT-PCR-based SARS-CoV-2 testing and indicate not only if a patient is SARS-CoV-2 positive, but also their likelihood of developing severe COVID-19 and thereforeappropriate initial therapeutic and clinical measures.

Hicks, Eugene
Major: Chemical Engineering (BSChE)

Mentor: Dr. Brooks Rabideau
Department of Chemical & Biomolecular Engineering
College of Engineering
Funding Source(s): SURF; Department of Energy
Poster #21

Smooth Transitions: Using DFT Calculations to Predict the Transition States of SNAr Reactions in Thermally Robust Ionic Liquids.

Nucleophilic Aromatic Substitution Reactions (SNAr) are important reactions commonly employed in the pharmaceutical and petrochemical industries. In the reaction mechanism, the reactants proceed through a first transition state (TS1), forming a resonance stabilized Meisenheimer Complex (MC). This complex then passes through a second transition state (TS2), forming the desired products. Usually, these reactions are conducted in conventional solvents at high temperatures; however, the desire to cut down on fugitive emissions has led toionic liquids (ILs) being considered as replacement solvents. This project aims to understand how the use of a family of thermally robust ILs affects the thermodynamics and kinetics of these SNAr reactions.

Using quantum chemical calculations, we simulate the reactants, intermediates, and products, and the Synchronous Transit-Guided Quasi-Newton (STQN) Method is used to identify the two transition states of interest. Calculating the energies of these states enables us to understand the relative reactions rates. By examining how these states and energies change depending upon the solvent that is used, we can develop a much better understanding of thesereactions and how they can be tuned to maximize rate and yield. In this work, we first validateour quantum chemical calculations by examining a known reaction in water, comparing our values with those presented in the literature. Next, we extend our study to reactions that take place in thermally robust ILs, and the results are discussed.

Howell, Makenna
Major: Biomedical Sciences (BS)

Mentor: Dr. Terrence J. Ravine
Department of Biomedical Sciences
Covey College of Allied Health Professions
Funding Source(s): Pat Capps Covey College of Allied Health Professions as part of the Collaborative Research Support (CORS) program initiative
Poster #23

Measuring Antibacterial Effectiveness of Various Biogenic and Chemically Produced Metallic Nanoparticles

Metallic nanoparticles have intrinsic antimicrobial properties. Their small size creates a large surface area for interaction with microbes like bacteria. They can interfere with bacterial plasma membrane function and/or metabolic processes limiting bacterial growth. The current study seeks to determine the antibacterial effectiveness of several metallic nanoparticles produced by either biogenic or chemical means. Biogenic nanoparticles are formed inside genetically-manipulated bacteria given a metal substrate. Chemically-produced nanoparticles involve exposure of a similar metal substrate to a strong reducing agent like ascorbic acid (Vitamin C). Antibacterial effectiveness of each produced biogenic or chemically produced nanoparticle will be assessed using the Minimum Inhibitory Concentration (MIC) method. As the name suggests, this method determines the minimum concentration of nanoparticles neededto inhibit the growth of a specific number of bacteria. An additional goal is to measure nanoparticle size and their uniformity. The desired nanoparticle not only needs to display substantial antibacterial activity but must also be relatively the same size. Static Light Scattering (SLS) can be used to measure particle size. Therefore, a particle sizing instrument using SLS will be employed to determine average particle size of each test nanoparticle and establish its range. The ultimate objective is to produce a novel antimicrobial film using the "best" nanoparticle, one exhibiting (1) sufficient antimicrobial activity against a variety of microbes including bacteria, fungi, and viruses and (2) is of an ideal size. A germicidal film is used to cover a variety of "high-touch" items routinely used in medical care environments to help prevent disease transmission.

Howze, Patrick
Major: Chemical Engineering (BSChE)

Mentor: Dr. Silas Leavesley
Department of Chemical and Biomolecular Engineering
College of Engineering
Funding Source(s): SURF
Poster #25

Improving Visualization of cAMP Gradients Using Algorithmic Modelling

A ubiquitous second messenger molecule, cAMP is responsible for orchestrating many different cellular functions through a variety of pathways. FÓ§rster resonance energy transfer(FRET) probes have been used to visualize cAMP spatial gradients in pulmonary microvascular endothelial cells (PMVECs). However, FRET probes have inherently low signal-to-noise ratios; multiple sources of noise can obscure accurate visualization of cAMP gradients using a hyperspectral imaging system. FRET probes have also been used to measurecAMP gradients in 3D; however, it can be difficult to differentiate between true FRET signalsand noise. To further understand the effects of noise on experimental data, a model was developed to simulate cAMP gradients under experimental conditions. The model uses a theoretical cAMP heatmap generated using finite element analysis. This heatmap was converted to simulate the FRET probe signal that would be detected experimentally with a hyperspectral imaging system. The signal was mapped onto an image of unlabeled PMVECs. The result was a time lapse model of cAMP gradients obscured by autofluorescence, as visualized with FRET probes. Additionally, the model allowed the simulated expression levelof FRET signal to be varied. This allowed accurate attribution of signal to FRET and autofluorescence. Comparing experimental data to the model results at different levels of FRET efficiency has allowed improved understanding of FRET signal specificity and how autofluorescence interferes with FRET signal detection. In conclusion, this model can more accurately determine cAMP gradients in PMVECs. This work was supported by NIH award P01HL066299 and NSF award 1725937.

Hughes, Houston
Major: Biology (BS)

Mentor: Dr. Jason Strickland
Department of Biology
College of Arts and Sciences
Funding Source(s): N/A
Poster #27

The Significance of Sampling *Gopherus polyphemus*

The presence of Gopher Tortoises (*Gopherus polyphemus*) is imperative to the wellbeing of many habitats in the southeastern U.S., particularly Longleaf Pine forests. As ecosystem engineers, tortoises play a significant role in maintaining the environments they inhabit and aretherefore focal points of many conservation programs. In southwest Alabama, Gopher Tortoises are state protected in both Mobile and Baldwin counties but only protected by federallaws in Mobile Co. For this study, our goal was to survey Gopher Tortoises and collect blood samples that will be used to assess pathogen prevalence. We performed burrow surveys at sitesin each county from May through August 2021. Active burrows found during the surveys were marked with a GPS and a tomahawk live trap was placed at the burrow entrance. Captured tortoises were measured for weight, sex, length, and width, and potential signs of disease were documented. We also notched unique identification marks in the carapace and collected blood samples before releasing the tortoise in its burrow. We visited 6 sites in Mobile Co. and 2 sites in Baldwin Co. and captured Gopher Tortoises at all but one site in Baldwin Co. We ultimatelysampled 72 Gopher Tortoises including 29 adult males, 25 adult females, and 18 juveniles. Theblood samples collected will be used to assess the presence of five different pathogens. Federaland state government agencies have different protocols for the protection of Gopher Tortoises and our data will provide information to both for management in southwest Alabama.

Hutto, Ronald
Major: Mechanical Engineering (BSME)

Mentor: Dr. Joseph Richardson
Department of Mechanical, Aerospace, and Biomedical Engineering
College of Engineering
Funding Source(s): SURF
Poster #29

Heat Transfer Simulations in OpenFoam

Accurate simulation of heat transfer in orbiting satellites is a challenging problem. A validatedthermal solution will provide the knowledge required to select satellite components based on their suitability in the given thermal environment. A ten week experiment was conducted utilizing the open source software OpenFoam to simulate heat transfer. During these ten weeks, a one-dimensional steady state heat conduction model as well as a one-dimensional transient heat conduction model were developed and tested with the laplacianFoam solver. Useof the laplacianFoam solver provided in OpenFoam allowed the testing of fixed temperatures and convective environments on one-dimensional plates. The data obtained showed that the laplacianFoam solver was able to accurately simulate heat conduction and should be a useful tool in engineering design.

Ikner, Aubry
Major: Exercise Science (BS- Pre-Professional Concentration)

Mentor: Dr. Chrystal Lewis
Department of Adult Health Nursing
College of Nursing
Funding Source(s): SURF
Poster #30

Assessing Trauma-Informed Care in Physical Therapy

BACKGROUND: Physical Therapists (PTs) are movement experts who improve quality of lifethrough prescribed exercise, hands-on care, and patient education. Trauma-informed care is bearing witness to a patient's trauma, creating a safe environment, establishing trustworthinesswith your patient, and avoiding retraumatizing a patient. It is important for PTs to understand Trauma-Informed Care (TIC) to avoid any possible trauma triggers a patient may have.
PURPOSE: The primary focus of this study was to understand the knowledge of TIC held by practicing PTs and determine if there is a need for further education on the topic of TIC withinthe field of Physical Therapy. METHODS: This study was a descriptive needs assessment performed using the ARTIC-35HS survey. The survey was distributed to PTs and completed electronically. RESULTS: There were a total of 37 PTs who participated in this study; 60.61%(n = 20) of participants stated they have had no TIC training, 21.21% (n = 7) stated they are unsure, and only 18.18% (n=6) stated they have had TIC training in the past. These 6 with previous TIC training identified as female. Of the five subscales analyzed from the ARTIC- 35HS Underlying causes (mean value 4.9318) and Reactions (mean value 5.1818) showed the greatest discrepancy from the ARTIC-35 comparison study. CONCLUSION: There is a gap inresearch regarding TIC in Physical Therapy. This pilot study suggests there is a need for further education for PTs on TIC.

Iweka, Rachel
Major: Geography (BS)

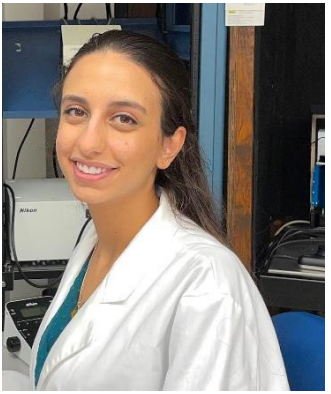
Mentor: Dr. Steven Schultze
Department of Earth Sciences
College of Arts and Sciences
Funding Source(s): SURF
Poster #32

Things Fall Apart: The Implications of Climate Change on the Inter-Ethnic Conflict and Genocide of the Fulani Nomads of Niger

The Republic of Niger, located within the landlocked confines of the interior Sahel, is currently facing environmental and social disparities caused by climate change. The inter- annual variability of precipitation traces and increased temperature totals have burgeoned the further dwindling of arable land for cultivation. Thus, worsening the prospects of inter-ethnicconflict with the sedentary farming community and the country's ethnic nomadic minority group - the Fulani pastoralists. Although the Nigerien government is cognizant in combating the effects of climate change, these efforts have nonetheless metastasized into the heightened marginalization of the Fulani pastoralists through the medium of human rights violations and ethnic persecution proliferated by governmental corruption. Through the usage of spatial and temporal analysis by the utilization of Coupled Modeled Intercomparison Phase 5, the geographic confines of Niger will be analyzed. An ensemble of representative concentration pathways (RCP) 4.5 and 8.5 will demonstrate the potential changes in temperature to the region. This study also gives a prospective outlook of how amplified climatic conditions suchas extreme drought periods, varying annual precipitation, soil degradation and other enhancedenvironmental factors can exacerbate the rudimentary social insecurities that this country faces. It has been determined that the country will foresee a temperature increase of 3°C to 4°C by the end of the century. The amalgamation of these environmental factors can potentially lead to the major security and diplomatic complications as the climatic displacement of the pastoralists has led to inter-ethnic conflict, famine, terrorism, and ethnic persecution and potential ethnic cleansing of the Fulani nomads of Niger.

Jalkh, Josephine
Major: Biomedical Sciences (BS)

Mentor: Dr. Thomas C. Rich
Department of Pharmacology
College of Medicine
Funding Source(s): NIH grant awards P01HL066299, R01HL58506, and R01HL137030
Poster #34



Measuring Calcium Signals in Human Airway Smooth Muscle Cells Using Hyperspectral Imaging and Adaptive Thresholding

Hyperspectral imaging was developed by NASA in order to identify features (water, shoreline,conifers, grassland, etc.) from satellite images of the Earth. All hyperspectral imaging approaches acquire and analyze images at a large number of wavelength bands. These form an image stack comprised of images obtained at each wavelength. More recently these approacheshave been applied to fluorescence microscopy to quantify the abundance of individual fluorophores on a pixel by pixel basis. Traditionally, hyperspectral imaging approaches filter the fluorescence emission, also known as emission scan-based hyperspectral imaging. This technique allows detection and quantification of multiple fluorophores. However, it also filters out a majority of the fluorescence emitted from a sample, increasing the risk of photobleachingand photodamage. In order to overcome these limitations, we utilize an excitation-based hyperspectral imaging technique. Detection and quantification of fluorophore abundance is accomplished by scanning the excitation spectrum. A long pass emission filter is used to collect a majority of the emitted fluorescence, allowing higher signal to noise ratios and faster acquisition times. Faster acquisition times reduce the risk of sample photobleaching and photodamage. We utilized excitation scan-based hyperspectral imaging to measure agonist- induced Ca^{2+} signals within human airway smooth muscle cells (hASMCs). Responses were triggered by carbachol, histamine, and chloroquine. Data were analyzed using custom spectral unmixing algorithms in MATLAB and adaptive thresholding algorithms coded in S8. We used these approaches to identify and track the spatial and temporal distributions of agonist-inducedincreased Ca^{2+} signals. Data are currently being analyzed in order to better understand differences in the intensity distributions of agonists-induced Ca^{2+} signals in hASMCs, and differences in the responses to these agonists. This work was supported by the Summer Undergraduate Research Fellowship, the Office of Undergraduate Research, and NIH grant awards P01HL066299, R01HL58506, and R01HL137030.

Jones, Ian
Major: Physics (BS)

Mentor: Dr. Martin Frank
Department of Physics
College of Arts and Sciences
Funding Source(s): SURF
Poster #31

Optimization of Magnetic Monopole Detection at NOvA's Far Detector

Fermilab's NuMI Off-axis Ve Appearance (NOvA) experiment provides the best method yet for detecting magnetic monopoles of cosmic origin. Specifically, the NOvA far detector's sensitivity and above-ground location significantly improve the probability of magnetic monopole interaction and observation, avoiding obstacles present in previous experiments. Thesoftware used to identify potential monopole interactions at the detector was updated earlier this year. We compared the updated software to the previous version using Monte Carlo simulated data sets that generate virtual monopole interactions to determine the software's ability to successfully reconstruct the events across various parameters. We found that while the updated software successfully reconstructs more events overall, the previous version is more accurate across certain parameters. Further optimization of the software will require a detailed analysis of the code itself, guided by the findings of this research.

Jordan, Chase
Major: Biology (BS)

Mentor: Dr. Ryan Littlefield
Department of Biology
College of Arts and Sciences
Funding Source(s): SURF
Poster #36

Gene Editing of the unc-22 gene with CRISPR-Cas9

Contractile muscle fibers (myofibrils) are composed of actin (thin) and myosin (thick) filaments that are organized and regulated to generate force and permit shortening. Myofibril structure and composition is conserved. In *Caenorhabditis elegans*, the unc-22 gene encodes twitchin, a giant protein associated with myofibril thick filaments that results in unregulated, non-uniform contraction (twitching) when mutated or with reduced expression levels. The twitchin kinase domain is considered to be stretch-activated and involved in a signaling pathway that reduces contraction in response to myofibril length changes. When the kinase domain was specifically inactivated by a mutation (K6290A) via CRISPR gene editing, the mutants moved quicker than the wild-type, but with no twitching raising the possibility that twitching may result from kinase overactivity, directly or indirectly. We hypothesize that the thick filament becomes less stiff when twitchin is unable to bind to it normally, leading to over-activation of the kinase and the twitchin phenotype. To test this, we used CRISPR geneediting to create an unc-22 mutant that may have an insensitive kinase domain to stretch. We inserted a trans-splicing signal upstream of the kinase domain that severed the N-terminal region from the C-terminal kinase region. Fluorescent protein tagging shows that both the C-terminal kinase and N-terminal regions are associated with the myofibrils in the pharynx and body wall muscle. The corresponding transgenic worms have coordinated motility and behavior but do not twitch. Thus, both regions of unc-22 can independently associate with myofibrils, not requiring stretch-activation of the kinase for normal behavior.

Kelly, Amiyah
Major: Biomedical Sciences (BS)

Mentor: Dr. Thomas Rich
Department of Pharmacology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #38

Excitation scan-based assessment of FRET index in pulmonary arterial endothelial cells

Pulmonary arterial endothelial cells (PAECs) form a contiguous, semi-permeable barrier between the bloodstream and the interstitial space. PAECs differ from other endothelial cells because they carry deoxygenated blood from the right side of the heart to the lungs. Therefore,it can be inferred that PAECs will respond differently to extracellular stimuli in endothelial cells from other segments of the pulmonary vasculature. Here we measure cAMP responses ofPAECs to prostaglandin E1 (PGE1), an agonist of prostenoid (EP) receptors. EP receptors are a class of G-protein coupled receptors (GPCRs) that trigger activation of Gs proteins.

Activated Gs proteins then stimulate adenylyl cyclase enzyme that catalyzes the conversion of ATP to cAMP. Cyclic AMP activates downstream effectors including protein kinase A (PKA),which phosphorylates a variety of proteins thereby regulating cellular function. We utilized Förster resonance energy transfer (FRET)-based reporters to measure cAMP in PAECs.

FRET is a common approach used to measure intracellular signals, including cAMP. The cAMP reporter is comprised of donor and acceptor fluorophores attached to a cAMP binding domain. A conformational change that reduces FRET efficiency occurs when cAMP binds to the binding domain. FRET probes have a low signal-to-noise ratios, thus FRET efficiency is often not accurately assessed. To overcome this limitation, we utilized excitation-scan based hyperspectral imaging and analysis approaches. These approaches allow measurement of fluorescent signals at 5- to 20-fold higher signal-to-noise ratios than emission scan-based hyperspectral imaging approaches, and 20- to 80-fold higher signal-to-noise ratios than standard filter-based approaches. FRET signals were measured in PAECs as follows. PAECs were placed on glass coverslips in 6 well plates. Cells were plated on laminin coated coverslipsand cultured in DMEM growth media. 24 hours after plating, cells were transfected with a plasmid encoding a FRET-based cAMP probe (H188). The cells were incubated for 48 hours followed by transferring them to a chamber for imaging. PGE1 was added to trigger an increase in cAMP. Excitation scan-based hyperspectral imaging approaches were used to measure changes in emission from the fluorescent donor and acceptor. A FRET index was calculated using custom image analysis scripts were written in the MATLAB program. We conclude that excitation scan-based hyperspectral imaging has the potential for accurate measurement FRET efficiency within PAECs. However, more work is required to achieve thisgoal.

Khan, Fiza
Major: Biomedical Sciences (BS)

Mentor: Glen Borchert
Department of Pharmacology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #33

Salmonella Outer Membrane Vesicles contain tRNA Fragments (tRFs) that Inhibit Bacteriophage P22 infection

For decades, it was widely believed that the sole role of tRNAs was to convert the informationencoded on mRNAs into amino acid sequence. Notably, pieces of tRNAs were first observed during phage infections of bacteria, and in humans, endogenous retrovirus transposition rates can be limited by host tRF expression and specific tRFs are induced by viral infection.
Together, these findings potentially suggest a role for tRFs in innate antiviral defense. In addition, S*almonella* Outer Membrane Vesicles (OMVs) were recently shown to inhibit P22bacteriophage infection. Furthermore, despite there being several published reports now independently describing (1) the marked prevalence of tRFs within secreted vesicle transcriptomes and (2) roles for specific tRFs in facilitating/inhibiting viral replication, there have been no examinations of the effects of vesicle-secreted tRFs on viralinfection reported to date. We recently screened small RNA seq datasets for the presence ofrecurrent, specifically excised tRFs through employing a novel RNA-seq analysis platform designed to annotate fragments excised from longer noncoding RNAs (SURFr). Excitingly, we have successfully identified 31 recurrent, relatively abundant tRFs expressed by Salmonella enterica, and what's more, find Salmonella OMVs contain significant levels of tRFs highly complementary to known Salmonella-infecting bacteriophage. Strikingly, we found 17 of our 31 tRFs bear marked complementarity to at least one known *Salmonella* phagewith an average sequence alignment of 97.4% complementarity over 22.9 nt. Perhaps most notably, tRNA-Thr-CGT-1-1, 44-73, bears 100% sequence complementary over its entire 30 nt length to 29 distinct, annotated *Salmonella* bacteriophage including P22. Furthermore, we find P22 phage pre-incubation with OMVs isolated from naÃ¯ve Salmonella,successfully rescues the ability of *Salmonella* transformed with the tRNA-Thr-CGT-1-1, 44-73tRF antagomiR to defend against P22. Collectively, these experiments confirm tRFs secreted in Salmonella OMVs are directly involved with and required for the ability of OMVsto defend against bacteriophage predation.

Khan, Sofia
Major: Biology (BS)

Mentor: Dr. Amy Nelson
Department of Physiology and Cell Biology
Covey College of Allied Health Professions
Funding Source(s): SURF; NIH grant awardsR00AG058780 (A.N.)
Poster #40

Identifying Matrix- and Transporter-Type Pericytes in Human Brain

A recent ribosomal nucleic acid sequencing (RNAseq) study found two human brain pericyte subtypes- which help to make up the blood brain barrier (BBB)- 1 type termed transporter (T)- type are enriched with transporter genes and matrix (M)-type have increased expression of the extracellular matrix (ECM). Interestingly, they found that there was a decrease in M-pericytes in Alzheimer's Disease hippocampus and superior frontal cortex that may contribute to perturbations of vascular ECM. We set out to determine which protein markers will work best for the identification of M and T-type pericytes based on differential gene expression identifiedin the RNAseq study. Next, we began assessing the localization of these novel pericyte types in human hippocampal and cortical post-mortem brain tissues.

Lake, Jake
Major: Electrical Engineering (BSEE)

Mentor: Dr.Daniela Touma
Department of Electrical and Computer Engineering
College of Engineering
Funding Source(s): SURF
Poster #42

Home Power Flow and Source Control With Grid Storage

Power companies are in an eternal battle against its customers. Not for customers using power,but instead for when they use it. There are periods of time, known as peak times, that electric demand skyrockets. The reason power companies despise these drastic upticks in consumptionis that it exponentially increases power losses on transmission lines. With power companies only able to charge consumers for power that reaches the meter, this comes directly out of the power companies' pocket. In addition, these drastic increases in demand can make the grid unstable, and the cost of constantly activating and deactivating peak demand power generatorsis significant. To combat this, power companies such as Alabama Power have introduced a dynamic pricing scale to encourage consumers to level out these peaks. Instead of charging a flat rate per kilowatt-hour, Alabama Power will charge the consumers depending on when the power is consumed. Using power during peak time will result in a higher price compared to using power during non-peak time. During summer months, this price increase can be over three times that of non-peak times. If a consumer can find ways to exploit this dynamic pricing, (I.E., don't use electricity during peak times) the consumer will enjoy a significantly lower electric bill and the electric company will enjoy less line losses and improved grid stability. To realize this outcome, home level grid storage along with time aware software was implemented and studied.

Manuel, Jodie
Major: Speech and Hearing Sciences (BS)

Mentor: Dr. Dahye Choi
Department of Speech Pathology and Audiology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #35

Loci of Stuttering in Children and Adults who Stutter

The purpose of this study was to examine the possible explanations to account for AWS's tendency to stutter more on content words compared to CWS's tendency to stutter more onfunction words. Participants were 11 CWS, ages 3 to 7 and 15 AWS, ages 20 to 59.
Participants produced at least 300-word conversational speech that was transcribed and coded for the instances of stuttering, word class, and location of a word within an utterance. Results indicated that (a) CWS stuttered significantly more on function words than AWS; (b) both CWS and AWS were more likely to begin their utterance with a function word compared to a content word; and (c) the tendency of stuttering at the utterance-initial position was less pronounced in AWS compared to CWS. These findings seem to suggest that AWS stutter moreon content words because their stuttering is typically distributed across sentences rather than concentrating at the utterance-initial position as observed in CWS's speech. Several other possible reasons for the last finding were discussed.

Marchioni, Makayla
Major: Biology (BS)

Mentor: Dr. Jason Strickland and Mr. Joel Borden
Department of Biology
College of Arts and Sciences
Poster #44

Population Demographics of Eastern Box Turtles (Terrapene carolina) on the University of South Alabama's campus

The Mobile/Tensaw Delta is recognized as a turtle diversity hotspot, with the Eastern Box Turtle (*Terrapene carolina*) being one of the most common species in the region. Box Turtles are a species of conservation concern as they are currently experiencing population declines in parts of their distribution in the eastern United States primarily due to habitat fragmentation. On the University of South Alabama's (USA) campus, there is a potentially isolated populationof Box Turtles in the natural areas where the nature trail is located. The goals of our project were to use mark-recapture methods to estimate the population size of Box Turtles on campus and to analyze their demographics. Specifically, we were interested in understanding the sex- ratio, sex-specific differences in size, and if reproduction is occurring. To capture Box Turtles for data collection, we used several techniques: targeted surveys, opportunistic hand-capture, and drift fences with pitfalls and funnel traps. For each capture, we collected size, weight, sex, age, and gave it an individual marking to be used to identify it if it was recaptured. Since the study began in October 2008, we have captured a total of 156 Eastern Box Turtles including 29 recaptures (M:21, F:8). To date, we have found 80 adult males, 46 adult females, 1 juvenile, and 2 hatchlings. Due to the recapture rate being so low, we were unable to estimate the population size. However, we hypothesize that the population size is quite large given the number of Box Turtles found thus far.

McLeod, Sean
Major: Computer Engineering (BSCpE)

Mentor: Dr. Jinhui Wang
Department of Electrical and Computer Engineering
College of Engineering
Funding Source(s): SURF
Poster #37

Mitigating Nonlinearity in Memristor-based AI Systems

Today's CMOS based artificial intelligent (AI) systems, could be improved, and with the inevitable death of Moore's Law ever approaching one solution proposed is the implementationof memristor-based artificial intelligent systems. However memristor technology has its fair share of problems one of such is nonlinearity. Nonlinearity has two weighted components one is Long Term Potentiation (LTP) and the other is Long Term Depression (LTD). This researchseeks to investigate nonlinearity, observing it's affects on a memristor based AI system throughhardware simulation using the NeuroSim software, and pose a possible solution. The method introduced in this research was modifying the nonlinearity weights and observing the effect onthe system's accuracy and accuracy loss. Hardware data was also collected during the process,but wasn't the main focus. The results indicate that as the nonlinearity weights for LTP and LTD increase, then the accuracy of the system decreases or accuracy loss increases.

Nguyen, Ivy
Major: Biomedical Sciences (BS)

Mentor: Dr. David Forbes
Department of Chemistry
College of Arts and Sciences
Funding Source(s): SURF; Internships in STEM Coca-Cola Scholarship
Poster #46

The Development of Diazirine-Based Photoaffinity Probes Using Electrochemistry

In the 1960s, Frank Westheimer pioneered photoaffinity labeling, a useful technique that is used to covalently bind chemical tags to the active sites of complex protein molecules in an irreversible fashion, preventing any dissociation from the active site to permanently attach the label. To generate such specificity of labeling, photoaffinity labeling uses a reagent that can betransformed into an exceptionally reactive intermediate through photolysis. The reagent at the forefront of photoaffinity labeling are diazirine-based photoaffinity probes, the smallest photoreactive group with the most favorable cross-linking properties. Current syntheses of diazirines are low-yielding; the few high-yielding synthetic schemes operate using far from desirable reaction conditions especially when considering synthetic utility. This research aims to develop a unified synthetic approach toward the assembly of diazirine-based photoaffinity probes which minimizes synthetic overhead and the use of less corrosive and hazardous reagents. The novel and innovative synthetic scheme of interest utilizes electrochemistry to synthesize diazirines from the corresponding diaziridine. Electrosynthesis shows great promisein improving the efficiency of existing synthetic schemes to improve the yields of diazirines while significantly reducing synthetic overhead and hazard. This research explores various ketonic derivatives possessing benzylic functionality, aliphatic functionality, and electron-withdrawing functionality. Currently, we have synthesized two diaziridines and the electrochemistry application for the oxidation of the diaziridine is ongoing.

Norris, Daniel
Major: Meteorology (BS) - Graduate School Track

Mentor: Dr. Sytske Kimball
Department of Earth Science
College of Arts and Sciences
Funding Source(s): NSF under Grant OIA-2019511
Poster #39

Temperature Quality Control and Temperature Extremes of four South Alabama Mesonet Stations

While standard quality control (QC) tests exist for in-situ and Mesonet observations, integrating the results from multiple QC tests into a Decision Making Algorithm (DMA) and deciding on flagging thresholds for each QC test depends on the sensor configuration and climate zone of the observation system. Standard QC tests include an existence test, range test,like-sensor test, and a step (or persistence) test. Range test limits can be chosen by simply using the manufacturer specified sensor range. The range can easily be narrowed and, hence, produce more effective QC results by using temperature ranges by month, based on the climatology of the observing system. Similarly, the like-sensor limits (difference between two different sensors measuring the same variable) and step test limits (current observation minus previous observation) will depend on sensor types, sensor locations, and measuring interval. Therefore, measurements from the observing system are used to derive accurate QC test limits(or flagging thresholds) for each QC test.
Ten years of temperature measurements from four South Alabama Mesonet Stations (Agricola,Elberta, Florala, and Geneva) were manually QC-ed. Bad data were identified and removed using python code. Statistics before and after the removal of the bad data were calculated for the range test, like-sensor test, and step test. Statistics included minimum, maximum, mean, median, standard deviation and inter-quartile range (IQR). Statistics from after the bad data removal will be used to define flagging thresholds for each of the QC tests. These statistics also provide a temperature climatology of the north-central Gulf of Mexico region. By comparing these temperature statistics from the 4 sites, microclimates might also be identified. Another reason for doing manual QC is to make sure that instances of sudden temperature changes that could be explained by a weather feature, such as significant temperature drops after a cold front passes, are not flagged by the automated QC and removed from our data.

Omar, Mariam
Major: Chemical Engineering (BSChE)

Mentor: Dr. Marie Migaud
Department of Pharmacology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #48

Analysis and Applications of NRH Stability and Reactivity in Hyaluronic Acid and Lysine Rich Solutions

This project is centered on reduced nicotinamide riboside (NRH) which serves as a model molecule for NADH, an important biomolecule found in the body. Studies focused on the reactivity of NRH have shown that there is a lot we do not know about NADH breakdown in the body. This project has two primary goals. First, to determine the feasibility of incorporatingNRH into osteoarthritis treatments. Second, to elucidate the role of NRH in pentosidine formation. Pentosidine, a known biomarker for diabetes and uremia, has unknown origins.
Based on previous studies of NRH reactivity, this lab anticipates that NRH is a precursor to pentosidine. All the while, ongoing studies with our colleagues at USCD have shown that NRH has anti-inflammatory properties, suggesting a future for NRH incorporation into arthritistreatment, requiring new formulations approaches. Both goals aim to give us a better idea on the role of NRH in the human body and how it could possibly be used in medicine.

Overstreet, Kaitlyn
Major: Exercise Science (BS) - Pre-Professional Concentration

Mentor: Dr. Ryan Colquhoun
Department of Health, Kinesiology, and Sport
College of Education and Professional Studies
Funding Source(s): SURF
Poster #41

THE EFFECT OF CAFFEINE SUPPLEMENTATION ON RATE OF TORQUE DEVELOPMENT

BACKGROUND: Previous research investigating the effects of caffeine on neuromuscular function has mainly been performed in males, with little to no research in females especially those on oral contraceptives. Therefore, the purpose of this study was to examine the time- course of neuromuscular responses of the quadriceps following acute caffeine supplementationin college-aged females. METHODS: Twenty recreationally active females volunteered to participate in a randomized, double-blind crossover, placebo-controlled study. Participants then completed a familiarization visit and a 1-week washout, followed two experimental visitsin which neuromuscular function of the quadriceps was assessed in 20-minute intervals following the consumption of either caffeine (CAF; 6 mg/kg/bw) or placebo (PLA). Rate of torque of development (RTD) was obtained via maximum voluntary isometric contraction (MVIC), in which subjects were asked to "kick as hard and fast as possible". Peak RTD (pRTD), as well as RTD during 0-100 ms (RTD0-100) and 100-200 ms (RTD100-200) were calculated from each MVIC offline. RESULTS: Repeated measures ANOVAs indicated that pRTD was greater in CAF when compared to PLA (750.6 ± 328.7 $Nm \cdot s^{-1}$ vs. 649.5 ± 318.9 $Nm \cdot s^{-1}$, p=0.010) and collapsed across time. A significant interaction effect and post-hoc analyses indicated that RTD0-100 was significantly greater at CAF20 (552 ± 356.6 $Nm \cdot s^{-1}$ when compared to CAF100 (400.6 ± 305.7 Nm·s-1, p=0.025) and at PLAPRE (338.0 ± 240.9 Nm·s-1) when compared to PLA20 (231.4 ± 173.3 Nm·s-1, p=0.022). RTD0-100 was also significantly greater in CAF at PRE (555.0 ± 385.7 vs. 338.0 ± 240.9 $Nm \cdot s^{-1}$, p<0.001), POST20 (552.0 ± 356.6 vs. 231.4 ± 173.3 $Nm \cdot s^{-1}$, p=0.001), POST60 (523.9 ± 293.5 vs. 261.6 ± 244.5 $Nm \cdot s^{-1}$, p=0.002), and POST100 (400.6 ± 305.7 vs. 324.8 ± 175.4 $Nm \cdot s^{-1}$, p<0.001), when compared to PLA. There were no changes in RTD100-200 at any timepoint. CONCLUSIONS: The primary finding of the present study was significantly greater early-phase and pRTD in CAF, when compared to PLA. Specifically,RTD0-100 significantly declined from PRE to POST20 in PLA, but not CAF. While there wasa significant decrease in RTD0-100 in CAF from POST20 to POST100, RTD0-100 was significantly greater during CAF at POST20, POST60, and POST100. Thus, our data suggest that CAF resulted in a net increase in early-phase RTD when compared to PLA, despite the lack change from PRE in the CAF condition.

Parker, Michael
Major: Biomedical Sciences (BS)

Mentor: Dr. Padmamalini Thulasiraman
Department of Biomedical Sciences
Covey College of Allied Health Professions
Funding Source(s): SURF; Faculty Development Council Grant
Poster #43

Impact of Hydroxytyrosol on the Expression of Estrogen Receptor Î± in Mammary Carcinoma MCF-7 Cells

Proteinase inhibitor 9 (PI-9) is an estrogen inducible serine proteinase inhibitor that blocks Granzyme B initiated apoptosis in human cells. Overexpression of PI-9 in cancer cells can complex with Granzyme B and inactivates Granzyme B released by the immune system in vivo. Transcription factors like estrogen receptor α (ERα) proteins are well documented promoters of PI-9. Structurally similar to estrogen, hydroxytyrsosol (HT) has been shown in our lab to downregulate the expression of PI-9 in MCF-7 cells. Knowing that PI-9 is induced by estrogen through Estrogen receptor α (ERα), in this project, we aim to determine whether ERα expression is modulated by the introduction of HT and as a result suppresses estrogen mediated induction of PI-9. Qualitative analysis of western blots composing the first preliminary data set demonstrate that HT increases the expression of ERα in mammary carcinoma cell line, MCF7, while the second experiment shows that HT has no effect on ERα expression. Therefore, a conclusion cannot be stated, and further experimentation will be conducted.

Randle, Perrin
Major: Speech and Hearing Sciences (BS)

Mentor: Dr. Brenda Beverly
Department of Speech Language Pathology and Audiology
Covey College of Allied Health Professions
Funding Source(s): SURF
Poster #45

Measuring the Fidelity of Mothers' Early Literacy Practices During a Home Tele-Coaching Enrichment Program

This project, which is part of a broader study funded by a 2020 Phi Kappa Phi Literacy grant awarded to Drs. Brenda Beverly and Victoria Henbest, supported the development of fidelity measures for a home enrichment program that teaches parents effective strategies for early literacy development during book reading. Fidelity is a measure of accurate implementation ofcore treatment factors. The investigator developed two unique assessments to assess fidelity:
(1) weekly surveys to track self-reported participant perceptions and use of intervention strategies; and (2) self-recorded videos of participants demonstrating strategy use for 4 of the 8weeks. Survey data were summarized as average frequency of strategy use and average ratingsfor perceived strategy ease and likeability. Video recordings were analyzed for the frequency of participant strategy use during book reading. Of the 20 planned participants, 6 mother-child dyads have completed the 8-week program. Videos revealed a range of treatment strategy use from 6 to 45 times while reading one book for an average of 10 minutes. Weekly surveys revealed average likability/helpfulness scores of 6+ on a scale with 7 as the highest rating. Data analysis is ongoing and differences among weekly strategies are of interest. Assessment of participants' adherence to the protocol is needed to support treatment effectiveness. That is, outcomes focused on the preschoolers' early literacy skills cannot be assumed to be related to the book reading strategies taught to the parents if parents did not accurately or consistently apply those strategies during reading.

Reeves, Joshua
Major: Chemical Engineering (BSChE)

Mentor: Dr. Brooks D. Rabideau
Department of Chemical and Biomolecular Engineering
College of Engineering
Funding Source(s): SURF
Poster #50

Using Machine Learning to Predict Ternary Eutectics from Binary Eutectic Data

Deep Eutectic Solvents (DES) are mixtures of two or more pure components that remain liquidwell below the expectations from ideal mixing. They are being considered as replacements for conventional solvents in industrial processes, as new heat-transfer materials for concentrated solar thermal plants (CSTPs), and as phase change materials (PCMs) for improvements in energy conservation for construction. The discovery of new DESs currently requires exhaustive experimental measurements to determine the eutectic compositions and temperatures. When considering ternary or quaternary eutectics, the experimental work that is required increases drastically.

To help guide this process of discovery, we apply Neural Networks (NNs) to predict ternary eutectic compositions and temperatures from existing pure component properties and binary eutectic data. We approach this overall goal by first building our NN in a series of smaller steps, on subsets of chemical data. First, boiling points of simple organic molecules were modeled using carbon count and heat of vaporization as inputs. Next, the freezing points of straight chain alkanes were modeled to demonstrate that complex behaviors could be modeledwith mild data preprocessing. Finally, the binary eutectics of fatty acids were predicted using pure component data. In this talk, we discuss the performance of our NN in these first studies,our model for predicting ternary temperatures and compositions, as well as our initial predictions.

Robles, Georgia
Major: Mechanical Engineering (BSME)

Mentor: Dr. David Nelson
Department of Mechanical Engineering
College of Engineering
Funding Source(s): SURF
Poster #47

Development of a Heterogeneous Skin Model to Simulate Heating Effects from Exposure to RF Electromagnetic Energy Above 15 GHz

Human exposure to high frequency electromagnetic energy is rapidly increasing due to the growing prevalence of technologies utilizing waves in the GHz range. A more detailed understanding of the electric and thermal effects of RF wave absorption by human tissue is necessary to ensure the safety of such mechanisms. The most significant implication of RF wave absorption by biological tissue is thermal heating in the outermost tissue layers. A computational, three-layer model of the human skin was designed in REMCOM's electromagnetic simulation software. The sample was exposed to EM waves with frequencies of 15, 25 and 30 GHz at a power density of $1 W/cm^2$. The resulting specific absorption rates were calculated using the finite difference time domain method. The absorption rates of incident waves were found to range between 0.44 and 0.47 and over 80% of all energy absorption occurred in the dermis. A preliminary thermal simulation was run with maximum temperature increases occurring in the dermis at all three frequencies, and an overall maximum temperature increase of 2.12 K occurring at 15 GHz.

Sanders, Caleb
Major: Psychology (BA)

Mentor: Dr. Krista Mehari
Department of Psychology
College of Arts and Sciences
Funding Source(s): SURF
Poster #52

Gender Moderation in Substance Use and Academic Motivation

Very little research has been conducted focusing on the role of gender in the relation between substance use and academic motivation. Data has shown that there are multiple variables that can affect the relation of substance use and academic motivation, and the current goal is to find where gender lies in that spectrum. It is important to understand what variables influence people in what ways, and by finding variables that moderate substance use and achievement motivation in adolescents, we begin to allow researchers, counselors, and school faculty members to better understand what negatively influences students and who are potentially more at risk. That way, we are better equipped to formulate things such as treatment plans and prevention programs. A sample of 262 high school students were asked to participate in a survey during school in small groups using an online survey platform designed to measure a wide range of variables including (but not limited to) achievement motivation, gender, and substance use of various sorts. Both longitudinal and cross-sectional regression models were used to examine the extent to which substance use predicted decreases in academic motivation. Age and gender were entered as control variables. Contrary to hypothesis, gender did not moderate substance use and achievement motivation in the given sample. Also, substance use did not predict decreases in achievement motivation after controlling for baseline levels of achievement motivation.

However, substance use did predict lower levels of achievement motivation cross-sectionally.One issue in this research project was the limitation of the sample. We concluded that genderdoes not moderate substance use and achievement motivation in the given sample. While the research question could not be confirmed in this sample, it does not mean that is not possible for gender to moderate the given variables. One might be interested in investigating if these results could be replicated if done with a larger sample size.

Schlumpf, Cody
Major: Biology (BS)

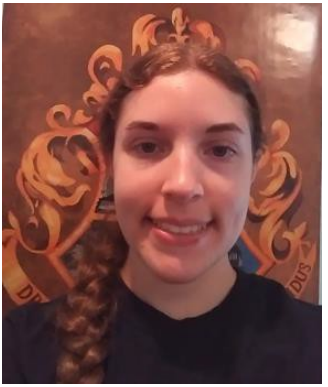
Mentor: Dr. Jonathon Audia
Department of Microbiology and Immunology
College of Medicine
Funding Source(s): SURF
Poster #49

The Effect of Superoxide on the Activation of Caspase-1 During *Pseudomonas aeruginosa* Infection

Pseudomonas aeruginosa is a bacterium responsible for more than 51,000 healthcare associatedinfections each year in the United States and is responsible for 40% of deaths related to ventilator-associated Pneumonia. The innate immune system plays a critical role in the defense against bacterial infections. Once *P. aeruginosa* is detected by the innate immune system, a cascade of protein complexes are activated to begin the host inflammatory response. This research is focused on Caspase-1, a protein activated during the immune response, and the relationship superoxide has on its activation during *P. aeruginosa* infection. In this research, the infection model used involved *the P. aeruginosa* strain PA103 and human MVR3 cells.
MVR3 cells were treated with ROS scavengers (N-Acetyl Cysteine, MitoTempo) and infected with PA103. The amount of active Caspase-1 present in the system post infection was then measured using the FLICA assay. Using this assay, the total activation of Capase-1 during PA103 infection decreased substantially when cells were treated with N-Acetyl Cysteine; however, cells treated with MitoTempo displayed no significant change in Capase-1 activation.From the data collected, assumptions can be made that superoxide plays a significant role in the activation of caspase-1, as treatment with N-Acetyl Cysteine caused the overall activation of Caspase-1 to decrease by a significant amount.

Seiler, Elizabeth
Major: Meteorology (BS) - Professional Track

Mentor: Dr. Sytske Kimball
Department of Earth Sciences
College of Arts and Sciences
Funding Source(s): SURF
Poster #54



Comparing composite atmospheric soundings of thunderstorm activity on sea-breeze and non-sea-breeze days in the Mobile, Alabama area

Sea breezes (SB) are a common phenomenon and occur frequently from May through October along the U.S. Gulf of Mexico Coast. One reason why SBs interest forecasters is their ability tospawn summertime thunderstorms, which can cause flash flooding, lightning, and hail. These can cause damage to property and injuries to the general public. However, forecasting the exact timing and location of SB-driven convection can be challenging. This presentation will focus on Mobile and Baldwin Counties in southwest Alabama, which experience two types of phenomena - SBs along the Gulf of Mexico Coast and bay breezes on either side of Mobile Bay. Over the past years, multiple undergraduate students have analyzed Mobile, Alabama radar imagery of past SB seasons and categorized each day between May 1st and October 31st into one of four categories: dry SB days, convective SB days, dry non-SB days, and convectivenon-SB days. Atmospheric balloon (or sounding) data from Slidell, Louisiana is also archived and is available from ftp://ftp.ncdc.noaa.gov/pub/data/igra/. Using a ten-year archive of SB seasons, we constructed a composite (or average) atmospheric sounding for each of the four categories by reading in individual soundings from the ten-year archive using python code.

The composite soundings were then plotted using the RAOB software, which also calculatedthe composite instability parameters. The latter are used to predict the likelihood of thunderstorm formation.

Simpson, Wade
Major: Sociology (BS)

Mentor: Dr. Hosik Min
Department of Sociology, Anthropology, and Social Work
College of Arts and Sciences
Funding Source(s): SURF
Poster #56

COVID-19 Hotspots in Mobile, AL: Implementing Social Services in High-Risk Communities

Increased levels of social services in systemic and community architecture is becoming ever more crucial to meeting the healthcare needs of minorities and marginalized communities. This need has been exacerbated by the introduction of the COVID-19 pandemic, which in turn has lead to higher rates of health-related disparities. Additionally, this "new normal" has altered our familiar way of operating and has created issues never before encountered in modern history. Problems such as increased levels of inadequate healthcare, food insecurity, and higherrates of mental health related illnesses have all contributed to for improved systemic and community-based social services. It is the goal of this project to offer five practical pathways, along with a strong theoretical framework, to help alleviate pressures felt by minorities/marginalized communities in the midst of a global health crisis. Moreover, primary populations include African Americans, and more specifically, elderly African Americans.

Prior research by public health professionals, medical sociologists, and epidemiologists is utilized and reviewed in the process of forming adequate social service recommendations and their community-based implementation. The reviewed literature is predominantly qualitative, as is the primary research approach of this project. Family stress theory, public health data, andsociological perspectives focused on the intersection of health and human rights are used to solidify argumentation, which assists in building contextual clarity. Furthermore, the geographic location for social service implementation was centered around the city of Mobile, AL in addition to its minority populations.

Singley, Ian
Major: Biomedical Sciences (BS)

Mentor: Dr. Neil Schwarz
Department of Health, Kinesiology, and Sport
College of Arts and Sciences
Funding Source(s): SURF; Horphag ResearchInc.
Poster #51

A randomized, double-blind, placebo-controlled trial evaluating the anti-inflammatory and anti-oxidant effects of Pycnogenol in an acute exercise model

The purpose of this study was to determine the effect of French maritime bark extract (FMBE) on circulating highly-sensitive C-reactive protein (hsCRP), total antioxidant capacity (TAC), and cartilage oligomeric matrix protein (COMP) following exercise in humans. Forty participants (n = 20/group) between 18 and 35 years of age completed the study. Height, body mass, and body mass index was 1.72 ± 0.1 m, 97.3 ± 20.2 kg, and 31.5 ± 4.5 kg/m^2, respectively. Participants visited the lab for an entry session and a multi-day testing session. During the entry session, informed consent was obtained followed by assessment of one- repetition maximum (1-RM) on the squat (84.1 ± 40.0 kg). Then, 200 mg of FMBE or placebo (rice flour) was ingested daily for 14 days. After supplementation, participants reported to the lab for their testing session. Upon arrival, a blood sample was obtained followed by exercise consisting of four sets of 8 squat repetitions at 60% 1-RM and 100 jumps.Blood samples were then obtained 1-hour, 24-hours, 48-hours, and 72-hours post-exercise withcontinued daily supplementation. No significant time x supplement interaction effects were observed for hsCRP ($p = 0.12$), TAC ($p = 0.24$), or COMP ($p = 0.38$). A significant main effectof time was observed for hsCRP ($p < 0.01$) with hsCRP significantly higher at 24-hr post exercise compared with baseline (2.40 ± 1.92 mg/L vs. 3.41 ± 2.10 mg/L; $p < 0.01$). In conclusion, FMBE did not affect blood markers; but exercise alone resulted in increased hsCRP at 24-hour post-exercise.

Skinner, Grant
Major: Meteorology (BS) - Broadcast Met Track

Mentor: Dr. Sytske Kimball
Department of Earth Sciences
College of Arts and Sciences
Funding Source(s): NSF under Grant OIA-2019511
Poster #58

Ten Years of Near-Surface Temperature Inversions at Four South Alabama Mesonet Stations

The South Alabama Mesonet consists of 26 research quality weather stations located in the north-central Gulf Coast area where corn, cotton, and other crops are grown. Four South Alabama Mesonet stations from various locations across southern Alabama and southeast Mississippi were chosen to study near-surface temperature inversion frequency, duration, and magnitude. All stations that were selected are in close proximity to farms and other agricultural resources.

The South Alabama Mesonet measures temperature at 4 different levels: 1.5, 2, 9.5, and 10m. Identical sensor types are used at 2 and 10m and at 1.5 and 9.5m. Hence, temperature inversions are defined as the temperature difference between 2 and 10 m. The temperature difference between 1.5 and 9.5 m is used as a quality control measure and for backup in case of missing or bad 2m/10m temperature data. A temperature difference (T2m - T10m) cutoff of -0.8°C is used to account for sensor accuracy. Past studies on near-surface temperature inversions have used different cutoff values. Inversion characteristics may help determine a cutoff value that is relevant to 1) agricultural activities and 2) the South Alabama climate. The sensitivity of inversion characteristics (frequency, duration, and magnitude) to the cutoff will be investigated.

Additionally, scalar mean wind speed at 2 and 10 meters, and total radiation values prior to and during temperature inversions will be studied to determine their influence on temperature inversion characteristics. Ten years' worth of data from 2008 to 2018 were collected and quality controlled in order to obtain accurate results.

Temperature inversions are very important to land managers and farmers due to their effect on the spread of spray pesticides and smoke. During inversion periods, both pesticides and smoke can spread much quicker. Pesticides may spread to areas that do not need to receive the pesticide treatment and can have a negative effect on other agricultural resources, other wildlife, and humans.

Smith, Logan
Major: Meteorology (BS) - Professional Track

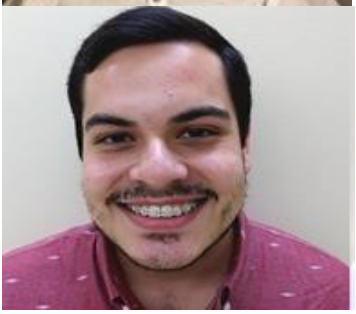
Mentor: Dr. Sytske Kimball
Department of Earth Sciences
College of Arts and Sciences
Funding Source(s): PREFER
Poster #53

Investigating near-surface temperature Inversions at a Gulf of Mexico Coast South Alabama Mesonet Station over a 3-year period

This research is focused on inversions around 2 m above the surface on the Alabama Gulf Coast. Inversions this close to the surface have large impacts on agriculture in the area. If a low level inversion like this is present when a farmer sprays their crops with pesticide the pesticide could easily spread to fields that it was not intended for or into residential areas. These inversions also have impacts in the winter with freezing. If one of these inversions are present during a cold period the crops could freeze before there would be a freeze advisory in place.
All data in this research is from the University of South Alabama Mesonet.

Eggers, Mark
Faye, Alexondria
Major: Biomedical Sciences (BS)

Mentor: Dr. Terrence J. Ravine
Department of Biomedical Sciences
Covey College of Allied Health Professions
Funding Source(s): This project was supported by an interprofessional research grant awarded by the Pat Capps Covey College of Allied Health Professions as part of the Collaborative Research Support (CORS) program initiative.
Poster #62



Developing a Quantitative Chromogenic Assay to Detect Intermediate Levels of Antibacterial Activity of Fabric Treated with Biocides

Biocides are chemicals routinely added to fabrics to extend their usable lifespan. They prevent microorganism growth associated with odors and fabric deterioration. Current textile industry standards for quantifying biocide activity have several limitations. They are cumbersome to perform, do not support multiple samples (reproducibility), and can be problematic to interpret.The current study sought to develop a new type of quantitative assay that could help alleviate some of these testing pitfalls. In doing so, we attempted to adapt a qualitative chromogenic method giving finite yes, or no, answers on biocide activity into one that could measure intermediate biocide action. The pigment producing bacterium Serratia marcescens was used todetermine optimal conditions for performing testing of treated and untreated fabric samples by the new method. Commercially available bleach was used as the biocide agent. Fabric samples were pretreated with bleach, situated in multi-well plates, inoculated with S. marcescens bacteria, and incubated overnight. Color development and bacterial numbers were assessed the next day. Spectral absorbance readings were taken at 540 nm the peak emission wavelength for *S. marcescens* pigment (prodigioson). Several attempts were made at determining the correctcombination of factors by varying experimental conditions. These included altering bacterial numbers, medium volumes, and bleach concentrations all in an attempt to gain reproducible results. However, fabric color and absorbance readings were not consistent between replicatesamples under any tested condition. A promising development involves increasing the absorbance wavelength to 600 nm to measure sample well turbidity, which allows for testingof non-pigmented bacteria.

Sutterfield, Baylee
Major: Management (BSBA) - Human Resources Concentration

Mentor: Dr. Thomas Nelson
Department of Management
Mitchell College of Business
Funding Source(s): SURF
Poster #55

Benchmarking for Outstanding Emerging Entrepreneurship Center

The Melton Center for Entrepreneurship and Innovation (MCEI) is developing and learning from other entrepreneurial centers. The "Outstanding Emerging Entrepreneurship Center" hasbeen awarded to 13 centers since 2012 by the Global Consortium of Entrepreneurship Centers(GCEC). The award honors centers that have demonstrated success in a variety of areas.

Thomas, Barbara
Major: Biomedical Sciences (BS)

Mentor: Brian Sims, MD. PhD.
Department of Pediatrics/Division of Neonatology and Center of Glial Biology in Medicine at the University of Alabama School of Medicine, Covey College of AlliedHealth Professions
Funding Source(s): National Institutes of Health (1R15DA045564-01) and # 5R25MH080661-13/2004445114.
Poster #64

Breastmilk exosomes attenuate LPS-induced activation of CD40 through p38 phosphorylation in BV2 microglia

The CD40 protein is a member of the tumor necrosis factor receptor (TNFR) superfamily, expressed on the surface of microglia, macrophages, B cells, dendritic cells, endothelial cells, and tumor cells. The binding of CD40 with its ligand, CD40L (CD154), is essential for an effective immune response. Studies have demonstrated that CD40 is normally expressed at lowlevels on microglia but is upregulated in response to Lipopolysaccharide (LPS) exposure, which leads to inflammation. Microglia are intrinsic mediators of the CNS immune response and are activated by a variety of insults involving brain-associated injuries/disorders. The CD40-CD40L complex's contact with MHC-II, CD80, and CD86 activate microglia, resulting in the secretion of various cytokines, chemokines (IL-1, IL-6, IL-10, and TNF-a), macrophage inflammatory protein 1 (MIP-1), and toxic-free radicals. Keeping these facts in mind, we hypothesized that human breastmilk (HBM) derived exosomes can attenuate LPS-induced activation of CD40 through p38 phosphorylation in BV-2 mouse microglia. To test our hypothesis, we isolated and characterized HBM-derived exosomes and BV-2 microglia were exposed according to the following four conditions: control (no treatment), LPS (1 µg/mL), HBM-derived exosomes (10 µg/mL), and simultaneous treatment with both LPS (1 µg/mL) and HBM-derived exosomes (10 µg/mL). They were exposed for 24h to study the expression of CD40 as well as pro-and anti-inflammatory cytokines using Western Blot (WB) and Ribonucleic acid (RNA) analysis. Our preliminary findings demonstrate that HBM-derived exosomes significantly downregulate the expression of CD40, p38, p44/42, and associated cytokines as compared to the control. In brief, HBM-derived exosomes have great potential forattenuating CD40 expression on microglia and its downstream effects in response to LPS exposure; however, further investigations are warranted to explore the underlying mechanism of CD40 signaling in microglial cells.

Traylor, Miranda
Major: Exercise Science (BS) - Pre-Professional Concentration

Mentor: Dr. Joshua Keller
Department of Health, Kinesiology, and Sport
College of Education and Professional Studies
Funding Source(s): SURF
Poster #57

SEX DIFFERENCES WITHIN THE VASCULAR SYSTEM DO NOT IMPACT THE RELATIONSHIPS BETWEEN MICROVASCULAR FUNCTION AND PSYCHOMOTOR SPEED IN YOUNG, HEALTHY ADULTS

Exercise benefits brain function possibly via vascular mechanisms in a sex-specific manner. Purpose: Therefore, we aimed to determine if vascular function was related to various cognitive domains as well as if there were sex differences in vascular function and cognition. Methods: Thirty adults completed two visits in which microvascular function was determined via near-infrared spectroscopy (NIRS) during a vascular occlusion test (VOT) of the forearm. Cognitive domains were tested via a battery of computer-based tests. Body composition was determined utilizing a Fit3D. Independent t-tests identified mean sex differences in the participant characteristics. Linear regression examined the rate of desaturation and reperfusionacross time. The slopes of the men and women resulting from the simple linear analyses were tested for mean differences. First-order correlations were assessed to determine relationships between cognitive and vascular function. Results: The men exhibited greater lean body mass (LBM) than the women (66.9±9.5 vs. 47.5±5.2; $p<0.05$). The men also exhibited faster ($p<0.05$) rates of desaturation and reperfusion than the women, yet this sex difference reversedwhen normalizing the NIRS signal to LBM and forearm circumference. Independent of sex, psychomotor speed correlated with the rate of desaturation ($r=-0.377$, $p<0.05$). Conclusion: It remains possible that females have greater mitochondrial respiration than males, but only afteraccounting for LBM, did we only observe a faster rate of desaturation in the females.
Furthermore, the adults, regardless of sex, demonstrated weak relationships between peripheralvascular and brain function, likely due to naturally occurring high levels of cognitive health.

Wade, Ashley
Major: Accounting (BSBA)

Mentor: Dr. Alan Chow & Ms. Tiffany Deroy
Department of Quantitative Methods
Mitchell College of Business
Funding Source(s): SURF
Poster #66

A Comparison of Price Returns for Portfolios Based on Company Size and Value Before and During the First Year of the COVID-19 Pandemic.

The COVID-19 pandemic left a significant impact on the economy and several lasting effectson many companies. The pandemic had both positive and negative effects on certain companies. Some companies, such as Amazon, thrived during the pandemic, whereas others were not so lucky and weren't even able to recover from all of the loss. I am considering comparisons of 12 months preceding the pandemic (March 2019-February 2020) and 12 months during the pandemic (March 2020-February 2021) to evaluate for changes in average price returns and the volatility of the change in price returns as measured by variance. I will utilize Microsoft Excel to test variance with an F-test to see if there was a significant difference between the price returns prior to the pandemic and during the pandemic and I willtest the average return difference with a T-test. After completing the tests I will be comparingthe returns based on the size of the company and their book value. This study will show how larger and smaller companies were impacted by the pandemic and if they were able to recoverby looking at their price returns. The data for this study will be downloaded from the Fama- French depository and I will be using the 25 portfolios based on company size and book to market value.

Watson, Skylar
Major: Biomedical Sciences (BS)

Mentor: Dr. Abigail Baxter
Department of Leadership and Teacher Education
College of Education and Professional Studies
Funding Source(s): SURF
Poster #60

Attitudes of Medical School Students Toward People with Intellectual Disability (Pilot Study)

This project was conducted with the purpose of examining the attitudes of medical school students toward people with intellectual disability (ID). The goal was to measure and identify medical school students' behaviors in clinical situations (if applicable), knowledge and skills, emotional response, feelings of responsibility of healthcare professionals, treatability of the patient, and worthiness of the patient to receive medical resources. The research was conductedby combining three questionnaires: Yi et al. Attitude toward Persons with Disability in Health Care, Morin et al. Attitudes Toward Intellectual Disability Questionnaire- Short Form, and Christison et al. Medical Condition Regard Scale (MCRS). The combined survey was then sentout through Qualtrics to a small group of medical school students considered the pilot participants. Five of the eight medical school students considered the pilot participants responded to the survey. At the end of the survey, there was a questionnaire for participants to inform the research team what they found difficult and/or confusing about the survey. Two participants responded and based on these responses; the survey was edited. One of the participants did not complete the entire survey, and it was hypothesized that the student took the survey on his/her phone and could not see the complete survey, so a warning was added to the survey about taking it on a phone. It was determined that the surveys were successful in gearing medical school students' attitudes toward patients with intellectual disability, however some changes needed to be made to make the survey easier to understand.

Whitfield, Brooke
Major: Mechanical Engineering (BSME)

Mentor: Dr. David & Dr. Michael Francis *Department of William B. Burnsed, Jr. Department of Mechanical, Aerospace, and Biomedical Engineering College of Engineering*
Funding Source(s): SURF
Poster #59

Vascularized Model of Skin for RF Dosimetry

Peripheral arterial disease (PAD) is a circulatory disorder that is caused by atherosclerosis which is a buildup of plaque in the arteries. PAD results from low blood flow mainly in the limbs of the body. Heart attack, tissue, and nerve damage are the main risk factors of this disease, and currently there is not an accurate way of diagnosing this in patients. Therefore, a device sensor utilizing RF radiation in the GHz range is in demand to help diagnose peripheralartery disease in a more effective way. In order to design this type of device, there are certain specifications and constraints that must be considered. The dielectric properties of human skinis a significant factor to consider as well as the circulatory system in the body. A phantom of human skin was designed with capillary mimicking needles embedded about 2 mm below the surface of the phantom. A flow simulation using a specific manifold design was made to mimic the blood flow through capillaries. Using a transducer, the phantom skin was heated as saline was pumped through the needles. This simulation provided useful information on how temperature varies when blood flow in capillaries are exposed to a set range of RF radiation frequencies. From this study, the effects of using radiation in the GHz range on human skin was able to be observed, and this will provide useful information for further research in the future.

Williams, Cameron
Major: Chemical Engineering (BSChE)

Mentor: Dr. Sean Walker
Department of Chemical Engineering
College of Engineering
Funding Source(s): SURF
Poster #61

Reduction of Vehicular Emissions by Altering Current Mix of Traffic

With a growing population that relies on vehicular transportation and taking into consideration that most vehicular transportation operates on an internal combustion engine, the world is currently facing a crisis from increased levels of emissions. Vehicular emissions, in particular carbon dioxide, methane, sulfur oxides, and nitrogen oxides, have been shown to contribute to issues such as climate change, rain acidification, and respiratory illnesses. One proposed method of reducing overall emissions for the state of Alabama is a conversion of some percentage of the traffic composition to electric vehicles. This has been suggested to reduce theproduction of vehicular emissions due to zero emissions from the operation of electric vehicles. These reductions are further exaggerated by the ability to recycle lithium-ion batteries. Research was conducted using data from the GREET database as well as the Federal Highway Database. A cost analysis based on the “the social cost of carbon” is utilized, using total yearly emissions to measure savings from reduced carbon dioxide emissions. The results of this paper can be used as the basis for implementing infrastructure that supports electric vehicles, as it would lead to human health benefits, and carbon cost reduction for the state of Alabama.

Wilson, Aaron
Major: Biomedical Sciences (BS)

Mentor: Dr. Robert Barrington
Department of USA College of Medicine
Department of Microbiology & Immunology
Covey College of Allied Health Professions
Funding Source(s): SURF; American Lung Association Biomedical Research Grant
Poster #63

Single cell-level transcriptomics of self-reactive B cells in mice with Pulmonary Alveolar Proteinosis

Autoimmune pulmonary alveolar proteinosis (aPAP) is a rare, often terminal lung syndrome affecting adults. aPAP is caused by autoreactive B cells that produce antibodies (gmAAB) against granulocyte-macrophage colony stimulating factor (GM-CSF) thereby neutralizing its activity. Neutralization of GM-CSF results in the accumulation of pulmonary surfactant in the alveoli causing respiratory insufficiency. To remove excess surfactant, patients undergo whole-lung lavages to clear the airways. However, this procedure offers only temporary relief.
Recently, our lab discovered a novel rodent model in which mice with aPAP have higher frequency and quantities of GM-CSF specific B cells as well as gmAAB compared to healthymice. This parallels findings in aPAP patients that have higher titers of gmAAB compared to healthy individuals. Little is known regarding genes encoding for the gmAAB produced by GM-CSF specific B cells from healthy vs. patients with aPAP. This study aims to investigatedifferences in the genes encoding for these gmAAB by using single-cell transcriptomics fromGM-CSF specific B cells of healthy mice and mice with aPAP. We hypothesize that gmAABwill differ between mice with and without aPAP. If this is not the case, this would provide support for a “threshold” hypothesis whereby a threshold amount of gmAAB is required to cause disease.

Yang, Joshua
Major: Electrical Engineering (BSEE)

Mentor: Dr. Saeed Latif
Department of Electrical Engineering
College of Engineering
Funding Source(s): SURF
Poster #68

Discrete Watchdog Circuit for Low Earth Orbit CubeSats (With Hard Reset Function)

While traditional watchdog integrated circuits are typically used to trigger a soft reset by performing a quick software reboot on the system when an error is detected, a discrete hardware solution is necessary to create a more robust error checking system and save the spacecraft potentially from radiation based single event effects. In space, transient radiation can create errors and upsets that can permanently disable the CubeSat and render the mission a failure. While single event effects are not likely to occur in low earth orbit due to the lower radiation levels, they are still a possibility and must be monitored to ensure the success of a CubeSat mission. The watchdog circuit design proposed in this paper is a fully discrete solution that monitors the operation of the CubeSat through a single input line and can be programmed to wait between a time span of 500 us to 4.8 hours through resistors. When the input fails to read a proper “heartbeat”, the circuit times out and disconnects the battery for approximately 20 seconds, conducting a hard reset and clearing the system of single event errors, saving the CubeSat. The CubeSat can also be directly reset at any time through a secondinput line.

University of South Alabama
Office of Undergraduate Research
Shelby Hall, Room 4135
150 Student Services Dr.
Mobile, Alabama 36688
Ph: (251) 341-3078