ABSTRACTS
SECTION I. BIOLOGICAL SCIENCES

Paper Session I
Thursday Morning, 8:00 AM – 12:20 PM
KCC Rooms F&G
Gordon MacGregor & Brad Bennett, Presiding

1. 8:00 am DISCOVERING OF NOVEL ANTI-TOXOPLASMOSIS DRUG COMBINATIONS. *Daniel Abugri* and Aarian Huffman, Tuskegee University. Toxoplasmosis is one of the top neglected parasitic diseases that affects over 2 billion people globally, with over 60 million Americans chronically infected. Few drugs are available for the treatment of the acute stage (tachyzoites) infection. However, these drugs are limited in efficacy, safety and are very expensive. Thus, novel inhibitors are urgently needed for the treatment of acute and chronic toxoplasmosis. Here, we report the anti-*T. gondii* activity of apigenin-7-O-glucoside, curcumin, and quinoline-based compounds (hydroquinine, 8-hydroxyquinoline, and 4-hydroxyquinazoline) against *T. gondii* growth *in vitro*. In our first study, we identified apigenin-7-O-glucoside alone and its combination with quinoline-based compounds to inhibit *T. gondii* RH-YFP (type I) tachyzoites growth up to 80%. In the second study, we identified curcumin and its combination with quinoline-based compounds to remarkably inhibit *T. gondii* ME-49 (type II) strain growth. Interestingly, the combinations treatments were found to be effective in inhibiting parasites growth up to 60% at low micromolar concentrations. Very importantly, most of the individual compounds and their combinations were found to have minimal cytotoxic effects at 48 hours interaction. Overall, the data showed that the *T. gondii* RH-YFP (type I) as well as *T. gondii* ME-49 (type II) strains, known to affect most HIV-AIDS patients, could possibly be treated using these apigenin-7-O-glucoside-quinoline-based and curcumin-quinoline based combination therapies. Further studies are ongoing to decipher their mechanism(s) of action as well as determine their potency and safety *in vivo*.

2. 8:20 am **g FUNCTIONAL ANALYSIS OF THYMIC NURSE CELLS IN LUPUS PRONE MICE. *Montessa Mitchell* and E'Lashae Richards Scott, Sheryce Henley, Edeoba W. Edobor and Marcia Martinez, Tuskegee University. Introduction: Functional loss of thymic epithelial cells, including thymic nurse cells (TNCs), is believed to contribute to faulty education of self for thymocytes, resulting in autoreactive T lymphocytes whose response to self-antigens is a consistent feature of Systemic Lupus Erythematosus (SLE). Objective: To analyze TNC function in SLE prone mice. Method: NZBW TNCs were isolated, immortalized, and cloned. Immunocytochemistry and fluorescent microscopy were used to analyze clones for the ability to interact with CD4+/CD8+ (DP) thymocytes and for constitutive and induced expression of major histocompatibility complex (MHC) proteins. Clones were coincubated with DO 11.10 thymocytes bearing transgenic T cell receptors specific for cOVA 323-339 fragment. Thymocytes were collected, stained with Annexin V or Bcl2 antibodies, and analyzed by flow cytometry. TUNEL stain was used to observe apoptosis among thymocytes interacting with TNC clones. Results: Two clones were found to interact with DP

thymocytes, but only one expressed MHC class II proteins. NZBW clones consistently had less Annexin V or TUNEL positive thymocytes than BALB/c.
Conclusion: TNCs of lupus-prone mice appear to be functionally limited in their ability to induce apoptosis among DP thymocytes.

3. 8:40 am **g INTRATHYMIC NURSE CELL TRANSPLANT REDUCES MORBIDITY AND MORTALITY IN SLE-PRONE MICE. *Michael Henderson*, Sheryce Henley and Marcia Martinez, Tuskegee University. Introduction: Systemic Lupus Erythematosus (SLE) is a chronic, inflammatory, autoimmune disease characterized by tissue destruction resulting from the aberrant behavior of lymphocytes. Studies suggest that loss of self-tolerance associated with SLE leads to end-organ tissue damage and a high mortality rate. Functional loss of thymic epithelial cells, including Thymic Nurse Cells (TNCs), is believed to contribute to faulty self-education of T lymphocytes. We hypothesize that replacement of TNCs will ameliorate tissue damage and decrease mortality in SLE prone mice. Objective: To observe the effect of intrathymic TNC transplantation on tissue morphology and mortality in lupus-prone mice. Materials & Methods: Immortalized TNCs derived from BALBc mice were fluorescently labeled and injected into the thymi of twelve-week old NZBWF/1 mice. Untreated age-matched mice or saline-injected animals were used as controls. Serum was collected bi-weekly and urine every 4 weeks for analysis of anti-DNA antibodies and proteins respectively. Mice were also observed over time to assess changes in mortality and morbidity. Results: Mice that were recipients of intrathymic TNC transplants showed an increase in survival and median age at natural death. TNC recipients also showed a reduction in proteinuria and serum levels of anti-DNA antibodies when compared to control groups. Conclusions: Intrathymic transplantation of TNC's into lupus prone mice results in decreased mortality and may ameliorate some of the downstream effects contributing to kidney damage associated with SLE.

4. 9:00 am **u CYTOTOXICITY AND COMPLEXITY OF THE VENOM FROM *CTENUS HIBERNALIS*. *Jonathan Berkuta*, Brad C. Bennett, and Robert A. Hataway, Samford University. There is an ongoing need for therapeutic drug discovery, especially antibiotics and neuromodulatory compounds. Novel compounds within venom have shown promise in both basic and translational research, as demonstrated in neuropathological studies of epilepsy and stroke. Molecular consequences of toxins include the modulation of specific ion channels and regulation of signal transduction pathways. Spider venoms are multicomponent mixtures of small molecules, peptides and proteins, many of which function as toxins and have distinct molecular targets in prey. *Ctenus hibernalis*, a wandering spider native to Alabama, has venom possessing nearly 2000 components. From a previous proteomic study, the identities of many of these components could not be characterized. Also, it was unknown whether this venom would have cytotoxic effects in mammalian cell lines. In a previous study, raw venom was extracted and was found to significantly reduce the viability and compromise the morphology of C2C12 muscle cells. In an attempt to understand the components responsible for prey capture and morbidity, RNA from the venom glands was extracted for paired-end poly-A sequencing of the mRNA transcripts. A transcriptome was assembled and several potential toxin components were identified based on annotation and protein sequence analysis. Primers were designed for these components and four putative toxin genes have been amplified. These were subsequently cloned into an

expression vector in order to synthesize recombinant toxin. These will be used in cell culture studies to associate certain pathological effects with specific toxins and to identify bona fide molecular targets in prey.

5. 9:20 am **u AN IN-DEPTH EXAMINATION OF THE BLACK BELT TICKS AND THE PATHOGENS THEY HARBOR. *Anna Holycross* and Tracy Keener, University of West Alabama. In the past few decades, tick-borne diseases have become much more numerous and frequent across the United States, with approximately 300,000 cases presenting annually. There are currently sixteen known tick-borne diseases in the United States, with Lyme disease (*Borrelia*) being the most prominent. Tick borne diseases are the most common vector-borne illnesses in the United States currently, and their transmission is still not fully understood. Because tick borne illnesses mimic the flu, it can be a very arduous task to detect and diagnosis the various diseases. Due to the growing threat of these diseases, approximately 5,000 dollars was spent in the 2016 fiscal year to conduct research in order to combat these diseases, and this monetary amount is projected to dramatically increase over the next few years. Three of the most common tickborne diseases are Lyme Disease, Ehrlichia, and Rickettsia, each with its own vectors, symptoms, and geographical regions. Studies are currently being conducted to better understand the transmission, life cycle, and treatment for these diseases, but here have been no confirmed treatments or preventions thus far, and the research is in its infancy; however, vaccines and the use of biomarkers are at the forefront of this research and seems to be possible much-needed solutions to these tick-borne diseases.

9:40 am COFFEE BREAK

6. 9:50 am **u LAB ANIMALS AND HUMAN DIETS: WHAT CAN WE LEARN? *Anna Grace Ballard*, Sophie Bru, Benjamin Marsh, Jarod Lowe, Michael Williams, Chloe Childress, and Stephen Watts, University of Alabama at Birmingham. Laboratory research animals are generally fed diets that are formulated to support their dietary requirements. Over the last few decades, lab animals have often been fed diets that reflect ingredients, nutrients, or bioactive food component profiles associated with the human diet in an effort to understand how diet might contribute to overall organismal health and, as a consequence, human health. Recently, zebrafish have been identified as effective models for dietary-induced obesity and related comorbidities. In this study, we surveyed college students and acquired a typical meal item, freeze-dried the material, and ground into a powder. These meals were fed to zebrafish for a period of 14 weeks ad libitum (6 to 10 % of body weight per day) and compared to a control diet formulated to provide all daily nutritional requirements. Fish were fed twice daily in 2.8 L tanks containing 14 fish, 4 tanks per diet. Survival was high (>96%) in all diets. Highest weight gain was seen in fish fed the formulated diet, the diet of which had the highest P:E ratio (134 mg/kcal). Lowest weight gain was found in those fed Ramen noodles (P:E of 30 mg/kg). All other diets provided intermediate weight gain. Reproductive success was limited in those fed human diets, suggesting one or more nutrients were limiting in either quantity or quality. These data suggest that zebrafish can be used as a model for evaluating ingredients and nutrients associated with the human diet.

7. 10:10 am URBAN TURTLE PROJECT: DOCUMENTING TURTLE POPULATIONS OF BIRMINGHAM URBAN WATERWAYS. *Andrew Coleman*, Hueytown High School. Alabama represents one of the world's greatest hotspots of

chelonian biodiversity, but little research has been done on Alabama's urban turtle populations. The present study aims to be a long-term conservation project that documents the demography, ecology, and survival of turtle species inhabiting the waterways of the Birmingham metropolitan area. Efforts began in 2017, and several sites in the Cahaba River and its tributaries as well as tributaries of the Black Warrior River were sampled. Nine of the possible ten species were captured, including the the protected Alabama Map Turtle (Graptemys pulchra) and Alligator Snapping Turtle (Macrochelys temminckii) species. Data gathered are already providing critical conservation and management information that will help ensure the continued survival of these populations.

8. 10:30 am **g EFFECTS OF CHEMICAL DISPERSANT (COREXIT 9500A) ON THE HISTOLOGY AND ION TRANSPORT FUNCTION OF BLUE CRAB (*CALLINECTES SAPIDUS*) GILLS. *Amanda Weiner*, Megan Roegner, and R. Douglas Watson, University of Alabama at Birmingham. Chemical dispersants are widely used in the remediation of spilled oil. When applied to an oil spill, such dispersants move to the oil/water interface and break the oil into small micelles, facilitating its dispersion through the water column. The several life cycle stages and broad distribution of blue crabs (*Callinectes sapidus*) increases the likelihood of their exposure to chemical dispersants used in remediation of spilled oil. Crustacean gills have multiple functions, including respiration and ion transport. Despite the economic and ecological significance of blue crabs in the western Atlantic and Gulf of Mexico, the effects of chemical dispersant on the structure and function of blue crab gills have not been adequately investigated. In studies reported here, adult blue crabs were exposed to the chemical dispersant Corexit 9500A (60-125ppm) under static conditions in glass aquaria containing artificial sea water. Effects of dispersant on gill structure were assessed using conventional histological methods. The results indicate exposure to Corexit 9500A resulted in an increase in gill epithelial edema. Effects of Corexit 9500A on gill ion transport function were assessed by quantifying the abundance in gills of transcripts encoding two Ca2+ transport proteins, plasma membrane Ca2+ ATPase (PMCA) and sarco/endoplasmic reticulum Ca2+ ATPase (SERCA). Results of quantitative PCR showed PMCA and SERCA transcript abundance was significantly lower in gills of dispersant-exposed crabs than in gills of control crabs. The combined results are consistent with the hypothesis that exposure of blue crabs to Corexit 9500A negatively impacts the structure and ion transport function of gill tissue.
Research supported by the BP/Gulf of Mexico Research Initiative.

9. 10:50 am **u EDIBLE OLEOGELS: BIOACCESSIBILITY OF RETINYL PALMITATE. *Isaiah Byrd*, University of West Alabama; Nuria Acevedo, Iowa State University. Oleogels have the potential to entrap and protect labile molecules while providing a suitable matrix for the delivery of lipid bioactive components. Previously, it was demonstrated that 10% Policosanol oleogels (PCOs) can entrap and protect retinyl palmitate (RP) from photodegradation. The goal of this study was to determine the ability of PCOs to gradually release RP during in-vitro digestion. PCOs were prepared at 10% w/w concentration containing 1% w/w RP. RP in liquid oil (RP-LO) was used as a control to account for the effects of structural difference on the release of RP. A three part (saliva, gastric, duodenal) in-vitro digestive system was developed to evaluate bioaccessibility of RP in the different matrices. Samples were collected at various times

(0, 30, 60, 120, 180 min) upon the duodenal stage to analyze the rate and amount of RP released. Normal phase high-performance liquid chromatography was used to quantify RP in the digested fractions. Compared to RP-LO, the RP-PCO had a slower and gradual RP release over three hours of digestion. The maximum release of RP from the liquid oil was observed after 30 minutes digestion whereas the maximum RP bioaccesibility in PCOs was upon 60min digestion. Our results demonstrated that PCOs are a suitable strategy to allow controlled and enhanced bioaccessibility of RP in food systems.

11:10-11:20 am COFFEE BREAK/

BUSINESS MEETING (Elect Vice-Chair for 2019-2021)

10. 11:20 pm **u ANNELID WORMS LIVING IN TOXIC HYDROGEN SULFIDE. *Shelby Lauzon*, Judson College, and David Johnson, Samford University. Very few species of Annelid worms live in Sulfur-rich environments. Little is known about the physiology of these few organisms that allows them to survive in toxic environments. An Annelid species belonging to the genus *Limnodrilus* was discovered in 2016 thriving in a highly toxic sulfur spring. The aim of our research was to identify the main mechanisms by which the *Limnodrilus* sp. detoxify themselves of hydrogen sulfide. Our data suggests that the *Limnodrilus* sp. exhibits two detoxification mechanisms via a sulfur dioxygenase enzyme and a sulfur-oxidizing bacterial symbiont. We used 16S rDNA primers from other sulfur-rich environment annelids to find these mechanisms. Current research involves the use of fluorescence *in situ* hybridization (FISH) to attempt to verify the presence of bacterial symbionts. Our study will help inform how these mechanisms play a major role in the longevity of this organism.

11. 11:40 pm POLYPARASITISM IN THE BLOOD OF THE TUFTED TITMOUSE (*BAEOLOPHUS BICOLOR*) AND NORTHERN CARDINAL (*CARDINALIS CARDINALIS*). *Kayla Fast*, University of West Alabama. Blood parasites are ubiquitous in wild populations of birds and are genetically diverse. The parasites that cause avian malaria and similar diseases are transmitted to birds through the bite of specific insects (Order Diptera). In the wild, blood parasites can be maintained in bird populations as benign infections, while some cases are fatal. We report a high prevalence of polyparasitism (i.e., the presence of more than one parasite in a single host) in the Tufted Titmouse (*Baeolophus bicolor*) and Northern Cardinal (*Cardinalis cardinalis*). Total parasite prevalence was 86.0% in titmice and 74.0% in cardinals as determined using polymerase chain reaction (PCR). Parasite genera *Plasmodium*, *Parahaemoproteus, Leucocytozoon*, and *Trypanosoma* were found at significantly different levels in the two bird hosts in either singular or mixed infections. Cardinals were infected significantly more often with *Parahaemoproteus* single infections and *Parahaemoproteus/Plasmodium* mixed infections. Titmice, on the other hand, harbored more *Trypanosoma* single infections and *Trypanosoma*/*Plasmodium* mixed infections. Overlapping habitat between certain insect vectors and bird hosts is a possible explanation for why specific bird species are infected with specific parasites, but this theory requires further investigation. We also show evidence that infection with certain parasites is influenced by season, host sex, age, and health. Sanger sequencing and phylogenetic analysis of parasite cytochrome b and 18S rRNA genes revealed that titmice and cardinals are infected with some of the same genetic lineages of parasites including several novel lineages.

12. 12:20 pm **u FIRST EVIDENCE OF STRIPED BASS NATURAL REPRODUCTION IN THE TENNESSEE RIVER**.** *Karen M. Inouye*, Samford University; Anthony S. Overton, Samford University and Alabama A&M University; and Douglas A. Smith, Alabama A&M University. Striped bass, a very popular game fish, do not natural occur in the Tennessee River system. Water flow conditions in reservoir systems generally cannot support striped bass recruitment. Striped bass were stocked in several reservoirs in Tennessee beginning in 1964 up until 1988 By ADCNR. Although ADCNR ceased striped bass stocking 1988, age-1 fish striped have been collected observed by Alabama Fisheries Biologist in Wilson, Wheeler, and Guntersville Reservoirs. This suggest that striped bass are successfully reproducing in the Tennessee River. The goal of this project is to determine if striped bass natural reproduction is occurring in Wheeler Reservoir. We conducted ichthyoplankton sampling during March-June (2016-2018) in Wheeler reservoir and its tributaries (Flint and Paint Rock Rivers). Larval striped bass abundance was variable throughout the study. We collected 38 total striped bass larvae in 2016 and 2018. There were no larval striped bass during 2017. Approximately 90% of the striped bass larvae were collected during May. There were no clear spatial patterns in larval abundance. Our study provides clear evidence that striped bass are successfully spawning and recruiting in Wheeler reservoir. Wheeler reservoir joins Lake Powell (Utah), Lake Texoma (Texas-Oklahoma), and Santee-Cooper (South Carolina) as the only confirmed reservoirs in the United States where striped bass are successfully spawning and recruiting.

***u* or ***g* Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.

SECTION I – BIOLOGICAL SCIENCES
Poster Session
Thursday Afternoon
KCC Atrium and Ballroom Foyer
Authors Set-up: Begins at 7:30 AM
Authors Present: 1:30 PM – 3:30 PM
Gordon MacGregor & Brad Bennett, Presiding

14. **u THE EFFECTS OF EXERCISE OF MEMORY: THE BRAIN-BODY CONNECTION. *Shelby Perez*, Faulkner University. This study should result in a higher memorization of the pictures after the exercises. I believe all the training methods will have a higher percentage of memorization than the non training group. Testing the memory will happen with a set of 40 pictures and then using different styles of exercise consisting of interval, resistance, and aerobic training to see which type of training methods will be most effective upon helping the memory to remember the set of pictures. Two tests will be administrated a baseline recall test to see where all of the participants stand with their initial memory recall. The second test will be done when the each group will finish the required twenty minutes of exercise time. The results will be analyzed and recorded.

15. **u *In Vitro* INTERACTION OF TANNIC ACID AND SULFADIAZINE AGAINST *TOXOPLASMA GONDII*. *Joy Massey*, Daniel Abugri, and Aarin Hoffman, Tuskegee University. *Toxoplasma gondii (T. gondii*) is a zoonotic neglected parasite that continues to infect over 2 billion people globally, with over 60 million people infected in America. Currently, there are no effective vaccines nor drugs for the treatment of the chronic stage of *T. gondii* infection in humans and animals. The few medicines that inhibit the proliferation of the acute stage (tachyzoite) are very toxic and expensive. Thus, there is an urgent need to develop new inhibitors that will be safe, effective and affordable for the treatment of both human and animal toxoplasmosis. Here, we hypothesized that "tannic acid which is known to have antimicrobial and antioxidant properties when combined with sulfadiazine will potentiate its anti-*Toxoplasma gondii* activity". From this study, we reported the *in vitro* activity of tannic acid alone and in combination with Sulfadiazine against T. gondii (RH-GFP) strain. We observed that at lower concentrations of tannic acid and sulfadiazine alone inhibited parasites growth ranged from 2% to 29%, and 4% to 35% respectively, whereas in the combination treatment, the inhibition of parasites growth was ranged from 16% to 19%. Further studies are ongoing to assess these findings and will be presented during the conference.

16. **u ANTI-PROLIFERATION ACTIVITY OF HYDROQUININE COMBINATION WITH GENISTEIN AGAINST *TOXOPLASMA GON*DII. *Carlyn Logwood* and Daniel Abugri, Tuskegee University. Genistein is a natural isoflavone compound derived from soybean. This compound is known to have anticancer, antiparasitic, and chemo-protectant properties. Dihydroquinine (hydroquinine) is a pharmaceutical impurity that has been known to have antimalarial and antibacterial properties. Little is known about

the dihydroquinine alone and its combination with genistein anti-Toxoplasma gondii (*T. gondii*) activity. Thus, this study will assess the anti-proliferation activity of genistein, hydroquinine, and their combination against T. gondii strains using human foreskin fibroblast as a medium of propagation. We will communicate the anti-proliferation activity of T. gondii parasites using 48 and 72 hours interaction during the conference.

17. **g NUTRIENT IMPACTS ON LARVAL SETTLEMENT OF THE UPSIDE-DOWN JELLYFISH. *Lindsay MacMillan* and Dustin Kemp, University of Alabama at Birmingham. Nutrient loading in coastal waters is a threat to marine ecosystems. Using the upside-down jellyfish, *Cassiopea* spp., this study investigates how increased concentrations of nutrients affect larval settlement. The impact of four concentrations of PO_4^{3-}, NO_3^- and NH_4^+ on larval settlement of *C. xamachana* and *C. frondosa* was monitored for four days. Two cues known to successfully induce settlement in these species were used and compared with similar nutrient treatments without cues. Interestingly, high concentrations of nutrients did not cause larval death before settlement, and there was a difference in settlement response between the two species. *C. frondosa* larvae reached just 10-30% settlement with an added chemical cue, while settlement was negligible for all other treatments. *C. xamachana* larvae treated with the same chemical cue reached 70-80% settlement; and when treated with NH_4^+ settlement was increased by 7-10% compared to the control groups without nutrient additions. Conversely, PO_4^{3-} treatments inhibited settlement up to 75% for *C. xamachana* larvae given the same chemical cue. We plan to expand upon these finding by adding the juvenile life stage (i.e.- ephyra) that contain algal symbionts (family: Symbiodiniaceae) to examine how these nutrients may affect the symbiotic partnership once strobilation has occurred.

18. **u DISCOVERY OF NOVEL BACTERIOPHAGE *OKaNui*. *Kaitlyn Mayfield*, Kayla Fast, Tracy Keener, and Michael Sandel, University of West Alabama. Bacteriophage (Phage) are a specific type of virus that infects a host bacteria for the purpose of replication and as a source of food. Bacteriophage destroy their host to release new phages when their need for them has subsided. Bacteriophage are an exceedingly significant component in the discovery of new treatments for bacterial diseases. As viruses and bacteria evolve, they are becoming immune to antibiotics which was my motive for discovering my bacteriophage. *OKaNui* was a phage discovered in Meridian, MS from a soil sample collected in August 2018. *Mycobacterium smegmatis* mc2155 was the host bacterium. Various techniques were applied including spot and full-plate titers, serial dilutions, polymerase chain reaction (PCR), and gel electrophoresis. DNA from *OKaNui* was extracted and concentrated. *OKaNui* has been added into the official SEA-PHAGES bacteriophage database.

19. **u BIOTIC AND ABIOTIC FACTORS AFFECTING THE DISTRIBUTION OF CARRION BEETLES IN A LARGE URBAN PARK IN ALABAMA. *Erik Johansen*, John Bryant, Neilly Ficken, Madeline Fric, Grant Gentry, Hannah Harper, Luke McKay, Bella McLay, and Madeleine Mitchell, Samford University. Carrion beetles are decomposers that provide essential ecosystem services. Central Alabama is at the fringe of carrion beetle habitat, thus population distribution of these species is not well characterized in this region. We investigated whether habitat type, soil temperature, soil compaction, air temperature, and ant presence impact carrion beetle presence and

distribution using pitfall traps in Red Mountain Park, Jefferson County. We found that habitat type, soil temperature, and soil compaction did not have a significant impact on carrion beetle distribution. However, we determined that air temperature correlated with ant presence, and consequently ant presence had a significant impact on carrion beetle presence. We hypothesized that ants affected carrion beetle presence since these species compete for carrion.

20. **u EFFECT OF TANNIN ON WEEVIL POPULATIONS ACROSS OAK SPECIES. *Merrilea Duke*, Johnny Herbert, Erin Prester, and Malia Fincher, Samford University. Tannins are secondary metabolites used by oaks trees as a defense against enemies, such as weevils, due to their ability to bind proteins in the midgut epithelium of the weevil. Our experiment examined tannin content and weevil infestation rates in six oak species. We predicted that oak tree acorns with higher tannin content would have lower rates of weevil infestation and that oak species in the red oak group would have a lower rate of weevil infestation, because red oaks on average have a higher tannin concentration than white oak species. We collected representative samples from six species of oak and quantified the weevil infestation rate per individual tree. We used a colorimetric method to extract and quantify the tannin levels in acorns of each species. We found that on average red oak species do indeed have a higher tannin concentration than white oak species. However, examination of weevil infestation of acorns and tannin concentration among three species of white and three species of red oak revealed that only two species had significant relationships between tannin content and weevil infestation. These correlations showed conflicting trends, with tannin content negatively associated with weevil infestation in post oaks, as predicted, but positively associated with weevil infestation in southern red oak. These counterintuitive results may be the result of multiple species of weevil attacking oaks in the area, particularly if the degree of dietary specificity of the weevils varies. Specialist and generalist herbivores and seed predators often respond differently to plant defenses.

21. **u THE EFFECTS OF STRESS ON *STREPTOMYCES* PIGMENTATION. *Zeenia Punjani*, Kristi Martin, Sarah Adkins, and Jeffery Morris, University of Alabama at Birmingham. *Streptomyces* are prolific soil bacteria, known for their production of secondary metabolites, including over 60% of all clinically utilized antibiotics. *Streptomyces* colonies often create pigmentation, visible on agar plates as a range of colors, which are related to their production of these volatile metabolites. Understanding when and why *Streptomyces* produce pigments is therefore important to researchers interested in their clinical and basic science applications. Based on unexpected observations from agar art created in a Course-based Undergraduate Research Experience, this study investigated the effect of stress on the loss of pigmentation of two *Streptomyces* strains isolated from soil, *Streptomyces chartreusis* and *Streptomyces lavendulae*. Both of the isolates were cultured under nutrient-rich growth conditions where both strains presented their original pigment (red and blue, respectively). Streak plates of each isolate were exposed to five different stresses in separate petri dishes: high cell density, low carbon media, cross-competition with other microbes, antibiotics, and ultraviolet light. Both *S. chartreusis* and *S. lavendulae* demonstrated evident discoloration in the presence of each of the five stress environments. These results indicate that some *Streptomyces*' pigmentation may only form in conditions that mimic their environment and decolor in the presence of stress. Ongoing research is elucidating

the generalizability of these findings by conducting the same methods on an array of *Streptomyces* strains.

22. **u AN INVESTIGATION INTO EFFECTS OF ARTIFICIAL SUGAR IN MICE. *Alexandra Selico-Dunn*, Faulkner University. A seven-week rearing experiment was completed on mice in order to determine the relationship between use of artificial sugar and pure cane sugar in regards of overall health. Results were obtained from each experimental and control groups of mice. Each individual mouse was weighed at the end of each week and had their FBG (Fasting Blood Glucose) taken three separate times throughout the experiment. The mice received the sugar each morning which was based on their weights. During the trial, three mice developed mass-abscess like tumor on their bodies. The results from the experiment showed no significant effect of the sugar treatments on weight gains and FBG and that the pure can sugar mice were overall as healthy as the mice who received artificial sugar.

23. **u *NiaP*, A PUTATIVE VITAMIN B3 TRANSPORTER, IN BACTERIA. *Shannon Gilstrap*, Katie Burelle, Kloe Freeman, and Brad Bennett, Samford University. Vitamin B3 compounds, such as niacin and nicotinamide, can be converted into nicotinamide adenine dinucleotide (NAD), a cofactor that is crucial to many metabolic processes. Using a growth and rescue assay, we looked at the uptake of vitamin B3 in a *ΔnadA* knockout mutant of E. coli, where a de novo NAD synthesis pathway would be blocked and a salvage pathway would have to be utilized in order for the cell to survive. Here, the salvage pathway would involve uptake niacin via a transporter. The *NiaP* family of transporters is not well studied but has been shown to transport vitamin B3 in two bacterial species so far and may have orthologues across the all Domains of life. These are likely members of the multifacilitator superfamily (MFS) and possess 12 moderately conserved transmembrane regions. Using bioinformatics and molecular biology, we have identified, PCR-amplified, and cloned *niap* genes from several bacterial species into plasmid vectors. Our goal is to expand this functional assay to determine whether *NiaP* in probiotic species such as *Lactobacillus casei* are definitively niacin transporters. This would help to quantify the beneficial properties of common probiotics found in foods and dietary supplements.

24. **u EXPRESSION OF RECOMBINANT TAMM-HORSFALL PROTEIN IN KIDNEY CELLS FOR LARGE SCALE ISOLATION AND PURIFICATION. *Valentyna Trull*, Judson College; Kaice LaFavers and Tarek El-Achkar, Indiana University School of Medicine. Tamm-Horsfall Protein (THP) is the most abundant protein found in the urine, and is produced in the thick ascending limb (TAL) of the loop of Henle. THP is a glycoprotein that regulates ion transport in the TAL, protects against urinary tract infections and kidney stones and serves as a marker for kidney function. Mutations in the UMOD gene have been associated in patients with medullary cystic disease type 2, familial juvenile hyperuricemic nephropathy, and glomerulocystic kidney disease, demonstrating its importance for optimal kidney function. Polymerization of THP *in vivo* is regulated by its Zona Pellucida domain but our lab has isolated a truncated form of THP that does not polymerize. This form has shown promising use as therapeutic treatment to protect against kidney injury in a mouse model. The goal of my project is to develop a system to express this truncated form of THP recombinantly in tissue culture. To do this, we first determined the optimal conditions to transfect a plasmid expressing

recombinant THP into a kidney cell line and then used these conditions to begin establishing a stable cell line expressing THP. Ongoing work includes validating the stable cell line and optimizing conditions for large scale protein production and purification. These findings will be used to produce THP in cell culture, thereby alleviating the need to extract the protein from human urine. This recombinant THP will be used as a therapeutic agent in mouse studies with an end goal of translating these findings to humans with kidney injury.

25. **u DISCOVERY, ISOLATION, AND CHARACTERIZATION OF MYCOBACTERIOPHAGE Candle. *Emma Ryan*, Kayla Fast, Tracy Keener, and Michael Sandel, University of West Alabama. The mycobacteriophage *Candle* was discovered in a soil sample found in Northport, Alabama at the base of garden okra plants. Using the host, *Mycobacterium smegmatis* mc²155, the sample was filtered, purified, and diluted until the bacteriophage was ready for DNA extraction. Techniques including polymerase chain reaction, gel electrophoresis, and grid staining were used in the final steps. Photos of the phage were taken before finally being archived

26. **u THE ADVENTURES OF DISCOVERING A BACTERIOPHAGE: *SUMTER*. *Garren Granec*, Kayla Fast, Tracy Keener, and Michael Sandel, University of West Alabama. A bacteriophage is a virus that hijacks a bacteria in order to replicate. The discovery of the bacteriophage *Sumter* was a complex process. It began by taking a soil sample from the University of West Alabama Rodeo Complex. Sumter was then filtered and purified. Then the phage DNA was extracted and then the whole genome was sequenced. The phage was stained with uranyl acetate, and images were captured using a transmission electron microscope.

27. **u DISCOVERY AND PURIFICATION OF THE BACTERIOPHAGE *Chip*. *Anna Morse*, Tracy Keener, Kayla Fast, and Michael Sandel, University of West Alabama. Bacteriophages are a type of virus that infect bacteria. The bacteriophage, *Chip*, was discovered on West Main Street, Livingston, Alabama on 9/4/18. *Chip* was collected by digging into the damp soil with a plastic spoon and putting the soil in a plastic bag. A series of methods was used to purify *Chip*, which included: filtration, enriched isolation, plaque assays, serial dilutions, and webbed plates. From the lysate, DNA was extracted and the phage was imaged by transmission electron microscopy.

28. **u ENVIRONMENTAL ANALYSIS OF FREETOWN CREEK IN PERRY COUNTY. *Quenteeria Mooney* and Kristopher McConnell, Judson College. In order to protect the environment and prevent the spread of communicable disease, municipal sewage must be treated before it is released into the environment. Inadequate treatment of sewage prior to release can result in nutrient pollution and elevated levels of fecal coliform bacteria. We tested pollutant levels in Freetown Creek south of Uniontown, a small community in southern Perry County, Alabama. Freetown Creek lies in close proximity to the Uniontown sewage lagoon. We detected elevated levels of fecal coliforms on multiple occasions, as well as consistently elevated levels of dissolved phosphates. However, these levels were also observed in Freetown Creek upstream of the lagoon, suggesting that they may be due to agricultural runoff.

29. **g BRINGING BACK LONGLEAF PINE: ARE THREATENED AVIAN SPECIES RESPONDING? *Natalie Harris*, Robert Gitzen, and William Gulsby, Auburn

University. The historical distribution of longleaf pine (*Pinus palustris*) included approximately 36 million ha of the southeastern United States; now it only exists within 3% of its original range. Unfortunately, >30 threatened or endangered species rely on the savanna ecosystems of which this species is an integral part. The U.S Fish and Wildlife Service, through their Partners for Fish and Wildlife program, has been planting longleaf pine on private land for the last 16 years in an attempt to restore longleaf ecosystems and benefit wildlife that rely on them. However, the program's efficacy at supporting focal avian species such the Bachman's Sparrow (*Peucaea aestivalis*) has not been evaluated. In 2018 we surveyed 42 private properties throughout south Mississippi to assess the presence/absence and occupancy probability for this species during the breeding season. We detected 3 individuals at 1 property during our first field season. Although our results are preliminary, it appears that the effectiveness of longleaf restoration efforts are limited by post-planting management. Specifically, the absence of frequent, low-intensity prescribed fire on many of the sites we sampled may be leading to poor habitat conditions within restored longleaf stands. These findings may be used to inform future longleaf restoration program requirements.

30. **u ISOLATION AND CHARACTERIZATION OF CORYNEBACTERIUM XEROSIS LYSOGENS. *Sristi Das* and Denise Monti, University of Alabama at Birmingham. Phages are the most abundant entities on earth and are believed to play a key role in nutrient cycling in the environment. Lytic phage infection is marked by production of new viral particles and bursting of the host cell to release progeny virus. Temperate phages take advantage of a phage integration system to stably integrate the phage genome into the genome of the bacteria host (lysogeny). In 2017, students in the UAB Phage Genomics program isolated and characterized 5 novel phages infecting the host *Corynebacterium xerosis*. These were among the first known phages isolated for this particular host and all appeared to have characteristics of temperate viruses. Full genome sequencing of 4 of the 5 phages proved all genomes contained a tyrosine integrase gene. In this project, we sought to determine whether stable lysogens could be isolated for each of the 5 newly characterized viruses. We then tested cross-infection of the lysogens using a new panel of *C. xerosis* phages isolated in fall 2018. We were able to isolate lysogens for all 5 *C. xerosis* phages and noted distinct infection patterns in the lysogen infection experiments. The results of these experiments were used to inform selection of additional *C. xerosis* phages for full genome sequencing in 2018. Taken together, these results show that *C. xerosis* phages share similar integration enzymes with other phages infecting hosts of the Order Actinomycetales despite host specificity. Moreover, lysogen cross-infection experiments can be informative for the selection of unique genomes prior to full genome sequencing.

31. **g CHEMICAL RESPONSE OF LOBLOLLY PINE (*PINUS TAEDA* L) TO *LEPTOGRAPHIUM TEREBRANTIS*. *John Mensah*, Auburn University; Mary A. Sword Sayer, USDA Forest Service; Ryan L. Nadel, Auburn University; George Matusick, New York City Department of Environmental Protection; and Zhaofei Fan and Lori G. Eckhardt, Auburn University. Loblolly pine (*Pinus taeda* L) is well known for its structured physical and chemical defensive mechanisms against invasion by pest and pathogens. Within the chemical defense system, a number of secondary metabolites such as terpenes, phenolics, and alkaloids, have been shown to possess antimicrobial properties. However, the quantity and quality of these metabolites differ based on a

particular pathosystem. The goal of the study is to assess the changes in total resins and phenolic content of loblolly pine undergoing growth stress from the root pathogen *Leptographium terebrantis*. Quantitatively, the induced resins in the *L. terebrantis* inoculated trees were significantly higher relative to the constitutive resins but the total soluble phenolics did not differ. There was no mortality in the low, medium, and sterile inoculated trees but mortality from the high inoculum trees was 13%. The cause of mortality is attributed to the copious amount of resins produced which occluded the sapwood triggering hydraulic dysfunction.

32. THE EFFECT OF NITROTYROSINE ON SKELETAL MUSCLE GROWTH AND DIFFERENTIATION. *Mattye Crowder* and Mary Anne Garner, Judson College. Tyrosine nitration is a hallmark of many neurodegenerative diseases. While the biochemical mechanism for the production of nitrated tyrosine residues in proteins in these disease states has been elucidated, it is unknown how these changes affect cellular metabolism. Here, we investigate the effects of free nitrotyrosine, a modified amino acid, on skeletal muscle cell growth, differentiation, and viability. Skeletal muscle was chosen as a model system since there is evidence for tyrosine nitration in the muscle fibers of patients and animal models of amyotrophic lateral sclerosis (ALS), also known as Lou Gehrig's disease. Though the focus of ALS tends to be the degeneration and death of motor neurons, it is of interest to discover the effects nitrated tyrosine residues might have on skeletal muscle health and consequently motor neuron viability. The nature of motor neuron degeneration in ALS is not completely understood, and the interaction of motor neurons with affected skeletal muscle may affect the overall health and viability of both tissues.

33. **u CHARACTERIZATION OF 513 NOVEL, PUTATIVE SMALL RNAS (SRNAS) IN CARBON-STARVED *SALMONELLA ENTERICA SEROVAR TYPHIMURIUM*. *Donavon Dahmer*, University of South Alabama. Small RNAs (also known as sRNAs) are short (estimated 50-200 nucleotides long) noncoding RNAs that control cellular functions in prokaryotes. In *Salmonella enterica* starved of a carbon-energy source, hundreds of (previously uncharacterized) sRNAs have been identified as bacterial regulators of microbial defenses against stressors (e.g. sterilization techniques and antibiotics). Specifically, sRNAs are now known to specialize in altering the levels of protein coding genes in correspondence to their external surroundings (stressors) to ensure a high survival rate. Of note, less than 10 *Salmonella* sRNAs had been identified just five years ago. That said, within the past two years, the Borchert lab published a work identifying 58 entirely novel sRNAs involved in regulating the *Salmonella* carbon starvation response. Excitingly, through coupling the methodologies presented in that original study with several novel strategies, we have now successfully identified and validated 513 entirely new *Salmonella* sRNAs as presented here. Strikingly, in addition to their practical implications, our results suggest sRNA genes actually outnumber protein coding genes in *Salmonella* as well as in many other bacterial species. Perhaps most importantly, however, we found evidence suggesting several of the sRNAs identified in this work will likely prove functionally relevant to *Salmonella* stress adaptation and the acquisition of antibiotic resistances and therefore represent novel therapeutic targets.

34. **u SEX RATIO PRODUCED IN KEMP'S RIDLEY RECOVERY PROGRAM AT THE PADRE ISLAND NATIONAL SEASHORE DURING THE 2017 NESTING

SEASON. *Elizabeth Bradley* and Thane Wibbels, University of Alabama at Birmingham. Due to extensive conservation efforts by American and Mexican agencies, the fate of the world's most endangered sea turtle, *Lepidochelys kempii*, the Kemp's Ridley sea turtle, has grown more optimistic with every nesting season. However, the increasing impacts of global climate change has the potential to undermine this success. Kemp's Ridley sea turtles have temperature-dependent sex determination in which higher incubation temperatures result in female hatchlings and cooler incubation temperatures result in male hatchlings. This study, which is a part of the Kemp's Ridley Recovery Program, evaluates the sex ratios from sea turtle nests on Padre Island National Seashore using histological examination of dead hatchlings collected from nests during the 2017 nesting season. The current data indicates a significant female bias. This may be beneficial for the population, as increased numbers of females could potentially improve the rate of recovery for this population in future seasons. This data will be utilized by the National Park Service, and the many partners of the Kemp's Ridley Recovery Program, to optimize their Kemp's Ridley Recovery Program.

****u** or ****g** Denotes presentation entered in student competition as an undergraduate or graduate student, respectively.