Schedule of Events – Auburn Research: Student Symposium 2023
March 28th
Auburn University Melton Student Center

Judges Check in and Check out.
Level 2 – 2326

7:30 a.m.
Continental Breakfast (Level 2 - beside rooms 2222 and 2223)
Registration (7:30 am – 3:30 pm - outside Level 3 Ballroom)

8:00 a.m. – 3:30 p.m.
Oral Presentation Sessions
(Level 2 - rooms 2107, 2109, 2216, 2222, 2223, 2225, 2227, 2326)

9:30 a.m. – 10:45 a.m.
Poster Session I
(Level 3 - Ballroom)

11:15 a.m. – 12:30 p.m.
Poster Session II
Networking Lunch
(Level 3 - Ballroom)

1:00 p.m. – 2:15 p.m.
Poster Session III
(Level 3 - Ballroom)

2:45 p.m. – 4:00 p.m.
Poster Session IV
(Level 3 - Ballroom)

Auburn Research: Student Symposium 2023
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Presentations Abstracts

Title: Effect of different inclusion levels of a multi-component enzyme on growth performance and nutrient digestibility of young chicks

Primary Author: Gerardo Abascal Ponciano

Additional Authors: Charles Starkey;Caroline Gregg;Brittany Wall;Joshua Flees;Jessica Starkey;Diego Ernesto Ventura Urbina

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Previous studies demonstrated that dietary carbohydrases maintain optimal broiler performance. The objective of this experiment was to evaluate the effects of a commercial carbohydrase (ENZ) at 4 concentrations on the performance and nutrient digestibility of 22-d-old broilers. The 10 experimental corn-soybean meal-based treatments were: 1) a positive control diet (PC) with phytase at 500 FTU/kg of feed (PHY), 2) a mid-control diet (MC) with a 50 kcal/kg reduction in energy + PHY, 3) a negative control diet (NC1) with a 100 kcal/kg reduction in energy, 4-5) NC1 + ENZ at 1,000 or 3,000 xylanase units (XU)/kg (NC1A and NC1B , respectively), 6) NC1 + PHY (NC2), 7-10) NC2 + ENZ at 1,000, 2,000, 3,000, or 4,000 XU/kg (ENZ1, ENZ2, ENZ3, and ENZ4, respectively). One-thousand-d-old chicks were randomly allotted to raised floor pens with 5 birds/pen and 20 replicate pens/treatment. Means were separated with the PDIFF option of SAS V9.4 PROC GLIMMIX at $P \leq 0.05$. On d 22, broilers from PC and MC treatments had greater body weight (BW) than all other treatments ($P < 0.05$). The lowest feed intake was reported in birds fed ENZ1 diet, but it was similar to NC1, NC1B, and ENZ3-fed broilers ($P < 0.05$). Broilers fed PC and MC had the greatest BW gain, however ENZ2-fed broilers were able to gain similar weight as MC treatment ($P < 0.05$). Broilers fed PC diet had the best feed efficiency, followed by MC-fed broilers, but these were similar to ENZ3 ($P < 0.05$). Protein retention was higher for MC-fed broilers, which was similar for NC1B and ENZ3 ($P < 0.05$). Meanwhile, the apparent metabolizable energy was the highest for broilers fed PC and MC diets ($P < 0.05$). Protein digestibility was higher for ENZ2-fed broilers, but this was similar to MC, NC1B, NC2, ENZ3, and ENZ3 ($P < 0.05$). Overall, broilers fed diets with 100 kcal/kg energy reduction and supplemented with 2,000 and 3,000 XU/kg outperformed the negative controls, which could be partially due to the utilization of dietary protein.

Title: Leaf temperature regulation in eastern United States forest trees: The influence of leaf traits and resource availability

Primary Author: Emily Acer

Additional Authors: Michael Aspinwall;Heather Alexander;Daniel Jones;Scott Enebak

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Temperature has a direct effect on leaf physiological processes (e.g., photosynthesis, respiration). However, the temperature that trees experience at the leaf level (Tleaf) is often decoupled from air temperature (Tair). Theoretical and experimental work has indicated that leaf morphology and physiology can influence Tleaf regulation, defined as β (β = ΔTleaf – ΔTair). However, which traits most strongly influence Tleaf regulation remains unclear; we also do not understand whether species differences or resource availability changes the relationship between leaf traits and Tleaf regulation. In this study, 11 angiosperm tree species native to the eastern U.S. were grown outdoors from November 2021 to September 2022 under a factorial combination of water and nutrient availability. From May to September, monthly diurnal measurements of canopy Tleaf and stomatal conductance were temporally matched with Tair measurements. Leaves were collected to measure leaf dimensions, leaf dry matter content, leaf mass per unit area, leaf chlorophyl content, and stomatal density. Using these data, we addressed three questions: 1) Does β differ among diverse tree species of the southeastern U.S.? 2) Do species leaf traits (structural, anatomical, gas-exchange) explain variation in β across species? and 3) Does resource availability alter species leaf traits, and in turn, β? Preliminary results indicate that Tair and Tleaf are strongly correlated ($p < 0.001$), but the relationship between Tleaf and Tair differs between treatments ($p < 0.020$). The high water treatments had lower β than the low water treatments, indicating that increased water availability supports greater Tleaf regulation across all species. Results of this study could improve our basic understanding of Tleaf regulation across species and growth conditions and help predict the effects of climate warming on species with different functional strategies and ecological niches.

Title: A fundamental study on the influence of biomass source and operation conditions on the self-assembly of cellulose-based hydrogels

Primary Author: Florrie Adams

Additional Authors: ;Sydney Brake;Soledad Peresin

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Cellulose-based products are gaining traction in the realm of research and applications. Due to cellulose availability, renewability and versatility for processing into films, beads, and other products. Of particular interest is the case of cellulose hydrogels, also known as beads due to their high specific area, porosity, and low density. Notably, cellulose-based beads have become a valuable area of research when studying their potential functionalization opportunities in fields such as medicine delivery, water remediation, purification, fertilizer delivery, etc. There have been various cellulose regeneration methods and starting sources used in the production of these beads, however, the effect of these in resulting porosity, density, as well as chemical and thermal properties are not well understood. This research focuses on filling this knowledge gap. Beads were produced by dissolving nanocellulose from wood and soybean hulls as well as traditional dissolving pulp in a chilled solution of NaOH and urea, and then regenerating the solution into spheres by administering drops through a syringe into three different regeneration baths consisting of citric acid, nitric acid, and sulfuric acid. Chemical, physical, and structural properties were studied using SEM, FTIR, and solid content. Comparing the characteristics of the beads formed from different starting materials and regeneration baths can give insight into the process and the applications possibilities.

Title: Tensile and fracture characteristics of fibrous cellulose papers: A study of processing parameters using DIC

Primary Author: Azeez Adekunle Adebayo

Additional Authors: ;Hareesh Tippur;Burak Aksoy

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: In this work, tension and fracture characteristics of cellulosic papers/films made of hardwood and softwood are studied. The role of process parameters and film thickness on the mechanical properties of these microscopically fibrous films are of primary interest. The hardwood cellulosic papers are made of commercially procured cellulose nano fibrils made into a solution of 2 wt% consistency. The softwood papers on the other hand are made from softwood pulp which is a commercial grade bleached softwood kraft. Both types of sheets are made following the modified hand sheet making procedure recommended by TAPPI. Different paper thicknesses ranging from 50-400 micrometer are prepared in the hardwood CNP category to examine the thickness effect. In case of softwood paper, processing of cellulose fibers in terms of beating duration is used to optimize the mechanical performance. In both these studies, full-field measurement of deformations is undertaken using digital image correlation method. Mechanical parameters of interest in the tension tests include elastic properties as well as ultimate stress and strain at failure. In fracture studies, the critical stress intensity factors as well as crack growth resistance behaviors are quantified.

Title: Non-destructive evaluation of corrosion status in cables used for aerospace applications

Primary Author: Yaqub Babatunde Adediji

Additional Authors: ;Jindong Wei;Haoran Wang

Department/Program: Materials Engineering

College: College of Engineering

Abstract: Corrosion is a significant problem in various industries and causes costly repair expenses and system failures. In aerospace engineering, red plague corrosion is a specific type of corrosion that affects silver-plated copper conductors, leading to reduced electrical conductivity and potential avionics failure. Existing methods for monitoring and detecting this corrosion are both destructive and expensive. Therefore, this study explores the use of s-parameter signals (Sij) as a non-destructive method for monitoring and characterizing red plague corrosion in silver-plated copper cables. Results obtained indicate that Sij signals at medium frequencies (10 MHz to 100 MHz and 100 MHz to 1 GHz) are sensitive to corrosion and can be used for monitoring the progression of corrosion over time. Numerical differences in S-parameter signals between fresh and corroded samples also increase over time. This research provides a potential solution for non-destructive monitoring and detection of red plague corrosion in aerospace applications.

Title: Assessment of Salmonella and Campylobacter isolates from pullets to final raw product of an integrated commercial broiler complex

Primary Author: Yagya Adhikari

Additional Authors: Richard J Buhr;Pankaj Prakash Gaonkar;Dianna Bourassa;Matthew Bailey;Ken Macklin;James Krehling;Kaicie Chasteen;Luis Rolando Munoz Romero;Cesar Escobar Lobo;Leticia Orellana Galindo;Steven Kitchens;Stuart Price

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Salmonella and Campylobacter are bacterial pathogens of both economic and foodborne importance in the poultry industry. With the aim to isolate these pathogens, and to determine potential risk factors for introducing them to the poultry complex, a total of 1340 samples were collected from various stages of an integrated broiler complex. All samples were analyzed with a 3M-Molecular Detection System (MDS) for rapid screening and suspect positive samples were further processed for confirmation of result and identification. This study is an epidemiological study. From pullet farms, 5 MDS Salmonella positive and 6 MDS Campylobacter positive samples were identified. Among these, one sample for Salmonella and Campylobacter tested culture positive. From breeder farms, there were 57 MDS Campylobacter positive samples, 7 of which tested positive on culture; none of the samples tested positive for Salmonella with the MDS. Broiler farms had 13 MDS positive samples for both Salmonella and Campylobacter. Among these, 7 and 2 samples for Salmonella and Campylobacter respectively tested culture positive. The hatchery had 17 MDS Salmonella positive and 2 MDS Campylobacter positive samples. From these, 5 samples tested culture positive for Salmonella while none tested culture positive for Campylobacter. Finally, from the processing plant, 3 and 11 samples for Salmonella and Campylobacter respectively tested positive with MDS and culture. Salmonella rough_O:r:1,5 isolate was identified from a pullet farm and serotypes S. Barranquilla, S. Kentucky, S. Liverpool and S. Luciana were identified from broiler farms, transport and processing plant. Similarly, serotypes S. Enteritidis and S. Typhimurium were identified from hatchery. With these findings, it can be inferred that the surroundings of poultry houses include various risk factors that can transmit these foodborne pathogens into the poultry complex, and hence, potentially to the consumers. Keywords: pathogens, broiler, serotypes   *Salmonella Campylobacter S.*

Title: Lower body power is related to hitting performance in youth athletes

Primary Author: Trent Agee

Additional Authors: Nicole Bordelon;Billy Lozowski;Anthony Fava;Adam Nebel;Gretchen Oliver;Yuki Yanagita

Department/Program: Kinesiology

College: College of Education

Abstract: Baseball hitting requires force generated by the lower extremity to be transferred through the trunk, upper extremities, and the bat to maximize performance. The purpose of this study was to evaluate the relationship between lower body power and hitting performance (exit velocity (EV)) in 51 youth (9-17 yrs) baseball athletes [right-handed (n = 48); 11.5 ± 1.7 yrs, 152.4 ± 13.2 cm, 50.5 ± 15.5 kg]. Each performed 2 trials of a standing broad jump (SBJ), triple broad jump (TBJ), and single leg lateral rotational jump (LRJ) (bilaterally) followed by 3 swings off a stationary tee positioned in the center of the strike zone. Exit velocity was measured using a Rapsodo® Hitting 2.0 unit positioned 4.3 m from home plate. Peak jump distances and EV were used for analysis. Pearson-product moment correlations determine bivariate associations between jump distances (cm) and EV (mph). A forward multiple linear regression, including height (cm) and jump distances, was performed to determine the best predictor of EV. Height was entered initially to estimate the proportion of variance accounted for by the anthropometric measure. The additional predictive value of each jump distance, above and beyond the predictive effects of height were also estimated ($\Delta R2$). Statistical significance was set a priori to $p < .05$. The mean peak EV was 56.1 ± 8.03 mph. Bivariate correlations determined all jump distances were significantly and positively related to EV (all p-values < .001). The regression analysis indicated that height accounted for 65.9% of the variance in EV alone. The predictive model was improved by adding peak SBJ [$\Delta R2 = .090$; $R2 = 0.749$, $F(2, 48) = 71.7$, $p < .001$]. On average, the model predicted that a 1.1 mph increase in exit velocity for every 10 cm increase in peak SBJ ($\beta = .376$, $p = < .001$). Lower body power is positively related to hitting performance in youth baseball hitters. Specifically, coaches can use the SBJ to monitor training progress and best predict EV.

Title: Comparative toxicity analysis of peptide-based and lipid-based nanoparticles: branched amphiphilic peptide capsules (BAPCs) and lipid nanoparticles

Primary Author: Tosin Akinsipe

Additional Authors: ;Nitish Sunil Kunte;Jose Noveron-Nunez;Emilee Middleton;Erin McGraw;Adriana Avila Flores

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: Lipid-based nanoparticles (NPs) are frontliners in nanomedicine, as their use as mRNA carriers and in drug delivery has become prominent over the years. However, growing concerns about their toxicity have moderated their clinical translation and led to studies that focus on any adverse effects that could be associated with them. Branched amphiphilic peptide-capsules (BAPCs), a protein-based nanoparticle used in this study, was developed by our group. Published studies have highlighted the potential and advantages of BAPCs in mRNA delivery compared to lipid nanoparticles (LNPs), hence we aimed to use this study to elucidate the toxicological behavior associated with these two major classes of organic NPs. For our comparative studies, we used both in vitro and in vivo analysis to fathom their potential harmful effects on cells. In vitro toxic effects of both NPs were evaluated based on oxidative stress, cell viability, and programmed cell death. For in vivo studies, serum from blood samples collected from mice 24 h after injection with nanoformulations was measured with specific enzymes to check biomarkers that could be indicative of organ or cell damage. Our results indicate that LNPs and BAPCs induced minimal cytotoxicity in vitro but showed no significant toxicity in our in vivo studies.

Title: Revisiting automatic evaluation of extractive summarization task: Can we do better than ROUGE?

Primary Author: Mousumi Akter

Additional Authors: ;

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: It has been the norm for a long time to evaluate automated summarization tasks using the popular ROUGE metric. Although several studies in the past have highlighted the limitations of ROUGE, researchers have struggled to reach a consensus on a better alternative until today. One major limitation of the traditional ROUGE metric is the lack of semantic understanding (relies on direct overlap of n-grams). In this paper, we exclusively focus on the extractive summarization task and propose a semantic-aware nCG (normalized cumulative gain)-based evaluation metric (called Sem-nCG) for evaluating this task. One fundamental contribution of the paper is that it demonstrates how we can generate more reliable semantic-aware ground truths for evaluating extractive summarization tasks without any additional human intervention. To the best of our knowledge, this work is the first of its kind. We have conducted extensive experiments with this new metric using the widely used CNN/Daily Mail dataset. Experimental results show that the new Sem-nCG metric is indeed semantic-aware, shows higher correlation with human judgement (more reliable) and yields a large number of disagreements with the original ROUGE metric (suggesting that ROUGE often leads to inaccurate conclusions also verified by humans).

Title: Investigating the impact of R-Etodolac on the blood-brain barrier

Primary Author: Amer Al khalifa

Additional Authors: ;Amal Khalil Kaddoumi;Hailey DeFreese

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Alzheimer's disease (AD) is a devastating neurodegenerative condition characterized by a gradual decline in memory and cognitive function. The blood-brain barrier (BBB) plays a crucial role in preserving the stability of the central nervous system (CNS). In AD brains, the BBB integrity and function are compromised, thus, restoring the BBB function as a therapeutic approach could treat AD. The objective of this work is to examine the effect of R-etodolac on the BBB-endothelium function and integrity in an in vitro cell-based model with AD characteristics. Western blot analysis and immunofluorescence staining were performed to assess the expression of β-catenin, claudin-5, occludin, and VE-cadherin in bEnd3 cells after treatment with R-etodolac. Permeability studies were also performed to evaluate the intactness of the cell-based BBB model. Our findings demonstrated that R-etodolac increased the expression of β-catenin, claudin-5, occludin, and VE-cadherin, in a dose-dependent manner, which resulted in a reduction in the monolayer permeability and enhanced its intactness. Additionally, our results showed that R-etodolac resulted in a significant decrease in the expression of cyclin-dependent kinase 5 (cdk5) and increased the phosphorylation of GSK-3β which were correlated with the observed increase in β-catenin levels. Thus, cdk5 and GSK3β inactivation would stabilize β-catenin and lead to its increased expression. Taken together, these findings suggest that R-etodolac could provide a novel mechanism for restoring BBB function and integrity, with implications for the treatment of AD and other neurodegenerative disorders. With these promising results, several experiments are currently in progress to validate these findings and to fully understand the molecular mechanisms underlying the protective effects of R-etodolac on the BBB.

Title: Role of CXCL7 in colon cancer progression

Primary Author: Hadeel Aldhowayan

Additional Authors: ;Elizabeth Lipke;Michael Green

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Colorectal cancer (CRC) is one of the most common cancers worldwide and the third most common cause of cancer deaths in the United States. Chemokines are inflammatory molecules linked to tumor progression. The chemokine (C-X-C motif) ligand 7 (CXCL7) is a potential biomarker for CRC diagnosis. However, its role in CRC progression is not known. Hence, this study was undertaken to determine the role of CXCL7 in mediating colon cancer proliferation through enhanced aerobic glycolysis. Using colon cancer cells (HT-29) transfected with CXCL7 or an empty vector as a control, we examined the effect of CXCL7 on the proliferation and glycolytic flux using lactate accumulation in the media of the cultured cells. In addition, we treated HT-29 cells with conditioned media (CM) from HEK-293T transfected CXCL7 cells or vector transfected cells as a control. The specificity of CXCL7 actions were examined using a CXCL7 neutralizing antibody and an antagonist (SB225002) to the CXCL7 receptor, CXCR2. We observed a 10-fold increase in the CXCL7 mRNA and a 52-fold increase in the secreted CXCL7 protein in CXCL7-expressing HT-29 cells. The proliferation rate in CXCL7 expressing HT-29 cells and HT-29 cells cultured with the CXCL7-CM were significantly higher (1.2-fold and 1.8-fold, respectively) compared to controls ($p<0.01$). Importantly, blocking the CXCL7/CXCR2 axis using the CXCL7 neutralizing antibody and the CXCR2 inhibitor abrogated CXCL7-stimulated proliferation. Lactate levels were two-fold higher in both culture media of CXCL7-expressing HT-29 cells and HT-29 cells treated with CXCL7-CM compared to the controls ($p<0.05$). In conclusion, our study for the first time showed that CXCL7 stimulates cell proliferation and lactate production in HT-29 colon cancer cells, suggesting that CXCL7 may stimulate colon cancer proliferation by modulating aerobic glycolysis.

Title: How Artificial intelligence (A.I.) is transforming the prevalence of neuroinfectious disease

Primary Author: Caleb Alford

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Jack Deruiter

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Artificial Intelligence is currently revolutionizing the field of medicine. This technological advancement has the ability to serve multiple purposes such as treating, diagnosing, and preventing infectious diseases that encompass the human and animal central nervous system (brain and spinal cord). However, many of these central nervous system (CNS) associated infectious diseases currently have poor prognoses and no specific cure. Some of these incurable neuroinfectious diseases caused by bacterial or viral infections include meningitis, encephalitis, progressive multifocal leukoencephalopathy, neurosarcoidosis, and transverse myelitis. Many of these communicable diseases have multiple symptoms that can lead to inflammation of the nervous system which can result in cognitive disabilities, movement disorders, psychological disturbances, or death. Currently, most of these infectious diseases are utilizing different treatment approaches such as immunotherapy, antibacterial, antiviral, and anti-inflammatory medications. Therefore, it has never been more important to precisely refine the functions of artificial intelligence to an early diagnosis, minimize the symptoms and prevalence of specific neuroinfectious diseases. In doing so, ultra-precise procedures and measurements performed by artificial intelligence can ultimately ensure a decrease in morbidity, mortality, and healthcare cost due to technological and financial advancement in the diagnostic and preventative forms of treating infectious diseases.

Title: Extra-virgin olive oil effect on blood Proteome in mild cognitive impairment

Primary Author: Nour Fadel Mahmoud AL-GHRAIYBAH

Additional Authors: ;Melissa Boersma;Amal Khalil Kaddoumi;Dylan Spivey;Andrew Roberts

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Mild cognitive impairment (MCI) represents a stage between normal cognitive function and dementia. The rate at which MCI progresses to dementia is 8-15% per year. Thus, MCI has been proposed to be a stage preceding Alzheimer's disease (AD). Previous research showed the positive effect of olive oil by decreasing the risk of AD. Previously, our lab showed the beneficial effect of extra-virgin olive oil (EVOO) in AD mice models and in individuals with MCI. Compared to refined olive oil (ROO), EVOO is a high-quality olive oil obtained from the first pressing of olive fruit, which yields an oil rich with phenolic compounds. The objective of this research is to investigate the role of olive oil phenolics on blood protein levels in MCI individuals. Twenty-five participants with MCI were randomized to receive 30 ml/day of EVOO or ROO for 6 months. Blood samples were collected at baseline and after six months of consumption. Protein levels in the blood samples were analyzed using LC/MS/MS followed by quantitative proteomic analysis. Statistical analysis was performed using SPSS software for significant changes in protein levels caused by EVOO-phenolics. Samples were examined for normality, followed by paired t-test and ANOVA. For non-normally distributed samples, appropriate non-parametric tests were used. Changes in protein levels were observed with EVOO consumption suggesting EVOO-phenolics altered various pathways. Based on the proteins altered, our work could identify potential pathways and molecular mechanisms affected by EVOO-phenolics.

Title: Machine learning models for predicting membranolytic anticancer peptides

Primary Author: Atefe Alimirzaei

Additional Authors: ;Christopher Kieslich

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: After heart disease, cancer is the second leading cause of death worldwide. Recently, membranolytic anticancer peptides (ACPs) have received considerable attention for their ability to target and kill cancer cells. Identification of ACPs is costly and usually time-consuming. Therefore, the development of efficient computational methods is of a great importance to aid in the identification of potential ACP candidates. In the current study, we developed multiple models using support vector machines (SVMs), gradient boosting classifiers (GB), and random forest classifiers (RF) to predict membranolytic anticancer activity given a peptide sequence. Oscillations in physiochemical properties in protein sequences have been shown to be predictive of protein structure and function, and in this work, we are taking advantage of these known periodicities to predict ACP sequences. To this end, Fourier transforms were applied to the property factor vectors to measure the amplitude of the physiochemical oscillations, which served as the features for our models. Peptides targeting breast and lung cancer cells were collected from the CancerPPD database and converted into physiochemical vectors using 10 property factors for the 20 natural amino acids. Using these datasets, cross-validation has been applied to train and tune the models based on multiple training and testing sets. Additionally, feature selection has been performed to further optimize our SVM models. To evaluate the models, performance has been quantified based on cross-validation classification accuracy. Furthermore, to try our prediction accuracy, we have also considered other sets of physiochemical features and properties of amino acids from the literature into our models.

Title: The implication of CYP enzyme interactions on Kratom use with other prescription medications in the United States

Primary Author: Kristin Allen

Additional Authors: ;Angela Calderon

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Kratom is a botanical product that has risen in popularity as it produces stimulant and opioid-like effects, depending on the dose. The leaves of kratom contain alkaloids that are metabolized by the cytochrome P450 enzymes CYP3A and CYP2D6. These cytochromes also play an important role in the metabolism of many medications used to treat chronic illnesses such as depression, chronic pain, HIV/AIDS, and cancer. The implication of CYP enzyme interactions on kratom use with other prescription medications that also utilize CYP3A and CYP2D6 for metabolism have become more prevalent and clinical evidence of this potential interaction exist, which emphasizes the need for further research on these interactions. This was a literature-based investigation utilizing the NIH-funded Center of Excellence for Natural Products Drug Interaction Center (NaPDI) database. Filtering by the common name “Kratom” as well as the Latin binomial “Mitragyna speciosa”, the database produced 126 results of kratom drug interactions. PubMed was also used to determine a list of medications that also utilize CYP3A and CYP2D6 for metabolism. The results of this investigation found that drug-drug interactions between the kratom alkaloids and medications that also utilize CYP3A and CYP2D6 for metabolism exist and can occur through inhibition and induction of the cytochrome enzymes. These results raise safety concerns that are at the forefront of current research. Polypharmacy is another factor that increases the safety concerns of using kratom with other medications as providers may not know all medications that patients are taking. The conclusion of this investigation is that further research on kratom drug-drug interactions is indicated as the knowledge of these interactions play a vital role in medication counseling and ensuring that the patient’s medications remain efficacious and safe to use. Future plans for analyses are to assess these drug-drug interactions in vitro.

Title: Effects of isoleucine and valine ratios to lysine in response to varying leucine to lysine ratios on pectoralis major protein expression in broilers

Primary Author: Cristopher Isaac Almendares Sanchez

Additional Authors: Dr. Charles Starkey;Jessica Starkey;Diego Ernesto Ventura Urbina

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Optimizing concentrations of dietary branched-chain amino acids (BCAA) can improve broiler chicken growth performance and carcass yields. A central composite design (CCD) study was conducted to understand the impact of dietary BCAA concentrations on Pectoralis major (PM) muscle protein expression and investigate the mechanisms behind how BCAA ratios affect broiler growth and muscle deposition. A total of 2,592 d-old Ross 344 × 708 male broilers were randomly placed in 144 floor pens. Each pen received 1 of 15 dietary treatments in the CCD from 20 to 35 d of age, varying in digestible ratios of valine:lysine (Val:Lys; 64 to 87), leucine:lysine (Leu:Lys; 110 to 185), and isoleucine:lysine (Ile:Lys; 52 to 75). On d 35, 1 bird per pen was randomly selected for PM protein extraction and proteomic analysis via data independent acquisition protein sequencing with a timsTOF Pro 2 LC/MS/MS and Spectronaut 15 software. Branched-chain-amino-acid aminotransferase (BCAT1), adipocyte-type fatty acid-binding protein (FABP4), phosphoserine aminotransferase (PSAT1), O-N-acetylglucosamine transferase subunit p110 (OGT), and large neutral amino acids transporter small subunit 1 (SLC7A5) were identified, quantified, and analyzed as a CCD using the RSREG procedure of SAS ver. 9.4 with significance set at $P \leq 0.10$. The surface response model for PSAT1 expression was significant ($P = 0.0149$; $R2 = 0.24$). A linear model effect ($P = 0.0023$) was observed for PSAT1 protein expression. However, optimal values for the other proteins could not be obtained due to stationary saddle points. Still, the coefficients for the Ile:Lys cross-product ratio effect on PSAT1 ($P = 0.0957$) protein expression was significant. Overall, the results indicate that varying concentrations of dietary BCAA may impact expression of proteins related to broiler skeletal muscle growth; however, further exploration will be required to explain the mechanisms behind how BCAA impact broiler growth and muscle development.

Title: Development of a landslide prediction tool for Alabama by application of Python scripting language in ArcGIS Pro software

Primary Author: Abraham Alejandro Alvarez Reyna

Additional Authors: ;

Department/Program: Civil Engineering

College: College of Engineering

Abstract: Landslide occurrences near existing roads and urban areas are a significant problem for the Alabama Department of Transportation (ALDOT). The identification of potential landslide events can help plan preventative maintenance of roads and avoid road closures. It is imperative to consider critical rainfall events, as they have been identified as the main triggering factor of landslides. There are several methods to identify thresholds for landslide activation based on precipitation. However, a prediction tool based on current data and threshold identification methods is still a topic of study that requires further testing. The purpose of this project is to develop a tool that can relate precipitation data to soil displacement at specific stations throughout the state on a real-time basis. As the main source of geographic data analysis and visualization, ArcGIS Pro software will be use used for the tool application. Moreover, Python scripting language will define the structure of the project. The goal is to automatize the extraction of precipitation data from reliable governmental entities such as the National Oceanic and Atmospheric Administration (NOAA) and create the visualization of landslide indicators at the stations of the project. Moreover, data collected will be transferred to the soil displacement files and continue with landslide thresholds threshold calculations based on methods from the literature review. At the ultimate phase of the project, the team will implement a real-time feature for continuously updating the data and calculations required for the landslide indicators.

Title: A microfluidic assay to isolate a highly migratory presenescent stem cell subpopulation

Primary Author: Farshad Amiri

Additional Authors: ;Farnaz Hemmati;Ayuba Akinpelu;Dylan Bowen;Panagiotis Mistriotis

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Cellular senescence refers to the permanent cell cycle withdrawal as a result of prolonged cell expansion which triggers a variety of phenotypic and structural alterations that diminishes stem cell potential. Ultimately, senescent cells contribute to disease progression and hinder tissue regeneration. Our goal is to devise a novel approach to eliminate senescent cells from adult stem cell populations in order to improve their therapeutic efficacy. To achieve this, we exploit the innate potential of stem cells to migrate toward damaged tissues in vivo. Since senescent stem cells display increased size and reduced motility and plasticity, we hypothesize that a Y-shaped microfluidic device that has been previously optimized to isolate highly migratory cells effectively distinguishes between presenescent and senescent stem cells. This device recapitulates the size of pores and longitudinal channel-like tracks encountered by migrating cells in vivo. To test our hypothesis, human mesenchymal stem cells (hMSCs) were seeded close to the entrances of a polydimethylsiloxane (PDMS)-based microchannels and their migration was monitored for 13 hours using time-lapse microscopy. Isolation results showed that highly migratory cells were significantly faster and smaller than non-migratory cells and also exhibited higher proliferative capacity and less DNA damage compared to non-migratory cells. To determine the ability of our assay to detect presenescent cells within heterogeneous populations, we mixed early passage cells labelled with a cell tracker dye with senescent cells at a 1:3 ratio. The device identified ~80% of early passage cells and only ~20% of senescent cells. Taken together, our assay enables the physical isolation and characterization of a highly motile presenescent cell subpopulation that can improve the standardization of cell preparations, enhance stem cell potency, and facilitate the discovery of signature markers for highly motile, presenescent stem cells.

Title: Wetland accretion rate model of ecosystem resilience (WARMER) and its application to coastal transportation infrastructure along Fort Morgan Road

Primary Author: John Anderson

Additional Authors: ;

Department/Program: Civil Engineering

College: College of Engineering

Abstract: Alabama State Route 180 located in Gulf Shores is a coastal roadway impacted by severe storms, high groundwater tables and future sea level rise (SLR). AL-180 is important because it serves as an evacuation route, ALDOT ferry to Dauphin Island, and enables local tourism. The area surrounding AL-180 supports a wide variety of ecological habitats for natural and nature-based features (NNBF). This project focuses on the effects of SLR on surface transportation infrastructure and the ability of NNBF to mitigate those effects. NNBF, such as living shorelines, combine ecological with conventional designs and can be expected to change substantially over their lifespan through natural processes. NNBF are also responsive to hydrologic conditions such as inundation, groundwater fluctuations, and wave action. To inform modeling of NNBF scenarios, we applied the Wetland Accretion Rate Model of Ecosystem Resilience (WARMER) to the vegetated areas of proposed NNBF designs. WARMER predicts changes in marsh surface elevation relative to mean sea level using a 1-D model to capture the critical marsh accretion processes (decomposition, compaction, sediment and organic matter accumulation) for individual sites along AL-180. We parameterized WARMER using marsh sediment core data collected by previous studies in Bon Secour Bay and NOAA predictions for SLR in the northern Gulf Coast region. Results show that under the low and intermediate-low scenarios, the accretion processes in marshland surrounding AL-180 will continue to outpace SLR over the next 150 years. Under the intermediate, intermediate-high, and high scenarios the marshland accretion processes are unable to keep pace and after about 50 years the elevation of the marsh surface begins to decrease dramatically. By applying WARMER to this location as well as other locations along the coast, researchers can better understand how the hydrological functions of NNBF will evolve with SLR and increased storm intensity due to climate change.

Title: 3D printed capsaicin loaded rod-shaped implant for the treatment of obesity and hyperlipidemia

Primary Author: Manjusha Annaji

Additional Authors: PADMAMALINI BASKARAN;Nur Mita;Jayachandra Ramapuram;Ishwor Poudel;Oladiran Fasina;Jessica Heard

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Diet-induced obesity has become a serious global health problem associated with an increased risk for developing type-2 diabetes, hypertension, cerebrovascular disease, and cancer. Currently, some of the FDA-approved drugs for weight loss are delisted due to their severe adverse effects. As an alternative, bariatric surgery such as Sleeve gastrectomy and Roux-en-Y gastric surgery were found to be more effective. However, it is expensive and associated with an increased risk of post-surgical complications. Therefore, there is an urgent need to develop safe, effective, and personalized therapies for the early prevention and treatment of obesity. Capsaicin is the principal ingredient of natural chili peppers. Many studies have revealed the beneficial effects of capsaicin such as anti-inflammatory, antiobesity, and anticancer effects. Both animal and human studies have shown its effectiveness for weight loss and hyperlipidemia. Oral administration of capsaicin induces the conversion of energy-storing white fat to energy-expending brown fat and enhances thermogenesis to promote weight loss in obese mice. However, due to its pungent nature, administration of capsaicin causes irritation to the skin and mucous membrane. In order to overcome this and to enhance the target site-specific availability of capsaicin, we developed 3D printed biodegradable capsaicin-loaded rod-shaped implants and propose to investigate the anti-obesity efficacy in a mouse model of diet-induced obesity. 3D printed rod-shaped implants were fabricated utilizing thermoplastic extrusion-based 3D printing technology. Implants showed higher drug loading with uniform drug distribution. The surface morphology of 3D printed implants showed a smooth and uniform surface without any macroscopic defects. In vitro release studies showed sustained release of capsaicin (~70% release) for more than two months. Considering the simplicity of the technology, it can be easily transferred to a clinical setup, where implants could be printed on-demand to fulfill the patient needs for treating obesity and hyperlipidemia.

Title: Effect of different levels of crude protein at different feeding rates on Pacific white shrimp (<<Litopenaus vannamei>>)

Primary Author: Adela Nicole Araujo

Additional Authors: ;Khanh Nguyen;Allen Davis;Trenton Corby;Leila Strebel;Melanie Rhodes

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: Feed management is one of the most important factors in shrimp culture, as feed makes up around 60% of the total variable costs. The aim of this study was to evaluate the effect of different protein intake levels on growth performance, feed utilization efficiency, and whole-body composition of Pacific white shrimp using different levels of crude protein (CP). This was done by feeding four practical diets with 40%, 35%, 30%, and 25% of CP, which were fed at two different rates, one of them being the standard feed rate (100%) and a second adjusted rate to match protein intake, resulting in a total of 8 treatments with four replicates each. Juveniles (0.41g ± 0.01 [mean ± SE]) were stocked into a green water system with 32 culture tanks at a density of 30 individuals/tank and reared for 77 days. At the end of the trial, growth performance parameters such as final weight, weight gain, biomass, and feed conversion ratio were found to be significantly different among treatments ($p<0.05$). All final body composition values (dry matter, CP, and minerals) did not show significant differences between the treatments except for fat ($p<0.05$). However, feed utilization measurements including apparent net protein retention (ANPR), and phosphorus retention did show to have significant differences ($p<0.01$). This study demonstrated that higher intake levels of CP in shrimp enact better with respect to growth performance and lower levels with respect to feed utilization.

Title: Towards isolation of single nuclei for sequencing of primary canine osteosarcoma

Primary Author: Arianna Thomas

Additional Authors: ;Bruce F. Smith;Rebecca Nance

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Osteosarcoma is a bone cancer that not only plagues humans but also dogs. Since the tumor in dogs share many of the features of human osteosarcoma, the dog is an excellent model in which to study this type of cancer. All tumors, including osteosarcoma, are heterogenous, and this makes them difficult to treat. Both differences between patients and within a patient can render tumor cells immune to specific treatments, resulting in the need to give multiple difference treatments to a patient in the hope that the combination kills all (or most) of the tumor. Single Cell Sequencing provides an approach to understanding this heterogeneity and a more thorough identification of molecular changes occurring in the tumor. In our laboratory, previous attempts to isolate viable cells from osteosarcoma were ineffective. This tumor type has been a challenge to analyze and examine due to the density and complexity of the tissue. However, new technology allows the isolation of single nuclei and sequencing both DNA and RNA from those nuclei. Isolating single nuclei was hypothesized as a way circumvent the viability issue. The protocol for the dissociation of osteosarcoma tissue into nuclei required significant optimization, as homogenizing the tumor is a necessary step in order to proceed to library prep. Multiple approaches to this optimization, resulting in apparently intact nuclei will be presented. Ultimately, this approach facilitates precision medicine treatment of tumors. With Single Nuclei Isolation, nuclei from cells of bone cancer can now be isolated and sequenced to understand the intricacy of the tumor and the unique characteristics of these cancers.

Title: Overview of receptors and pathways modulated by Alzheimer's disease

Primary Author: Thomas Averill

Additional Authors: ;Amal Khalil Kaddoumi

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Alzheimer's Disease (AD) is the most common form of neurodegenerative dementia, affecting 1 in 9 people above the age of 65. Clinically, AD is characterized by cognitive dysfunction and pathologically by β-amyloid plaques and neurofibrillary tangles. Additionally, oxidative stress, glucose and lipid dyshomeostasis, and limited autophagy are all secondary markers of the disease. Due to the complex nature of AD, these pathologies have numerous affected pathways linked to dysregulated receptors and functions across the brain. With a proper understanding of these pathways, future discovery and development of novel AD treatments can be fully explored. My objective is to search the scientific literature for receptors whose functions are altered by AD, compiling the most promising ones in an easy-to-read database/graphic noting their name, function, modulation, and drug relation. I did this by exploring the PubMed database of scientific literature using keywords relating to the study, ensuring the papers I draw from are reputable and adequately informative. These keywords included "Alzheimer's Disease,", "Receptor", and "Signaling Pathway". I have identified over 40 receptors that I believe are promising targets in the alleviation of AD pathologies. These pathways illustrate points of control for both primary and secondary symptoms of AD development and encourage additional neuroprotective measures when activated. I have included the pathway, the receptor, the drug targeting the receptor, whether an agonist or antagonist is needed to regulate function, and any additional notes regarding the process of treatment or function. In conclusion, the proper understanding of the numerous pathways in which AD develops is crucial to the future development of new and effective treatments. With current approved symptomatic treatments being only partially effective, future treatment must take into account the complex pathologies we now associate with the disease.

Title: Automated kinetic modeling and reaction network generation for fast pyrolysis of lignin with model compounds

Primary Author: Tanzina Azad

Additional Authors: ;

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Lignin is one of three major structural components of the lignocellulosic biomass and the second most abundant natural polymer. Due to its highly heterogenous molecular structure, lignin contributes most of the recalcitrance to overall biomass valorization. Fast pyrolysis is the most promising among the established thermochemical processes to convert lignin into value-added products. However, the knowledge of the reaction mechanism for this process still needs to be completed, and many information gaps exist among the experimental and computational studies on this topic. To address it, we employ the concept of automated kinetic modeling to study lignin pyrolysis using the model compounds. The computerized reaction network generation approach is a beneficial and realistic choice to do microkinetic modeling for such a complex and large reactive system. This work studies anisole and guaiacol as surrogates for primary tar from lignin pyrolysis. These model compounds have been experimentally investigated, and specific product spectra have been reported in the literature. Major products from anisole pyrolysis include phenol, benzaldehyde, methane, carbon monoxide, and cyclopentadiene. In contrast, the list of significant pyrolysis products from guaiacol includes similar species, pyrocatechol, methyl catechol, and 2-hydroxybenzaldehyde, which are distinct products. We aimed to investigate the prospect of the automated kinetic modeling approach for building a comprehensive reaction network that would be insightful for lignin pyrolysis using these two model compounds. The resulting simulation from our work shows excellent agreement with the experimentally reported pyrolysis products. Therefore, this work is the foundation for the successive model extension to the concept of automatic kinetic modeling, which could be used for lignin pyrolysis.

Title: Effectiveness of drone-based remote sensing for assessing the impact of catastrophic windstorm events on timberland

Primary Author: Dipika Badal

Additional Authors: ;Sanjiv Kumar;Lana Narine;Richard Cristan

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Forests of the southern United States are considered among the most productive forest regions in the world with this region commonly referred to as the "wood basket" of the nation. Every year, violent windstorm events, such as tornadoes, hurricanes, and tropical storms have a profound impact on forests, altering growth, adaptability, and stability. Timber damage and associated environmental impacts not only cause economic losses, but also increase the likelihood of secondary disturbances such as forest fires, surface runoff, and insect outbreaks. Given the increasing frequency of these disasters, it is critical for landowners, policymakers, and other relevant stakeholders to understand the nature and severity of the damages to forests in order to reduce the potential for ecological impact by extracting downed timber, reducing fuel loads, and reforesting the site naturally or artificially. The integration of remote sensing technologies has substantially improved the efficiency of forest assessments, replacing traditional, cost-intensive, and time-consuming on-the-ground field measurements. Remote sensing techniques such as Light Detection and Ranging (LiDAR), with its unique capability to penetrate the tree canopy, ability to accurately depict vertical forest structures, and provide three-dimensional data on forest attributes with high precision, has made it an essential tool in the forestry field. The purpose of this study is to examine the efficacy of drone-based remote sensing including LiDAR to assess storm-damaged forest stands, characteristics of downed timber, and environmental impact in high windstorm-affected regions of the southeastern United States. The findings of this study will be beneficial for foresters, land managers, landowners, and policymakers, providing them with valuable insight on the use of cutting-edge LiDAR technology to evaluate the impact of catastrophic windstorms on forested ecosystems.

Title: Assessing changes in health awareness and attitudes to vitamin consumption post Covid 19

Primary Author: Bailey Arant

Additional Authors: Ann Marie O'Neill

Department/Program: Biology and Environmental Science

College/School: College of Sciences, Auburn University at Montgomery

Abstract:

The dietary supplement industry in the United States is worth an estimated $39 billion annually, and latest research indicates that four out of five Americans regularly consume dietary supplements. Supplement usage among Americans has grown steadily over the last twenty years, and the Covid 19 pandemic appears to have changed how supplements are consumed. This is despite a lack of convincing evidence on the usefulness and effectiveness of supplements. Indeed, there is contradictory evidence suggesting that, in some cases, the use of supplements may have harmful effects on health.

The purpose of this study was to evaluate health awareness, supplemental vitamin consumption and knowledge of perceived health benefits of vitamin supplements among participants pre and post pandemic. We undertook a two stage longitudinal study utilizing a quantitative research approach with a number of pre-validated likert scales addressing several health related constructs; these included general health awareness attitudes, and participants' perception and knowledge of the effects of vitamin supplements. Additionally a range of demographic questions were asked to enable deeper data analysis. Data was collected in 2019 and 2022 for comparison. Results indicate that self perceived health awareness increased slightly after the pandemic, with 65% of participants reporting that they were reading more health related articles in 2022 compared to 2019, and 80% of participants believed their dietary habits changed for the better as a result of the Covid 19 pandemic. There was no significant increase in individual vitamin supplement consumption levels pre and post pandemic, however perception of the perceived health benefits was reduced in 2022 compared to 2019. This indicates that there is a potential increase in the public's knowledge of the usefulness of supplemental vitamin consumption, and that this may be, in part, due to increased health awareness reported post pandemic.

Title: The effects of stocking density on the growth of juvenile Pacific white shrimp Litopenaeus vannamei in a recirculating biofloc system

Primary Author: Shrijan Bajracharya

Additional Authors: ;Allen Davis;Luke Roy

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: One of the most crucial aspects of shrimp cultivation is stocking density. Shrimp production can be increased by increasing stocking density; however, this requires more feed input, which could impair water quality. High stocking density can affect shrimp growth, survival, and contribute to the stress response brought on by overcrowding. The objective of this study was to observe the response of *L. vannamei* when cultured at different stocking densities in a biofloc system. The experiment was conducted in an indoor biofloc recirculating aquaculture system consisting of twenty-four 150L culture tanks. The shrimp were stocked at 67, 133, 200, 267, 333, 400, 467, and 533 shrimp/m^3 and raised for 30 days. All the treatments were provided with a commercial shrimp diet (Zeigler Shrimp Grower SI-35, CP 35%) four times per day via hand feeding. At the end of this study, significant differences in growth and feed conversion ratio (FCR) between treatments were observed. Survival was at/above 90% in all the treatments. The highest mean weight (6.03 g) and weight gain percentage (545.97%) were recorded in shrimp cultured at 67 shrimp/m^3. A decrease in the final mean weight and weight gain (%) was observed with an increase in stocking density. FCR and biomass both increased with increasing density. From the shrimp grower's point of view, one would want to achieve higher biomass (more shrimp) by raising shrimp at higher stocking densities, but the risk of crowding, poorer FCR, and potentially poor water quality associated with higher stocking densities can compromise shrimp growth, resulting in smaller shrimp. Therefore, it is critical to determine optimal stocking densities in biofloc systems to promote better shrimp growth.

Title: Mitigation response of a red-tailed hawk to vertical gusts

Primary Author: Colin Bamford

Additional Authors: Tyson Hedrick;Jack Nix;Vrishank Raghav Shankare Gowda;Paul Swiney

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: Here we study the biomechanical and aerodynamic response of a red-tailed hawk to vertical gusts. One major obstacle to stable unmanned aerial vehicle (UAV) or small aircraft flight is extreme gusts acting on the vehicle's airframe. Small vehicles struggle to fly through significant gusts, hampering their transport or defense applications. To solve such engineering problems, inspiration can be taken from natural gust responses employed by a bird. To study these responses, an indoor flight arena was constructed incorporating perches, gust generators, and high-speed cameras. Six industrial fans were used to produce vertical gusts with average speeds of 4 to 8 m/s at bird height, corresponding to different gust intensities. As the hawk flew through the tunnel, two Phantom VEO 640L and two Phantom VEO 4k 990L captured the three-dimensional motion occurring just before, during, and after the gust. The hawk's wing, tail, and body were tracked to measure their response to the gust. A lower-order unsteady aerodynamic model was applied to the response data to estimate lift coefficients across the wing during gust interaction. The hawk used a similar downward-pitching wing response at all gust intensities, while the tail response varied. These results suggest that this bird could not fully mitigate gust effects with its wing alone, and that the tail response plays a role in producing stable flight through a gust.

Title: Thermal variation during late-stage incubation and its effects on broiler chicken growth performance, carcass characteristics, and breast meat quality

Primary Author: Jorge Enrique Banegas Duron

Additional Authors: Joseph L. Purswell;Brittany Wall;Jessica Starkey;Jeremiah Davis;Martha Sabine Rueda Lastres

Department/Program: Poultry Science

College: College of Agriculture

Abstract: The objective of this study was to evaluate effects of air temperature during late-stage incubation (LSI) and sex on broiler growth performance, carcass characteristics, and incidence and severity of breast meat quality defects, Wooden Breast (WB) and White Striping (WS). Ross 708 ? Yield Plus broiler breeder eggs were incubated at 37.5 °C from embryonic day (ED) 0 - 10. From ED 11 - 18, eggs were incubated at 1 of 3 temperature set points: 37.5 °C (CTL), 36.4 °C (COLD), or 38.6 °C (HOT; n = 2 incubators per treatment). On ED 18, all eggs were transferred to baskets in hatchers set to 36.7 °C. Chicks were pulled from hatchers simultaneously, vent sexed, placed in floor pens blocked by incubation treatment and sex (n = 6 replicate pens of 30 birds per treatment), fed a common diet in 3 phases (starter, grower, and finisher), and processed at d 33 (n = 15 per pen). Data were analyzed as a 2-way ANOVA with the GLIMMIX procedure of SAS ver. 9.4. Means were separated at $P \leq 0.05$ with the PDIFF option and tendencies were declared when $0.0501 \leq P \leq 0.10$. While chicks from COLD incubators were heaviest on d 0 ($P < 0.0001$), they were the lightest on d 9, but were like those from the HOT treatment on d 23 and 32 ($P = 0.0121$). Broilers from CTL incubators had the greatest overall BWG, while those from COLD incubators had the poorest overall FCR ($P = 0.0086$) but had similar BWG as those from HOT incubators ($P = 0.0056$). Broilers from CTL incubators had the heaviest wing weights ($P = 0.0428$) and heavier carcasses than those from HOT incubators ($P = 0.0261$). Thigh and fat pad weights as well as WB severity were lowest in broilers incubated in HOT conditions ($P \leq 0.0438$). Broilers from the COLD incubators had higher incidence of WB score 3 breast fillets than those from the HOT treatment but were like those from the CTL incubators ($P = 0.0259$). Overall, sub-optimal incubation temperatures during (LSI) altered broiler growth performance, carcass characteristics, and WB severity.

Title: Semantic overlap summarization among multiple alternative narratives: an exploratory study

Primary Author: Naman Bansal

Additional Authors: ;Mousumi Akter

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: In this paper, we introduce an important yet relatively unexplored NLP task called Semantic Overlap Summarization (SOS), which entails generating a single summary from multiple alternative narratives which can convey the *common information* provided by those narratives. As no benchmark dataset is readily available for this task, we created one by collecting 2,925 alternative narrative pairs from the web and then, went through the tedious process of manually creating 411 different reference summaries by engaging human annotators. As a way to evaluate this novel task, we first conducted a systematic study by borrowing the popular ROUGE metric from text-summarization literature and discovered that ROUGE is not suitable for our task. Subsequently, we conducted further human annotations to create 200 document-level and 1,518 sentence-level ground-truth <<overlap labels>>. Our experiments show that the sentence-wise annotation technique with three overlap labels, i.e., {Absent (A), Partially-Present (PP), and Present (P)}, yields a higher correlation with human judgment and higher inter-rater agreement compared to the ROUGE metric.

Title: Effect of starter diet nutrient reductions and feed form on <Pectoralis major heterogeneity of satellite cell and macrophage populations in broilers.

Primary Author: Juan Jose Barberena Baltodano

Additional Authors: Charles W. Starkey;Jessica Starkey;Cristopher Isaac Almendares Sanchez;Diego Ernesto Ventura Urbina;Said Joel Herrera Vallejos;Gerardo Abascal Ponciano

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Previous work indicates that Wooden Breast (WB)-affected broilers exhibit greater densities of satellite cell (SC) populations expressing myogenic regulatory factors (MRF) Pax7 and MyoD, and greater densities of total macrophages compared with unaffected broilers. The objective was to utilize a starter diet nutrient reduction and feed form model to generate birds affected and unaffected by WB and assess pro- and anti-inflammatory macrophage populations densities as well as SC and myonuclei MRF heterogeneity. A total of 96 male Ross 708 × Yield Plus chicks were placed in 16 pens (n = 6 birds per pen) and were fed either a control starter diet in crumble form (CONCRUM) or 30% digestible methionine, digestible lysine and metabolizable energy reduced starter diet in meal form (REDMEAL). On d 9, 12, 15, and 18, muscle samples from the left *Pectoralis major* were collected for cryohistology and stored at -80 ºC until analysis. Samples were sectioned into 5-µm thick sections creating 3 set of slides that were immunofluorescence stained for 1 of 3 strategies: 1) total macrophages (KUL01+), pro-inflammatory (CD80+) macrophages, or anti-inflammatory (CD206+) macrophages; 2) Pax7+, MyoD+, and Myf-5+ nuclei to assess SC population MRF heterogeneity; and 3) MRF4+, MyoD+, and Myf-5+ nuclei to assess myonuclei population MRF heterogeneity. Data were analyzed as a 1-way ANOVA using the GLIMMIX procedure of SAS and means were separated at $P < 0.05$. Populations of Pax7+:MyoD+:Myf-5 SC were more abundant in muscle samples of broilers fed the REDMEAL diet compared with CONCRUM on d 15 ($P = 0.0171$). On d 9 and 15, total myogenic cells (all MRF+ cell nuclei) were more abundant in REDMEAL fed broilers compared with CONCRUM fed broilers ($P > 0.0249$). In conclusion, inflammation, and SC populations may not be impacted by the early development of WB. However, these strategies may be useful to further assess macrophage inflammation state and SC function related to WB in future studies.

Title: National opinions about police body-worn cameras (BWCs) compared to bystander footage

Primary Author: Halee Barbour

Additional Authors: ;Sara Driskell;Savannah Atkins;Liza McConaghie;Sarah Petersen

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Perceptions of video footage in legal spaces have immense repercussions, and it is important to investigate the differences in perceptions between bystander footage and body-worn camera (BWC) footage. In the efforts to establish a fair justice system, understanding individual beliefs about the trustworthiness of different types of video evidence will help us understand when and how to include video footage in court. In addition, we aimed to investigate potential misunderstandings the lay public have about such footage and how they are used in the justice system. We surveyed 1183 online participants through Amazon's MTurk platform (mean age=38.15, SD=11.92; 50.9% women, 47.9% men, 1.2% other). In general, participants supported changes to policing (M=2.82, SD=1.49 on a 1-7 scale where 1=Strongly Agree). Participants also agreed that BWCs are meant to reduce police use of force (M=2.51, SD=1.39), help protect people from police (M=2.37, SD=1.40), and increase their accountability (M=2.16, SD=1.32) while also increasing safety for officers (M=2.84, SD=1.50). However, participants focused on their main ability to increase prosecutions for police misconduct (M=2.94, SD=1.62) while disregarding other common outcomes for BWCs. Participants also thought they would lengthen the justice system process (M=2.8) without considering other important impacts on the justice system, but they did not think bystander footage would have any strong impacts on the justice system. Participants also thought BWCs would be more accurate than bystander recordings, <<t>>(1093)=98.9, <<p>><.001. Among common concerns about BWCs, participants acknowledged privacy rights (M=2.85, SD=1.41) and officers' noncompliance with rules about their use (M=2.65, SD=1.34) more than other common problems. These suggest growing knowledge of BWC policies while also falling for common misconceptions about BWCs.In addition, these show strong differences in how they view BWC footage compared to bystander footage.

Title: Exploring sustainability practices in the current Bangladeshi garment industry

Primary Author: Ummey Hani Barsha

Additional Authors: ;

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Bangladesh is currently a major global sourcing hotspot. Since sustainability is the must-do trend in the global apparel industry and Bangladesh is a major player in garment manufacturing, it is important to examine the current sustainability practices that are emerging in the current Bangladesh garment industry. Thus, this study specifically aims to explore the type of sustainability practices that are most valued by buyers who import apparel products from Bangladesh. Using the triple bottom line theory this exploratory study identifies current sustainability practices occurring in the Bangladesh garment industry. Keywords or key phrases, obtained from publicly available 25 garment factories' annual reports, are content analyzed for this study. Most of the companies have stressed those matters mostly for what they have been pressurized and criticized for to come up with a clean image.

Title: Meals on wheels of Coweta County extending aging in place for their seniors

Primary Author: Brittany Bates

Additional Authors: ;Alicia Powers

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: In the United States, one in five Americans are 60 years old or older, with 12,000 people turning 60 every day. While this aging population continues to rise, hunger and isolation continue to plague our country's most vulnerable people. Before the world pandemic, 9.7 million seniors were threatened by food insecurity and malnutrition, and the numbers have only increased since. However, 90% of this population would prefer to age in place. This is where Meals on Wheels recognizes the benefits of their request and takes the opportunity to bridge the gap. This project aimed to describe Meals on Wheels of Coweta (MOWOC) clients and assess their satisfaction with MOWOC. Meals on Wheels of Coweta currently serves 195 clients. To take an accurate analysis and assessment, this project collected data from 25% of clients totaling about 50 people. A descriptive study using quantitative and qualitative methods was conducted. Exclusion criteria included if the client had missing information in MOWOC charts or if they were related to a client already selected. One-on-one telephone calls were made to collect data for a survey. This survey included 20 open-ended questions for participants to provide feedback and offer suggestions. Clients voiced overwhelming gratitude for MOWOC and its volunteers. One overarching difficulty most often mentioned by those surveyed was wrapping for the frozen meals being too difficult to open. Suggestions to switch to alternative packaging and providing education on plastic lids were recommended. Also recommended was to incorporate more fresh fruits and vegetables and more variety in meat.

Title: New students' transitions to Auburn, connections to their parents, and stress-management

Primary Author: Ashley Bean

Additional Authors: ;Sara Driskell;Tracy Parsons;Emily Findlay;Grace Wright;Aly Grace Kessler

Department/Program: Psychology

College: College of Liberal Arts

Abstract: As early childhood attachments are incredibly meaningful for young people, these past relationships may ultimately shape how they connect and cope on campus. Freshman and transfer student participants (N=106) were asked to complete a series of questions describing their parental relationships, feelings about Auburn, homesickness, coping, and wellbeing. We found that students' overall transition to Auburn correlated positively with their wellbeing (r=.610, p<.001) and sense of place at Auburn (r=.618, p<.001) and negatively with their stress (r=-.295, p=.003). Importantly, having a better transition to Auburn was correlated negatively with feeling homesick (r=-.229, p=.024). Participants reported talking to their parents more than anyone else for stress about homesickness and physical sickness, bad grades and other troubles, college changes and successes, joining new organizations, disagreements with friends, and not feeling like themselves. In addition, they agreed that they are close to their parents (M=4.71, SD=1.81) and that their parents support their decisions (M=5.71, SD=1.16). Despite this, they also rate themselves as relatively independent (M=5.13, SD=1.21). Importantly, having parental support (r=.248, p=.011) and being comfortable with their own feelings (r=.310, p=.001) correlated positively with a successful transition to Auburn. Parental support also correlated positively with their wellbeing (r=.216, p=.030) and negatively with their stress levels (r=-.449, p<.001). This suggests that how students connect to their parents strongly impacts their success and wellbeing at Auburn.

Title: Effects of facial masks on speech intelligibility in college-aged listeners

Primary Author: Maggie Beard

Additional Authors: ;Grace Crim;Grace Dohl

Department/Program: Communication Disorders

College: College of Liberal Arts

Abstract: Facial masks have been used extensively during the COVID-19 pandemic. While the use of facial masks have controlled the spread of the virus, they can reduce the audibility of speech cues, thereby reducing the speech intelligibility for listeners. Even listeners with normal hearing face difficulty discerning certain types of words when listening to a speaker wearing a facial mask. Specifically, this study focused on addressing speech intelligibility connected to lexical density. Lexical density is defined as the proportion of content words (nouns, verbs, and adjectives) that provide the dominant meaning to an utterance in a sentence. Normal hearing college listeners listened to sentences recorded previously under two conditions: 1) unmasked (without a facial mask); versus 2) while wearing a facial mask. The average length of each sentence was about 8.5 words and the average number of dense words in each sentence was 5.5. Listeners wore unaware which of the recorded sentences were masked or unmasked. Each listener listened to these sentences via earphones and completed an online list of responses. The responses were then scored by the investigators for accuracy of dense words reported. To evaluate differences between unmasked and masked conditions above, a statistical T-test was performed, and highly significant differences were found across listening conditions, $p < 0.1$. The accuracy of dense words reported was significantly lower while listening under the masked condition compared to the unmasked condition. From our study results, listening under a masked condition could significantly affect the neighborhood boundary of lexical items. This is potentially concerning because while all participants in this study had normal hearing, these differences may be further exacerbated in listeners with hearing loss.

Title: Prevalence of trace metal limitation on Algal growth across a range of productivities

Primary Author: Isabel Bela

Additional Authors: ;Alan Wilson;Matthew Gladfelter

Department/Program: Fisheries and Allied Aquacultures

College: College of Engineering

Abstract: Algae require specific nutrients in varying quantities for growth. Macronutrients like nitrogen and phosphorus are needed in large amounts, while trace metals like copper and iron are needed in small amounts. Most strategies limiting harmful algal bloom growth focus on phosphorus and/or nitrogen. However, when these nutrients are present in a system, certain trace metals have been shown to exhibit colimitation on algal growth. As such, the goal of this study was to examine under what conditions trace element additions limit algal growth among systems with different levels of productivity. To examine potential interactions, three ponds of different trophic levels were selected as study sites. Pond water with known algal species composition and nutrient levels was transferred into sealed, floating, plastic containers inside a frame within each pond, maintaining natural temperature and sunlight conditions for algal growth. The containers were then treated with a full factorial design of additions of nitrogen, phosphorus, and/or trace metals (iron, copper, zinc, cobalt, magnesium, and manganese) plus a control. Each treatment had 4 replicates, totaling 32 containers per pond. Over the course of two weeks, the algal abundance, in conjunction with total and dissolved trace metal levels, was measured. As expected, the results revealed that for all systems, trace metals alone exhibited no limitation when compared to the control. Colimitation between trace metals and macronutrients was present in the two systems of lower productivity. In the oligotrophic pond, the containers treated with nitrogen, phosphorus, and trace metals had significantly more algae than those with just nitrogen and phosphorus. In the mesotrophic pond, the containers treated with nitrogen and trace elements had significantly more phytoplankton than those with nitrogen alone. These results indicate that variation in ambient pond productivity can dictate limiting factors for phytoplankton growth.

Title: Comparing the Effectiveness of Modifications to the CTAB Method in Isolating DNA from *Rhododendron prunifolium*

Primary Author: Soto, Isabella

Additional Authors: Koelling, Vanessa A.

Department/Program: Biology and Environmental Science, Auburn University at Montgomery

College/School: College of Sciences

Abstract:

Understanding how new species form remains a key question in evolutionary biology. In the case of the southeastern azaleas, this is a clade of plants that has experienced rapid and recent divergence with an extensive amount of hybridization, physiological differences, and changes in chromosome number between species. To better understand species differences in this group, we are studying morphological, physiological, and genetic differences. To study the population genetics of these species, we need to be able to isolate high quality DNA. Within genus *Rhododendron*, secondary compounds appear to bind to the DNA and are not filtered out thoroughly through standard CTAB isolation methods. We tested nine different modifications to the CTAB isolation method to try and improve the quality and yield of DNA from *Rhododendron prunifolium*. We observed no significant improvement in the 260/280 ratio, 260/230 ratio, or concentration of DNA with any of these modifications, although we did observe that some modifications significantly worsened the 260/230 ratio. Overall, there was no modification that significantly improved the quality and yield of DNA for this species. We were still able to successfully produce an Illumina sequencing library without size selection for our samples, however, which indicates that quality and yield are sufficient for most downstream genetic applications.

Title: Cerebellum network model of psychiatric disorders: A transdiagnostic metaconnectomic approach

Primary Author: Olivia Bellini

Additional Authors: ;Meredith Reid

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Though the role of the cerebellum has historically been thought of in relation to balance and motor coordination, studies show that it is involved in a wider range of functions, including emotion regulation, memory, and cognition. These findings raise the question of how the structure and function of the cerebellum relate to psychiatric disorders. Currently, there is limited understanding of the cerebellum's role in psychiatric pathophysiology, so our research will hopefully broaden the understanding of the interconnectedness of the cerebellum's structure and function in relation to psychiatric disorders and behaviors. Our research is data-driven through the brainmap database, in which we implemented several search criteria, which limited our results to all studies with experiments that correspond to changes in the size of the cerebellum in people with various psychiatric disorders, some of which include generalized anxiety disorder, schizophrenia, and panic disorder. That data, in the form of coordinates, was then entered into GingerALE, which found highly concentrated regions of coordinates and generated maps representing the brain regions consistently associated with cerebellum structural abnormalities in psychiatric disorders. These regions included the insula, precentral gyrus, anterior cingulate, thalamus, parahippocampal gyrus, middle frontal gyrus, postcentral gyrus, caudate, amygdala, and medial frontal gyrus. Each region of interest was compiled into one network that was then run through BrainMap behavioral and paradigm analysis software to determine what behaviors and tasks are associated with that network. The behavioral analysis showed statistically significant associations with attention, both explicit and implicit memory, language, and positive emotions. The statistically significant paradigms included cued explicit recognition and reward.

Title: Evaluating the effects of SARS COV-2 “Omicron” variant on neurological functions of the central nervous system

Primary Author: Natalie Bennett

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Sindhu Ramesh;Timothy Moore;Rachel Parise;Manoj Govindarajulu

Department/Program: Pharmacy

College: College of Science and Mathematics

Abstract: The emergence of the SARS COV-2 (COVID-19) "Omicron" Variant has proven to be one of the most challenging variants due to its ability to mutate rapidly, making it more contagious than any other variant of SARS COV-2 globally. The significant adverse health impact of the SARS COV-2 "Omicron" Variant is because it is highly transmissible and infectious. With the continual increase in the aging and immunosuppressed population, the risk of neurological insult drastically escalates. However, the neurotoxic effects and mechanism of the SARS COV-2 "Omicron" Variant are not distinctly elucidated. We hypothesize that the SARS COV-2 "Omicron" Variant can directly or indirectly affect the blood-brain barrier (BBB) and induce a neurotoxic effect on the central nervous system (CNS). Therefore, distinguishing the neuronal/glial cells degeneration/loss and neurological symptom (s) will be crucial in determining pathways to create a pharmacological process to prevent and treat the SARS COV-2 "Omicron" Variant induced neurotoxicity. The goal of the study is to establish the effects of the SARS COV-2 "Omicron" Variant on neurological implications. Literature was acquired from PubMed, Google Scholar, and Centers for Disease Prevention and Control (CDC) using the following search terms: COVID-19, SARS CoV-2, Brain, Central Nervous System (CNS), Neurons and Glia. This study will assist in fast-tracking novel methods, mechanisms, and new prophylactic/therapeutic improvements with identifying potent solutions and breakthroughs to slow the progression of the impact on the CNS. Collecting valid scientific data and analysis will be vital until the healthcare community identifies a curb in SARS COV-2 "Omicron" Variant especially, to its resistance which will help prevent the initiation and progression of various neurological disorders.

Title: Comparing the performance of different heavy duty platooning control strategies

Primary Author: Will Bentley

Additional Authors: ;Evan Stegner;Philip Snitzer;Mark Hoffman;David Bevly

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Platooning is a promising technology which can mitigate greenhouse gas impacts and reduce transportation energy consumption. Platooning is a coordinated driving strategy where trucks align themselves in order to realize aerodynamic benefits to reduce required motive force. The aerodynamic benefit is seen as either a “pull” effect experienced by the following vehicles or a “push” effect experienced by the leader. The energy savings magnitude increases nonlinearly as headway (following distance) is reduced. In efforts to maximize energy savings, cooperative adaptive cruise control (CACC) is utilized to maintain relatively short headways. However small transient accelerations caused by imperfect control result in observed energy savings being less than expected values. This study analyzes the performance of a recently developed nonlinear model predictive control (NMPC) platooning strategy over challenging terrain. The NMPC strategy is compared to the previous proportional-integral-derivative (PID) control scheme in terms of headway, commanded torque, and fuel rate variances along with the total fuel consumed per lap. These comparisons reveal that the NMPC based controller’s ability to optimize headway variation while considering upcoming grade disturbances reduces the harshness of commanded torque and fuel rate transients. These platoon behavior changes result in significant fuel energy consumption reductions. In all platooning configurations analyzed, the NMPC strategy consumed less fuel than the comparable PID based data. This is best exemplified by findings from platoons with increased headway spacing. When compared to PID platoon control, the NMPC produced 25.5% and 31.6% fuel consumption decreases for the final truck in four-truck platoon configurations when targeting 50 foot and 100 foot follow distances, respectively. These results suggest that the NMPC implementation minimizes extraneous acceleration events associated with rigid PID headway adherence.

Title: Effect of addition of LAKE food colorants on textural characteristics of pet treats derived from ground chicken meat

Primary Author: Ileana Maria Berganza Portillo

Additional Authors: Charles Starkey;Jessica Starkey;Catarina Stefanello;Hilary Gisselle Carrera Arcia;Jorge Romero Garcia;Justin Dunavant;Emily Valeria Turcios Rosales

Department/Program: Poultry Science

College: College of Agriculture

Abstract: This study was conducted to evaluate the effect of synthetic colorants in textural characteristics of pet treats. Ground chicken breasts (GCB) were divided in 3 batches. Two synthetic food colors (blue#2 and orange) were mixed with GCB and a third group that served as a control with no color addition. Colored-raw products (n = 270) were placed into silicon molds, refrigerated, and cooked using a conventional oven until they reached an internal temperature of 74°C. Cooking times were 90 minutes for blue treats and 140 minutes for control and orange treats. A TA-43R probe on a TA-HDplusC texture analyzer was used for the 3-point bend (3PB) test to assess hardness, flexibility, and stiffness, while a TA-42 probe was used for the shear force (SF) test to evaluate firmness and toughness, and a TA-HDplusC texture analyzer with a TA-30-cylinder probe was used for the texture profile analysis (TPA) to measure hardness, resilience, cohesiveness, adhesiveness, chewiness, and springiness. Data were analyzed as a 1-way ANOVA using the GLIMMIX procedure of SAS 9.4 at $P \leq 0.05$. For 3PB, orange samples were harder compared to blue and control samples ($P \leq 0.0001$). Blue samples had higher flexibility compared to other treatments ($P \leq 0.0001$). Orange samples were the stiffest among all samples ($P \leq 0.0001$). For SF test, there were no differences among samples on firmness ($P = 0.9362$) and the control samples were tougher than blue samples ($P=0.0376$). For TPA, no differences were observed among samples for cohesiveness and resilience ($P \geq 0.1576$). However, control samples were harder than colored samples ($P \leq 0.0001$). Chewiness values were higher on orange and control samples than on blue samples ($P=0.0006$). Control had lower springiness values than colored samples ($P \leq 0.0001$). Control samples had higher adhesiveness values than orange samples ($P \leq 0.0001$). Color additives can affect textural characteristics of pet treats, though it is unclear how this might affect pet owner purchasing decisions.

Title: Biotic and abiotic stress distinctly influence the phyllosphere microbial community structure

Primary Author: Rishi Bhandari

Additional Authors: ;

Department/Program:

College: College of Agriculture

Abstract: While the physiological and transcriptional response of the host to biotic and abiotic stresses have been intensely studied, little is known about the resilience of associated microbiomes and their contribution towards tolerance to these stresses. We evaluated the impact of one such abiotic stress, elevated tropospheric ozone, under open-top chamber field conditions on host susceptibility and phyllosphere microbiome associated with pepper cultivars resistant and susceptible to Xanthomonas. Pathogen challenge resulted in distinct microbial community structures in both cultivars under an ambient environment. Elevated ozone alone affected microbial community structure associated with resistant cultivar but not the susceptible cultivar, indicating the role of host genotypic background in response to abiotic stress. Elevated ozone did not influence overall host susceptibility but did increase disease severity on the resistant cultivar, indicating a possible compromise in the resistance. Interestingly, combined stress resulted in a shift in microbial composition and structure like that observed with pathogen challenge alone. It indicates the possible prioritization of community response towards the most significant stress and pathogen being most influential regardless of the cultivar. Despite community composition differences, overall functional redundancy was observed in the phyllosphere community. To gain insights into community-level interactions, network topology assessment indicated a stable network with enhanced taxon connectedness upon pathogen challenge. However, an observation of destabilized random network with a shift in hub taxa in the presence of combined stress warrants future studies on the consequences of such unstable microbial communities on host response to pathogens in the face of climate change.

Title: Sensitivity analysis of the Alabama phosphorus index: Planning tool to assess and manage phosphorus loss

Primary Author: Anjan Bhatta

Additional Authors: ;Rishi Prasad;Debolina Chakraborty

Department/Program: Agriculture

College: College of Agriculture

Abstract: Phosphorus (P) loss from agricultural lands to water bodies causes degradation of water quality and impacts aquatic ecosystem. To combat the water-quality challenges due to P loadings from agricultural fields, USDA_NRCS has made revisions to 590 Nutrient Management Conservation Standard and directed to use Phosphorus Index (PI) for making management decisions. Phosphorus index is a risk assessment and management tool which helps to identify critical P source areas and ranks site's vulnerability to P loss to a water system. Phosphorus-index is a field-scale tool and contains discrete input variables such as source factors and transport factors. In Alabama, the PI source factor includes soil test P, P application rate, method of nutrient application, and grazing animals, whereas transport factors include underground outlets, soil erosion rate, hydrologic soil group, field slope, P application distance to water, and filter strip width and also include impaired habitat in the watershed. The objective of this study was to perform a sensitivity analysis of Alabama PI, which had not been studied yet. Sensitivity analysis is a powerful diagnostic tool for assessing the behavior of PI and ranks the contributions of input parameters to model output. The realistic baseline conditions, upper limit, and lower limit of each parameter were selected based on the farmers information's from representative fields and our previous research. Stochastic sensitivity analysis was performed using Monte Carlo simulations and parameters sensitivity were determined based on probability distribution analysis. The sensitivity analysis will help us to identify the important parameters in Alabama PI and prioritize those components for further investigation and research and therefore provide fundaments to perform refinement in Alabama PI for water quality conservation.

Title: Leading the Change in Southeast: Innovations with Sensors, AI, and Computer Vision for Precision Agriculture

Primary Author: Rafael Bidese Puhl

Additional Authors: ;Yin Bao

Department/Program: Biosystems Engineering

College: College of Agriculture

Abstract: Recent advancements in sensors and artificial intelligence with the development of efficient algorithms have opened up new opportunities in precision agriculture. Here, two projects are presented that demonstrate how these technologies can be used to improve agricultural practices and decision making. The first project focuses on automated pine seedling counting for nursery management. Accurate inventory of seedlings is crucial for nursery management, as it provides insights into how many seedlings can be sold and if there are any losses due to factors such as washout and pests/diseases. A system was developed to automatically count pine seedlings in production sites and map seedling density in the field. The results showed that the proposed approach was able to count seedlings in crowded scenes under complex field conditions with a lower error compared to the current practice of manual sampling and counting. The second project focuses on the development of an mmWave radar-based peanut yield monitor. Yield monitoring is an essential part of precision agriculture, but field conditions can make it challenging to develop sensors for certain crops. During the harvest of peanuts, foreign materials commonly run through the pneumatic conveyor in the harvester, making the environment inside the air duct harsh and harmful to fragile components. To address this issue, a non-contact measurement of yield was necessary. Therefore, an mmWave radar-based mass-flow sensor was developed to monitor yield during peanut harvest. The results showed that the yield prediction performance was similar or superior to other systems presented in the past. However, further field investigation is needed to evaluate the effects of factors such as combine movement and soil type. In conclusion, these projects demonstrate innovations with potential to revolutionize precision agriculture practices in the southeast US greatly improving agricultural efficiency and productivity.

Title: Food label readability: Examining the effects of font size and color contrast on reading experience and behavior

Primary Author: Adam Book

Additional Authors: ;Adam Book;Wei Wang;Veena Chattaraman;Jennifer Kerpelman;Yee Ming Lee

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Researchers have demonstrated that small font size (FS) and low color contrast (CC) inhibits reader comprehension. Despite abundant empirical literature relating to text readability (the ability to read text), a gap exists in the knowledge of reader response. This study first aims to validate the Typographic Readability Index (TRI), developed through a previous exploratory study, which is comprised of two primary readability factors, FS and CC. Second, this study aims to test the moderating effect that age group plays on the main and interaction effects of FS and CC on perceived reading difficulty (PRD). A total of 173 Auburn-area adults ranging from 19 - 83 years old completed an in-person digital questionnaire, which employed an 8 (FS: 4pt – 11pt within subjects) × 9 (CC: 3:1 – 11:1 between subjects) mixed factorial design. Images of eight different food packages with ingredients labels and accompanying questions were presented. Questions that followed each food label assessed PRD, comprehension, behavior, (e.g., intention to seek more information), and affect (e.g., anxious). Findings revealed a significant main effect for FS on PRD ($p < .001$) but not for CC on PRD ($p = .494$). FS had a significant effect on affective response ($p < .001$) but not on behavioral response ($p = .172$). CC did not have a significant effect on affective or behavioral responses ($p = .382$) and ($p = .541$) respectively. The only significant interaction effect was observed for FS and CC on affective response ($p = .049$); joint influence from FS and CC on affective response highlights the necessity of addressing FS and CC. These findings reveal the importance of adequate food packaging label text. Implementing font size requirements based on findings from this study may afford food distributors improved messaging capability, as well as help policymakers encourage public awareness of food contents by supporting optimal font sizes.

Title: Mitigation strategies for heifer development on 'KY 31' tall fescue

Primary Author: Madison Boone

Additional Authors: ;

Department/Program: Agriculture

College: College of Agriculture

Abstract: Tall fescue (Schedonorus arundinaceus) contains a symbiotic endophyte that reduces animal performance and conception rates in cows and heifers. The objective was to mitigate the toxic effects of 'KY 31' tall fescue by limit-grazing cool-season annuals as an alternative to feed supplementation. In January 2022, 48 heifers were randomly assigned to tall fescue, tall fescue with supplemental feed, tall fescue with limit grazing of cool-season annuals for 24 h per week, and cool-season annuals. Body condition scores (BCS), hair coat scores (HCS), and body weight (BW) were recorded every 30 d. Forage samples were taken for biomass, nutritive value, and ergovaline concentration. On April 1, 2022, heifers were artificially inseminated (AI), and conception rates were determined after 45 d. Data were analyzed using the Glimmix procedure of SAS 9.4 (SAS Inst, Cary, NC) with $\alpha = 0.05$. Conception rates averaged 75, 67, 42, and 50% for the continuous, limit graze, supplemental feed, and tall fescue treatments, respectively. Crude protein (CP) concentrations for the control and limit grazing treatments were greater than the continuous grazing and the supplemental feed treatments (13.5, 10.7, 10.4, and 8.9%, respectively; ($P < 0.0120$). Neutral detergent fiber (NDF) and acid detergent fiber (ADF) were different among the supplemental treatment when compared to other treatments (48.2% vs 64.7% NDF and 25.8 vs. 37.0% ADF; $P < 0.0361$). The results indicate that limit grazing cool-season annual forages may be an option to mitigate fescue toxicosis.

Title: The effect of incubation temperature and hypoxia on body mass of avian embryos

Primary Author: Kaitlyn Borck

Additional Authors: ;Wonil Choi;Haruka Wada

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: Increasing temperatures due to climate change can affect animal survival and development. Particularly, oviparous embryos are vulnerable to rising temperatures since they are immobile and cannot thermoregulate. Previous studies have demonstrated that high temperatures can induce shorter incubation periods in avian species, which may lead to decreased hatchling body mass. Additionally, high temperatures can increase embryonic metabolic rates, which can be detrimental to their development and survival—this is because avian embryos rely on the microscopic pores on their eggshell for gas exchange, including oxygen, carbon dioxide, and water vapor. The number of pores on the shell cannot change, therefore exposure to high incubation temperatures may impact oxygen consumption. This study aimed to understand the separate and combined effects of incubation temperatures as well as hypoxia on avian embryo's body and organ masses, specifically in the zebra finch (*Taeniopygia castanotis*). To test this, we assigned the eggs to four treatment groups: half were incubated at 37.4°C (optimal) or 38.9°C (high)—37C and 38C, respectively. The other half were covered in beeswax by 30% of their total surface area and were incubated in the previously described temperatures—37W and 38W. We hypothesized that embryos incubated in high temperatures will exhibit lower body mass, whereas wax-treated individuals will show increased body mass regardless of incubation temperature. We also predicted that their residual yolk mass will be inversely proportional to their body mass. Our preliminary data suggests that the eggs incubated in high temperatures had an overall lower body mass compared to those that were incubated in optimal temperatures. It also suggests that eggs incubated in hypoxic conditions (wax-treated) had an overall higher body mass compared to those in optimal oxygen conditions. Global warming can affect avian embryo's body mass, which may have negative post-hatch consequences.

Title: Using Gehl theory to evaluate the landscape performance of Gulf State Park, Gulf Shores, Alabama.

Primary Author: Kangkhita Aishwarya Bosu

Additional Authors: ;Charlene Lebleu

Department/Program: Architecture

College: College of Architecture

Abstract: This paper evaluates the landscape performance of Gulf State Park in Gulf Shores, Alabama as a part of the Landscape Architecture Foundation's Case Study Investigation Program 2022. The Gulf State Park's landscape design is a recipient of the American Planning Association, National Planning Achievement Award for Implementation - Silver, 2020 along with the Lodge at the park which is awarded SITES Platinum, LEED Gold; FORTIFIED certificates. The paper reviews the investigation under LAF's social benefits category by engaging site observations using Gehl Public Life Tools. There are several Gehl Public Life Tools available but we used Age and Gender Tally and People Moving Count in our research. The key observations and results include the user groups and their activities on the site. The Age and Gender Tally tool helped us observe and estimate the number of people in our selected areas and their approximate age and gender. The People Moving Count tool allowed us to record how many people move through our sites and their mode of movement. There are several limitations related to these tools including weather, time of day, day of the week, and season on observation days. The results achieved from the tools help build a vision and comprehensive programs based on the activities and public life inherent in the area which in turn help facilitate and encourage further design activity. Map research showed that 9 acres of the developed footprint were reduced by the new lodge, compared to the original lodge, which had a much larger footprint encroaching on the primary, and dunes, and transects through the landscape revealed that plant species sampled showed an increase of 22% when compared to the species planted.

Title: Investigation of testicular toxicity of per- and polyfluoroalkyl substances in the male rat gonad

Primary Author: Samantha Bradley

Additional Authors: ;Benson Akingbemi;Joel Hayworth

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: Emerging PFASs, such as perfluorobutanoic acid (PFBA) and perfluorobutanesulfonic acid (PFBS), are thought to be safer than legacy perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) due to decreased toxicity and rapid environmental degradation. The present study is designed to compare the endocrine-disrupting properties of legacy and emerging PFASs. Male Long-Evans rats (n=12) were fed test chemicals (PFOA, PFOS, PFBA, PFBS) in drinking water at 10 or 100 ng/L from postnatal days 21 to 49. Animals were then sacrificed to obtain testicular tissue and Leydig cells for incubation in DMEM/F-12 culture medium for 3 h for basal T or with 100 ng/mL ovine LH (NIDDK, NIH) to measure LH-stimulated testosterone (T) production by RIA. Testes, Leydig cells and pituitary glands were processed for western blot analysis. Exposures to PFOS and PFBS at 10 and 100 ng/L decreased ($p<0.001$) basal testicular T production, but PFBA at 10 ng/L increased ($p<0.05$) LH-stimulated testicular T production. Testicular expression of the MIS protein was increased ($p<0.05$) by PFOS and PFBA at 100 ng/L, whereas testicular inhibin-β protein was decreased ($p<0.001$) by all test chemicals at 10 and 100 ng/L doses except the lower PFBA dose. Exposure to PFOA at 10 ng/L and PFBS at 100 ng/L increased ($p<0.05$) pituitary LH-β protein expression similar to PFBA at 100 ng/L and PFBS at 10 ng/L which increased ($p<0.001$) pituitary FSH-β protein. In Leydig cells, PFOA at 100 ng/L increased ($p<0.0001$) but PFBA at 100 ng/L decreased ($p<0.05$) StAR protein. Cytochrome P450 17A1 enzyme protein was decreased ($p<0.05$) by both PFBA and PFOS at 100 ng/L in Leydig cells compared to control. These observations showed that both legacy and emerging PFASs can impact the male neuroendocrine-reproductive axis, with implications for germ cell development, sperm production and male fertility.

Title: Impact of fire history and seed depredation on seedling emergence of four southeastern tree species

Primary Author: Payton Brewer

Additional Authors: John L. Willis;Heather Alexander;Kathleen Gabler;Rachel Nation

Department/Program: Wildlife Ecology and Management

College: School of Forestry

Abstract: Across the southeastern United States, decades of intentional fire exclusion have contributed to substantial decreases in the longleaf pine ecosystem, with consequent declines in biodiversity of associated flora and fauna, including endangered species like the gopher tortoise (Gopherus polyphemus) and red-cockaded woodpecker (Leuconotopicus borealis). In response, there has been considerable research investigating factors that impact natural regeneration of longleaf pine, especially in fire-restored forests. However, one especially important, yet understudied, process that could impact longleaf regeneration relative to its hardwood competitors is seed depredation. Thus, the objective of this research is to quantify how fire history and seed depredation impact seedling emergence of longleaf pine seeds in comparison to three common competitors, tulip poplar (Liriodendron tulipifera), sweetgum (Liquidambar styraciflua), and blackgum (Nyssa sylvatica). In February 2023, we deployed several types of predator exclosures, which differentially restrict access of vertebrate and invertebrate predators, at two study sites near Auburn, AL, USA: the Mary Olive-Thomas Demonstration Forest and the Tuskegee National Forest. Within each site, we selected three unburned and three frequently burned stands (2 -10 ha each). Each stand had three 25 m x 25 m plots of 16 exclosures randomly placed ~ 5 m apart. Ten seeds of each species were placed in each exclosure and monitored periodically for seed removal rates. Overall, the data collected from this research will alleviate a deficit in research on the early seedling establishment and seed depredation rates of four southeastern tree species in unburned and frequently burned stands. Further awareness of the early life stages of longleaf pine in relation to competing hardwood species will aid forest managers in understanding the interacting influences of fire frequency and seed predators on community assembly.

Title: A Study of Climate Change Impact on Major Alabama Crops

Primary Author: Gracen Bridges

Additional Authors: ;Ruiqing Miao

Department/Program: Agricultural Economics and Rural Sociology

College: College of Agriculture

Abstract: Many studies have focused on the negative impact of climate change overall, but not especially for the state of Alabama. I investigate the impact of climate change on yields of corn, cotton, soybeans, and peanuts in Alabama using a large panel data set for the 1950 – 2019 period. I collected the county-level data for corn, cotton, peanuts, and soybeans from the National Agricultural Statistics Service (NASS) of the U.S. Department of Agriculture (USDA). I performed two methods of analysis: the Ordinary Least Squares Model (OLS) and the Fixed Effects Panel Data analysis. I found that an increase in the normal Growing Degrees Days (GDD) range of the crops has a statistically significant positive impact on yield, whereas an increase in overheat GDD has a statistically significant negative impact. For the corn yield analyses, the OLS model and Fixed Effects produced coefficients of -0.425802 and -0.4656344 for overheat GDD (GDD above 29 degrees C). These results mean that when overheat GDD increases by 1 unit, the corn yield will decrease by 0.43 and 0.47 bushels/acre. For the cotton yield analyses, when overheat GDD of 32 degrees C increases by 1 unit, the yields will decrease by -4.75926 and -5.684936 lb/acre.

Title: Conforming to Injunctive Classroom Norms of Aggressive Behavior: The Moderating Role of Empathy and Moral Disengagement

Primary Author: Emily Brigham

Additional Authors: ;Wendy Gordon

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: Studies investigating the link between injunctive social norms and youth aggression have indicated that in classrooms where aggression is socially condoned, heightened aggressive behavior is later observed. Less known is if individual characteristics moderate youth's susceptibility to aggressive behavioral norms. Given research implicating empathy and moral disengagement (MD) as influential to aggressive behavior, the present study examined whether associations between injunctive norms supportive of aggression and youth's aggressive behavior are stronger when youth are low in empathy or high in MD. These propositions were examined longitudinally using multi-level latent growth curve analyses. Data were collected from 1466 youth in fourth- and fifth-grade classrooms (721 girls) at three timepoints across a school year. In the fall, youth completed self-report measures of empathy and MD. At all three timepoints, teacher-reports of proactive, relational, and overt aggression, and peer-reports of relational and overt aggression were obtained. Youth also completed a peer-rated popularity measure. Using fall data, classroom injunctive norms were computed by calculating within-classroom correlations between participants' peer-reported popularity and their aggression as reported by peers and teachers. Significant cross-level interactions between the injunctive norm for aggression and either empathy or MD were found for teacher-reported, but not peer-reported, aggression. Although exact findings varied as a function of aggression type and gender, teachers in classrooms with a higher positive association between aggression and popularity reported higher levels of aggression for youth with low levels of empathy or high levels of MD. Recentering the intercept to the spring revealed that the moderating effects of empathy and MD remained significant throughout the school year. These findings demonstrate that individual characteristics may make youth more or less likely to conform to classroom aggression norms.

Title: Analysis of Cassiopea jellyfish populations within the Florida Keys

Primary Author: Auburn Brown

Additional Authors: ;Katherine Buckley;Megan Maloney

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: *Cassiopea*, the upside-down jellyfish, have become increasingly prevalent in tropical and subtropical coastal regions worldwide. In many areas, these species are invasive, which has important ecological implications. However, due to high levels of phenotypic variation within species, it is often difficult to accurately determine species based on morphological traits alone. This study focuses on the identification of *Cassiopea* species in the Florida Keys using both genetic and morphological techniques. In order to determine *Cassiopea* species, we sequenced the mitochondrial genes, Cytochrome C Oxidase and 16S, for X number of jellyfish from various environments from Key Largo to Key West. Despite the wide variety of morphology and phenotypic variation, results show that the majority of the species sequenced were from the *Cassiopea xamachana* species. These results suggest that, at least within the Florida Keys, the high prevalence of upside-down jellyfish is the consequence of expansion of a single species. Further work will be performed to understand how these organisms have been so successful despite the large variation in environmental conditions.

Title: Chinese tallow (Triadica sebifera) seed viability decreases rapidly in pine forests along the Gulf of Mexico coast

Primary Author: Eric Brubaker

Additional Authors: ;Heather Alexander;Zhaofei Fan;Christopher Anderson

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Along the Gulf of Mexico coast, endangered longleaf and slash pine (Pinus palustris, P. elliottii) flatwoods are at risk of degradation from Chinese tallow (Triadica sebifera; hereafter: tallow) – an ecosystem transforming invasive exotic tree species with prolific seed production. Tallow seeds spread through two primary mechanisms: hydrochory (water dispersal) and zoochory (animal dispersal, specifically by birds). Seeds distributed by zoochory are scarified in the bird's digestive tract which removes the waxy seed coat. To assess changes in viability over time between seeds dispersed by different mechanisms, we installed a total of 30 plots at Mississippi Sandhill Crane National Wildlife Refuge, MS, USA in May 2022. Each plot contained bags with seeds from two scarification treatments (Scarified, SD, and Unscarified, USD) placed at 3 depths below soil surface (0, 2, and 5 cm) that were collected 3-, 6-, and 9-months post planting. Seed viability was determined using the tetrazolium (TZ) test. We allowed seed embryos to imbibe in a 1% TZ solution for 3 days, and seeds stained red were presumed to be viable. Prior to out planting, baseline viability was 92% and 94% for SD and USD seeds, respectively. Early results indicate a sharp decline in seed viability across all treatments at the 3-month collection period with SD seeds having lower viability than USD seeds at 6% and 21%, respectively. At 6-months, seed viability continued to decline and was similar between scarification treatments (SD: 5%, USD: 13%). These results demonstrate a sharp initial decrease in tallow seed viability regardless of dispersal mechanism or burial depth which could limit the ability of tallow seeds to persist long-term in the soil seedbank.

Title: <<Gyrodactylus cichlidarum>> infecting the skin, fins, and gill filaments of intensively cultured Nile tilapia, <<Oreochromis niloticus>> (Cichlidae)

Primary Author: John Brule

Additional Authors: ;Ash Bullard;Micah Warren;Haley Dutton;Nhat Triet TRUONG;Steven Ksepka;Stephen Curran;Jacob Shurba;Justin Krol

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: The parasites of Nile tilapia, *Oreochromis niloticus* (Linnaeus, 1758) (Cichliformes: Cichlidae) are poorly documented in North America. These parasites concern fisheries managers and fish culturists in North America because they comprise potential introduced (exotic, non-native) pathogens that kill intensively- or extensively-cultured tilapias and could theoretically harm sympatric wild fishes. As part of a survey of the parasites of Nile tilapia cultured at high density in flow-through raceways, we observed numerous monogenoid specimens attached to the skin, fins, and gill filaments that we identified as *Gyrodactylus cichlidarum* Paperna, 1968. This parasite was originally described from the skin and gill of mango tilapia, *Sarotherodon galilaeus* (Linnaeus, 1758) (Cichlidae) from pools and streams in the Accra plains, southwestern Ghana. Live specimens of *G. cichlidarum* intended for morphology were heat-killed, formalin-fixed overnight, routinely stained, cleared, and whole-mounted on glass slides. Additional specimens were preserved in 95% ethanol for DNA extraction and sequencing of the internal transcribed spacers 1 and 2 (*ITS1, ITS2*) and *5.8S* ribosomal RNA gene. We identified our specimens as *G. cichlidarum* by comparing our specimens with published descriptions of *G. cichlidarum* (emphasizing the morphology of the ventral bar and marginal hooks). Our two identical sequences of the *ITS1-5.8S-ITS2* (783 bp and 723 bp) were nearly identical (1 bp difference) to those ascribed to *G. cichlidarum* from the United Kingdom. The present study is the first taxonomically confirmed record of a parasite infecting Nile tilapia in the United States and comprises the first genetic information for *G. cichlidarum* in the United States.

Title: Examining the effects of response monitoring instructions on endorsements of suicidal ideation

Primary Author: Cassidy Brydon

Additional Authors: ;April Smith;Tracy Witte;Sydney Waitz-Kudla

Department/Program: Psychology

College: College of Liberal Arts

Abstract: It is common practice for researchers to monitor responses to items assessing suicidality and follow up with participants at higher risk when their identities are known. However, given that the act of assessing suicidality does not increase the likelihood that an individual will become suicidal, it is becoming increasingly common for researchers to administer fully anonymous surveys that do not allow for follow-ups with participants at higher risk. Currently, it is unknown whether these two different approaches—monitoring and follow-up vs. no monitoring or follow-up—affect the willingness of participants to endorse suicidal ideation. Our study uses an experimental design to manipulate instructions about response monitoring to evaluate whether it affects the accuracy and severity of self-reported suicidal ideation. We are administering a brief, online survey to undergraduates across two timepoints (N=572), with the monitoring condition shifting to anonymous, non-monitored responses at Time 2. We hypothesize that that the anonymous condition will report higher levels of suicidal ideation than the monitoring condition at Time 1, presumably reflecting more honest responding. Additionally, we will investigate between-within-subject interactions and hypothesize that the monitoring condition will exhibit an increase in ideation as they shift to anonymous responses, while we predict no change for the fully anonymous condition. Results from the current study will clarify how monitoring instructions may impact self-reports of suicidal ideation.

Title: Sambucol-based novel prophylactic and healing approach to prevent and treat the global pandemic associated with COVID-19

Primary Author: Olivia Buise

Additional Authors: Muralikrishnan Dhanasekaran;Muralikrishnan Dhanasekaran

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: COVID-19, an acute viral respiratory disease that gave rise to a global pandemic, affects men and women of various ages but is most dangerous for individuals ages 65 and up. The current therapeutic strategies are ineffective in preventing and curing this infectious disease. Sambucol, a natural bioactive from the berries of the elderberry plant (Sambucus nigra L.), can be utilized as a prophylactic and therapeutic treatment for COVID-19. Many pre-existing pharmacological approaches for COVID-19 have demonstrated few beneficial effects for patients who are non-hospitalized and have only been effective for patients with severe symptoms. Sambucus extract has anti-viral properties and has previously been utilized in treating influenza. Interestingly, Sambucol has a low adverse drug reaction profile and has been deemed safe for influenza treatment. Therefore, using Sambucol as a treatment for COVID-19 may be effective in preventing infection and reducing symptoms in patients with mild to moderate COVID-19. Literature was acquired through Google Scholar, PubMed, and Centers for Disease Prevention and Control (CDC) through February 2023 by using keywords like "Sambucol and COVID-19," "Sambucol and elderberry," and "COVID-19 and elderberry." Our study will reveal the novel pharmacodynamic mechanisms and justify the current and future use of Sambucol.

Title: Asymmetric electron emission patterns in H2 & D2 after VUV + NIR photoabsorption

Primary Author: Spenser Burrows

Additional Authors: ;Guillaume Laurent

Department/Program: Physics

College: College of Science and Mathematics

Abstract: Using the COLTRIMS technique, we investigated the dissociation of vibrationally excited H_2 and D_2 molecules after 2-color (VUV + NIR) absorption. The Advanced Light Source synchrotron provided VUV radiation to photoionize H_2 (D_2), leaving H_2^+ (D_2^+) ions in specific vibrational states. A synchronized 1030-nm NIR 12 ps laser pulse then dissociated these ions at a controlled time delay. We report on electron emission in the molecular frame, retrieved from the recoil ion lab-frame momentum, and its dependance on the orientation of the VUV and NIR polarizations. For some vibrational states, we observed an asymmetric photoelectron angular distribution that depends on the VUV/IR time delay. This asymmetry could be related to photoelectron retroaction with the dissociating ion. This research was supported by U.S DOE, Office of Science, Office of Basic Energy Sciences, Division of Chemical Sciences, Geosciences and Biosciences

Title: Effect of food restriction on DNA damage across breeding stages in adult zebra finches

Primary Author: Hannah Butterfield

Additional Authors: Natalie Gassman;Tori Coutts;Haruka Wada

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The environment plays a crucial role in the physiological states of organisms. When organisms are exposed to chronic changes in the environment that could potentially be stressful, oxidative damage and buildup of reactive oxygen species (ROS) can occur which can lead to DNA damage. Many studies have shown links between food restriction and DNA damage in rodents, but few have investigated the impacts of food restriction on DNA damage during periods of high energetic demand such as breeding or looked at these relationships in taxa other than rodents. To address these gaps, adult zebra finches (*Taeniopygia castanotis*) were either exposed to a restricted diet or a control (*ad libitum* food) starting at the hatchling stage of breeding. Blood samples were collected from parent birds when the parents were paired (before treatment), when the offspring fledged, and when the offspring became nutritionally independent. We then used the red blood cells (RBCs) to extract the DNA and performed Repaired Assisted Damage Detection (RADD) to analyze DNA damage that could be apparent. Data show no effect of food restriction on DNA damage. However, food-restricted parents had lower body mass than control parents at fledge, and body mass loss was negatively correlated with DNA damage. Our results show DNA is robust during periods of food restriction and that body mass gain is more related to increases in DNA damage. Thus, individual variation in body mass changes during breeding is more important in the ability for DNA to repair rather than environmental conditions.

Title: Protocetraric acid, found in common greenshield lichen, as a possible cure for malaria

Primary Author: Camille Daugherty

Additional Authors: Click or tap here to enter text.

Department/Program: Civil Engineering

College: College of Engineering

Abstract: As one of the deadliest diseases in the world with an average of 350–500 million clinical episodes and more than one million deaths a year, malaria is an ever-present global concern. Common malarial symptoms include fever, shivering, cough, respiratory distress, pain in the joints, headache, watery diarrhea, vomiting and convulsions. This leads to increased infant mortality when contracted by pregnant mothers, and increased mortality when contracted by children under five. If not properly treated, the infection can become severe and may cause kidney failure, seizures, mental confusion, coma, and death. Malarial parasites are beginning to develop widespread resistance to common cures, creating an increased need for new research and development. Current drugs such as Primaquine, Chloroquine, Lumefantrine, and Curcumin have a 71.8% effectiveness rate. These drugs work to kill the malaria parasites during their development stage in the liver and red blood cells. Protocetraric acid has been cited for its promising antimicrobial properties when used to treat Salmonella typhi, and therefore can be utilized in the treatment of malaria. This natural product is a carbonyl compound unique to lichens. Relevant search terms contributing to the study objective were used across electronic platforms such as PubMed and Google Scholar, through February 2023 to establish the gap in current research surrounding alternative cures for malaria. This study will propose the use of protocetraric acid, as found in the common greenshield lichen, as a cure for malaria due to its antimicrobial properties.

Title: A healing community design for veterans with accessible tiny homes and central healthcare facilities

Primary Author: Madie Camp

Additional Authors: ;Anna Ruth Gatlin

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: The United States reported 31,136 homeless veterans in 2022. These citizens, who sacrifice physical and mental wellbeing, often return home to minimal institutional and governmental support. Veterans experiencing homelessness leave their time of service with financial stress, mental trauma, physical injuries, and lack of community; this research proposes a prototype for a healing community to support the population. Research suggests a healing environment, accessible living spaces, equitable and efficient mental healthcare, and health technology leads to better environments for veterans. Financial stress is the most prevalent issue for discharged veterans in America. Supporting veterans while they get back on track with their financial situation, managing mental health issues caused by active duty, designing safe spaces that allow for privacy and autonomy, and providing accessible health centers that focus on veterans' needs is essential to recovery post service. One option for supporting the holistic needs of the veterans is an economically reasonable, universally accessible community of tiny homes adjacent to a veteran-centered healthcare rehabilitation facility. A sense of community is universal; lack of camaraderie has been shown to negatively affect veterans that return to no one. The purpose of this research is to propose a veteran-centered community grounded in evidence-based design, to improve the lives of veterans experiencing homelessness in America. A prototypical accessible tiny home will be fully developed and annotated, and the community urban plan will be proposed at a high level. Factors considered in the design elements will be supporting veteran mental well-being, accessibility features that allow functionality regardless of disability, and community-centered support. Creating a community that provides refuge for soldiers and allows healing will enhance the wellbeing and change the lives of veterans experiencing homelessness in America.

Title: Role of CCL-11 in COVID-19-mediated cognitive impairment: Possible Prophylactic and therapeutic role of Bacoside-A: A clinical meta-analysis

Primary Author: Juliet Cannizzo

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Rachel Parise

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: The inflammatory effect of the severe acute respiratory syndrome coronavirus type 2 SARS-COV-2 (COVID-19) can cause deficits in memory, attention, and cognitive processing speed. With over 675 million cases and over 6.7 million deaths, healthcare systems worldwide are being strained. Proposed mechanisms for SARS-CoV-2 reaching the CNS include an ACE2-dependent "neuroinflammatory" pathway utilizing the olfactory system, infiltration of pro-inflammatory cytokines (CCL-11) from blood circulation by crossing the blood-brain barrier, and access through infected immune cells. The most common CNS symptoms and disorders associated with SARS-CoV-2 include cognitive impairment and others such as anosmia, dysgeusia, myasthenia, vertigo, restlessness, euphoria, convulsions, depression, anxiety, and stroke. If cognitive impairment is not prevented or treated appropriately, it will drastically increase the burden of health care and result in increased morbidity and mortality globally. Hence, there is an imminent and immediate necessity to develop novel natural bioactive-based prophylactic and therapeutic strategies to decrease CCL-11 and prevent/treat the cognitive impairment associated with COVID-19-induced neuroinflammation. Bacopa monnieri can boost memory and act as a neuroprotectant. Bacoside-A is one of the primary active chemical compounds and is a non-polar glycoside that passes the blood-brain barrier through lipid-mediated passive diffusion. The interaction of Bacoside-A with CCL-11 in the treatment of cognitive impairments from the COVID-19 virus is unknown. Relevant search terms contributing to the study objective were used across electronic platforms such as PubMed, Scopus, and Google Scholar, through February 2023 to establish the role of neuroinflammation associated with COVID-19-indued neurological insults. This study will propose the neuroprotective role of Bacoside-A that can be used to prevent and counteract the neuroinflammation induced by COVID-19.

Title: Catalytic effect on properties of bio-oil based Polyurethane

Primary Author: Lucila Carias

Additional Authors: ;Brian Via;Iris Vega Erramuspe;Maria Auad;Lorena Alexandra Portilla Villarreal

Department/Program: Polymer and Fiber Engineering

College: College of Engineering

Abstract: Bio-oils are a mixture of different organic compounds derived from biomass. Some of the compounds include various organic acids, alcohols, and phenols. The composition of bio-oil is based on the initial source of the bio-oil. In this project, bio-oils that were utilized were derived from eucalyptus, pine, and poplar wood. Due to the different compounds, bio-oils can be utilized for developing polyurethanes. Polyurethane is a versatile material that can have a wide range of properties depending on the specific formulation. By modifying the formulation with the bio-oils, a safer, greener polyurethane can be produced that could eventually be used for additive manufacturing-based construction. The bio-oils in this project are mixed with diols and an isocyanate as well as, in certain samples, the catalyst dibutyltin dilaurate, a common catalyst that is used for accelerating the polyurethane reaction. Through FTIR analysis, it was concluded that the mixture of bio-oil, diol, and isocyanate did form a polyurethane due to the peak at 2250 cm-1 decrease with time indicating that the isocyanate was consumed in the reaction. The conversion of the isocyanate increases when dibutyltin dilaurate is present in the system. Not only is the conversion speed increased with the catalyst, but the curing reaction also starts fifty percent sooner compared to the catalyst free reaction. Further research into the catalytic effect on the curing reaction is ongoing as well as any byproducts of the polyurethane reaction due to the presence of water in the bio-oils.

Title: Artificial Intelligence provides promising advantages for movement disorders

Primary Author: Bernadette Carl

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Movement disorders are the term used for a group of neurological disorders that cause a change in movements. Movements often become uncontrollable by those with movement disorders. Some of the most common movement disorders include Parkinson's disease, Huntington's disease, Tourette syndrome, ataxia, and essential tremor. Artificial intelligence (AI) is the perceiving, processing, and inferring information by a computerized machine. AI is rising in many fields, including healthcare for humans and animals. AI can be used to help with early diagnosis, decreasing mortality and morbidity, and improving efficacy by individualizing drug dosing, aiding in the discovery and/or the development of novel therapeutic or preventive agents and approaches. AI helps to slow the progression of diseases. The widespread use of AI in the healthcare field is scarce. It would be a major benefit for medical professionals to begin to adopt the use of AI. AI has the potential to provide the best prognosis for patients by minimizing the costs of therapy, adverse reactions, and hypersensitivity reactions. AI has the ability to improve the lives of patients with movement disorders drastically. AI could provide the much-needed discovery of treatments, drugs, and techniques for patients with movement disorders. There is certainly a growing need for the use of artificial intelligence to advance modern-day medicine. In this study, we will investigate the role of artificial intelligence in movement disorders.

Title: Comparing sources of sex education and sexual discomfort between sexual and non-sexual adolescent offenders

Primary Author: Emma Carpenter

Additional Authors: ;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: This study sought to investigate differences in sexual discomfort across several different juvenile offending populations. These populations include adolescents adjudicated for illegal sexual behavior (AISB) and adolescents adjudicated for general delinquent behavior (AGBD), including those adjudicated for court-mandate chemical addiction behaviors. All youth participants (n = 749)were placed in residential treatment program from 2001-2017 and data from archival pre-treatment evaluations was analyzed. Prior research suggests that early exposure to inappropriate sexualized media has been linked with problematic sexual behavior, particularly for AISB. Additionally, early childhood sexual abuse may play a role in an adolescent's development of sexual offending behavior. Therefore, the groups were compared with child abuse and sexual discomfort scales, which may or may not be impacted by the sources of the youth's sexual education. A series of 3X5 ANOVAs were used to test the theory with group membership and sources of sex education as the grouping variables. There were no significant interaction effects between factors. Only direct main effects for group membership were significant, indicating the AISB group often scored higher. For the sexual discomfort score, regardless of how they first learned about sex, the AISB group scored significantly higher (P>.001) and there were no significant differences with sexual discomfort levels regardless of the source of education (P=.865). With respect to the child abuse score, AISB had a significantly higher than average child abuse score than AGBD across all sources of sexual education categories (P>.001). These results provide further evidence that youth who sexually offend are unique and need different treatment and intervention.

Title: Effect of lake powdered dyes on instrumental color and pH of raw and cooked ground chicken pet treats

Primary Author: Hilary Gisselle Carrera Arcia

Additional Authors: Charles Starkey;Jessica Starkey;Ileana Maria Berganza Portillo;Jorge Romero Garcia;Justin Dunavant

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Color additives (CA) are often used to increase marketability of pet treats. There is limited data on how CA influence the physiochemical properties of treats. The objective of this experiment was to evaluate the effects of CA on instrumental color and pH of raw and cooked ground chicken breast (GCB) pet treats. Six treatments were composed of combinations of raw and cooked GCB and 3 CA (blue, orange, and control). Treats were manufactured by mixing GCB with lake powdered dyes (blue #2 and orange), and a control with no color addition (CTRL). Raw and cooked treats were placed into silicone mold and refrigerated. One half of the treats were cooked in a convection oven until the product reached an internal temperature of 74 °C. A Hunter Lab MiniScan EZ colorimeter was used to analyze lightness (L*), redness (a*), and yellowness (b*) on raw and cooked treats. Also, pH was analyzed using a Hanna Professional Portable meat pH meter. Data were analyzed as a 2-way ANOVA using the GLIMMIX procedure of SAS ver. 9.4. Means were declared different at $P \leq 0.05$. Cooked blue treats required the least amount of time to reach internal temperature (90 mins) vs. orange treats (140 mins). Raw CTRL treats were the lightest and cooked blue treats were the darkest ($P < 0.0001$). Raw orange treats were the reddest and yellowest ($P < 0.0001$). Raw and cooked CTRL products had similar redness and pH. Cooked blue samples had the highest pH, raw orange samples presented the lowest, and CTRL treats presented a similar pH between raw and cooked samples ($P = 0.0014$). Delta-e measures the perception of color differences by the human eye. Evaluated delta-e values for all colored products suggest a substantial difference between color of treats at different doneness stages (raw and cooked). Results imply the interaction between CA and doneness stages will influence the visual as well as chemical characteristics of meat-derived pet treats.

Title: Characterization of canine Adenovirus type 2 tropism

Primary Author: Atonu Chakrabortty

Additional Authors: ;

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Adenoviral vectors are the most commonly used gene therapy vectors. The natural tropism of an adenovirus can be exploited to deliver genes to cells that are refractory to Ad transduction. The expression pattern of the Ad-specific cell surface receptors determines the virus tropism and, therefore, the ability to use specific vectors to transduce specific cell types. Canine adenovirus 2 (CAV2) is a canine adenovirus with a known ability to infect human cells, including neurons and ovarian cancer cells. CAV2 transduction is not dependent on CAR and cell-surface integrins like its human counterpart Ad5. The cell surface receptors involved in CAV2 transduction are still unknown, and identification of these would provide valuable information for enhancing Adenovirus-based vectors to develop enhanced gene delivery tools. The newly gained knowledge will help modify Ad based vectors to transduce Ad refractory cells creating a substantial and wide-ranging impact ranging from experiments focused on understanding basic molecular processes to ones that address sickness and disease (drug targeting). This research will also help understand the basic biological mechanism of infection by this adenovirus, further expanding knowledge with respect to both this virus and this class of virus.

Title: Understanding the effect of climate and land use on sedimentation rates in geographically isolated wetlands with MUSLE

Primary Author: Suranjana Chatterjee

Additional Authors: Steven T. Brantley;Frances O'Donnell;Coleman Barrie

Department/Program: Civil Engineering

College: College of Engineering

Abstract: Geographically isolated wetlands (GIWs) are widespread in different agricultural regions of the USA. This study will provide fundamental insights into the spatial and temporal variability in the mediation of nutrients and sediment runoff by GIWs. The location of study is southwest Georgia - a karstic region with numerous GIWs and intensive irrigated row crop agriculture. To determine long-term erosion and sedimentation, we used the Modified Soil Loss Equation (MUSLE) which is applied to individual storm event. It is a simple model that provides good sediment yield prediction accuracy and eliminates the need for delivery ratios. The parameters to find sediment yield in MUSLE from a given rainfall event are runoff volume, peak flowrate, soil erodibility factor, slope length and gradient factor, cover management factor, and erosion control practice factor. We predict runoff volume and peak runoff from daily precipitation data collected onsite from 1920-2020 based on the NRCS TR-55 procedure. The soil erodibility factor is determined from analysis of soil cores collected from the site. We determined the slope length and gradient factor from a USGS 10-m Digital Elevation Model of the site using the ArcHydro extension for ArcGIS Pro. Cover management and erosion control practice factors and site-specific curve numbers are determined from historical imagery. Results of the long-term sediment yield model will be compared to wetland sedimentation rate determined from paleolimnological analysis of sediment cores. Results for the first wetland showed sedimentation rate of 0.2-1.7 g/cm2/yr based on model results and 0.3-2.5 g/cm2/yr based on the sediment core. These rates are similar to or higher than sediment storage by other types of water bodies in agricultural regions. Ongoing work will compare long-term sedimentation rate across several GIWs with contrasting characteristics to determine the interacting effects of climate and land cover on sedimentation rate.

Title: Egg-cellent endeavors: Exploring eggshell pores and their role in shaping Avian embryo thermal tolerance

Primary Author: Wonil Choi

Additional Authors: ;Haruka Wada

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: Elevated temperatures due to global warming threaten many organisms' survival. The threat is likely direr for ectothermic animals as metabolic rates increase with surrounding temperature. Avian embryos are unique in that they are ectothermic and rely on microscopic pores that reside on their shell surface for gas exchange, and the number of pores is pre-determined at lay and is fixed for the remainder of development. As metabolic rates increase at higher temperatures, avian embryos may suffer from hypoxia when a limited number of pores are available. We do not fully understand the deleterious effects of the limited gas exchange on embryonic development, and whether pores play a role in the thermal tolerance of embryos. Here, we aimed to understand the specific role these microscopic pores play in embryonic development and survival by physically covering a portion of the zebra finch eggs with beeswax and incubating them in either optimal or high incubation temperatures. We hypothesized that the reduction in pore area will decrease the embryo’s hatching success rates. We also predicted that the eggs that are covered in beeswax will lose less water and consume less oxygen throughout their incubation period due to less available gas exchange channels. Our data show the lowest hatching success rates in the wax-treated group incubated at high incubation temperatures. Additionally, wax-treated individuals lost and consumed less water and oxygen compared to the control groups, regardless of the incubation temperature. These results suggest a lower number of pores decreases thermal tolerance in zebra finch embryos.

Title: The secret history of women in Leonora Sansay's the *Horrors of St. Domingo*

Primary Author: Zana Christjohn

Additional Authors: ;

Department/Program: English

College: College of Liberal Arts

Abstract: The Cult of True Womanhood encapsulates the ideologies that surrounded women for centuries, reflected in the literature and media of the past. Heavy research into the significance of patriarchy within cultures, especially in European/American studies, has uncovered the impact of male-dominated ideology on women's lived reality in these spheres. Throughout the Americas' colonial development, the European concept of a submissive, pure, chaste, and pious woman as the "Angel" of the home spread, which also reinforced ideas of fallen women (typically poor, independent, and black women). Writing during this period, Leonora Sansay enters literary circles with her work *Horrors of St. Domingo*. Written through female characters' perspectives, *Horrors* provides a look into the female experience during the Haitian Revolution and the experience of all women shaped by the Cult of True Womanhood's ideals. I examine Sansay's depiction of her female characters in her work, especially her characterization of Clara, locating the underlying presence of the Cult. Utilizing close readings of the text and incorporating research on relationships, female sexuality, the true woman, patriarchal societies, and colonial women's experiences reveals that Sansay deliberately commentates on the ideological expectation of women during her time. Establishing the historical basis of the Cult and the ideology's influence on society, I move through the general depictions and perceptions of Clara and Mary and examine the specific relationships and interactions these characters have with men and women. I argue that through her employment of physical description, female action, relationships, and sexuality, Sansay operates within the limits of the Cult to oppose the ideology surrounding women, offering her readers a more dynamic view of womanhood. Sansay's work transcends the bounds of the narrative, exposing the disparity between women's lived experiences and the idealization of the True Woman.

Title: Understanding dormancy release in peach flower buds (<<Prunus persica>> L.)

Primary Author: Adriana Cifuentes Carvajal

Additional Authors: Darío Chavez;Bernardo Chaves-Cordoba;Melba Salazar-Gutierrez;Edgar Vinson;Elina Coneva

Department/Program: Horticulture

College: College of Agriculture

Abstract: Variations in temperature and short photoperiods lead to meristem inactivity in peach floral buds as a physiological response. Warmer winters and Spring temperature fluctuations through time modify the peach dormancy release pattern increasing the probability of premature flowering and affecting peach production and harvest dates. The goal of the study was to understand the dormancy release and the bud break in peach flower buds (*Prunus persica* L.), by integrating the chilling and heat requirements, under specific climate conditions using different models including the Cumulative Chilling Hour, Modified Weinberger model, Dynamic model, and Growing Degree Model. Dormancy release and the phenological transition were established for each cultivar using a biological cutting test. The dynamic of the floral bud progression was observed every day. Climate information has been used from two weather stations from Chilton Alabama to calculate chilling and heat accumulation. An average of 197, 192, and 186 days was determined between the dormancy stage (From September 1) and petal fall (last stage evaluated) for Harvester, Redglobe, and Rubyprince cultivars respectively. Rubyprince was the first cultivar to get bud break followed by Redglobe and Harvester. Models showed most of the floral buds reached the break in a range of 800 to 985 CH. At the end of the project, we will be able to identify the starting point where dormancy breaks and the beginning of phenological stages occur. This valuable information will use for improving management practices and future development of models generating an immediate impact in the Chilton Alabama industry.

Title: Addition of self-assembling small molecules to cellulose hydrogels to enhance gelation and tune microstructure

Primary Author: Jordan Clemmons

Additional Authors: ;Symone Alexander

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Chronic kidney disease (CKD) affects more than 1 in 7 U.S. adults (CDC), 71% percent of these people are treated with dialysis (NIDDK). Dialysis lowers the quality of life for patients due to the long treatment times and the stress it puts on the patient's body. Currently, we are developing orally ingested sorbent microgels as an alternative treatment for CKD. These microgels mimic dietary fiber to absorb uremic toxins while releasing probiotics. However, challenges with these gels include lengthy gelation times and difficulty in controlling microstructure. Self-assembling small molecules can be added to cellulose gels to tune the microstructure of the gel and ensure the correct pore size and geometry, which also decreases the gelation time due to rapid self-assembly. In this study, we investigate the gelation characteristics of a pH-responsive small molecule, FMOC, and its effect on cellulose-based microgel structure. Since FMOC creates a gel in a basic solution, different concentrations of sodium hydroxide were added to determine the most stable pH. The gels were observed over a month and a pH of 12.7 was determined to be the most stable. When FMOC was added to a cellulose solution, a gel was instantly formed, confirming that a small molecule will decrease the gelation time for the microgels. Microscopy images were taken of FMOC gels without cellulose. The microscopy images showed an increase in the density and connectivity of fiber networks that was proportional to an increase in pH. Thus, small molecule fiber networks could be used as a template to create a more uniform gel. In conclusion, these findings show promise that a small molecule is beneficial in tuning the formation and function of a microgel and should be investigated more thoroughly. This method could make the production of cellulose microgels more feasible, changing the lives of many patients suffering from CKD.

Title: Development of a nanobody-based immunocytochemistry for phenotyping canine lymphoma

Primary Author: Ashley Clowers

Additional Authors: ;Emily Graff;Jonathan Marable;Maninder Sandey;Cornelius Withers

Department/Program: Chemistry-Biochemistry

College: College of Science and Mathematics

Abstract: Nanobodies (Nbs) are specific, stable, single-domain antibodies found in camelids and cartilaginous fish. Their attributes make them ideal for bulk production by bacterial cells and their antibody-like binding properties make them a more economical and efficient substitute for traditional antibodies in diagnostic assays. Immunocytochemistry (ICC) is a method that uses antibodies or nanobodies to bind to an antigen in a cytology sample and can be helpful for rapid immunophenotyping to aid in the diagnosis of certain diseases, such as lymphoma. Recently, our lab has identified anti-CD3 and anti PAX5 Nbs that can be used to immunophenotype canine lymphoma cells. The CD3 and Pax5 are well-established immunomarkers for canine T and B-cell lymphoma, respectively. The purpose of this project is to evaluate the specificity and sensitivity of these Nbs to detect CD3 and Pax5 expression on canine lymphoma cell lines. We have designed a protocol that will allow us to test Nbs for both B-cell (Pax5) and T-cell (CD3) lymphocytes in various cell concentrations and ratios in cytospin preparations. Information from these studies will allow us to optimize a similar ICC protocol to immunophenotype canine lymphoma in cytologic samples from patients. The successful development of this assay will reduce the time and cost of lymphoma diagnosis for canine cancer patients.

Title: Simulating tradeoffs between fishing quality and economic performance with increasing tournament effort in an Alabama black bass fishery

Primary Author: Natalie Coash

Additional Authors: ;Matthew Catalano

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: Black bass (Micropterus spp.) populations in the southeastern US are subject to high catch-and-release angling effort partly attributable to the popularity of fishing tournaments. Systems with high catch-and-release rates, and low post-release survival, can have catch-and-release mortality rates that exceed harvest mortality, possibly resulting in negative effects on fishing quality. Tournaments may have a stronger negative impact on fishing quality due to higher post-release mortality in comparison to non-tournament catch and release angling. However, tournaments also provide economic benefits through increased expenditures in local communities. The objectives of this study are to evaluate the trade-offs between economic benefits and fishing quality across a gradient of increasing black bass tournament fishing effort at Neely Henry Lake, a 4,500-hectare reservoir within the Coosa River Basin in northeast Alabama. We utilize a dynamic age structured model including a submodel for fishing-related economic expenditures. The model allows for differential effort, post-release mortality, and effort-related expenditures between tournament and non-tournament anglers. The model will be informed by published creel and economic surveys and a current intensive reward/telemetry tagging study being conducted on Neely Henry. Agencies can utilize this information to construct management regulations that maximize the benefits of the tournament fishing industry as well as support a high quality fishery with desirable catch rates and size structure.

Title: Functionalizing cellulose nanocrystals as an organic nano-herbicide

Primary Author: Elise Collins

Additional Authors: ;Delaney Clouse;Virginia Davis

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: In recent years, cellulose nanocrystals (CNCs) have become notable as a biodegradable, non-toxic, and readily modifiable nanomaterial that can replace traditional materials in areas where a "greener" option is desired. A novel area of interest for CNC is as a carrier of chemicals for agricultural applications. The modified CNC can be used to enable direct delivery of agricultural agents and growth regulators to plant cells and, consequently, reduce excess herbicides that contaminate groundwater and disrupt ecosystems Previous studies successfully attached the herbicide 2,4-dichlorophenoxyacetic acid (2,4-D) to the surface of CNC but found that degree of substitution is low due to side reactions and unfavorable conditions. The purpose of this investigation is to attach 2,4-D onto the surface of CNC and determine the degree of substitution necessary for reliable detection and the desired effect on plant cell growth. Multiple 2,4-D-CNC conjugation reactions were conducted with varying CNC concentration to understand the effect of water content on substitution. Products were characterized using thermogravimetric analysis (TGA), infrared spectroscopy (ATR-IR), elemental analysis, proton nuclear magnetic resonance (1H NMR), and ultraviolet-visible spectroscopy (UV-Vis). Results from this investigation demonstrated that changes in reaction procedure and water content both affected the final degree of substitution of 2,4-D on the surface of CNC. Lowering the water content by increasing the initial CNC concentration was found to reduce the number of side reactions occurring in the dispersion, increasing the degree of substitution. This research demonstrated how small changes in reaction conditions could affect the resulting conjugated nanomaterial. Future research will build upon this work to further increase the degree of substitution of 2,4-D on the surface of CNC.

Title: Common knowledge or common sense? Identifying systematic misconceptions of animal agriculture and food familiarity in higher education individuals

Primary Author: Katie Corbitt

Additional Authors: ;Brandon Smith;Karen Hiltbrand;Madison Coursen;Soren Rodning;Donald Mulvaney

Department/Program: Agriculture

College: College of Agriculture

Abstract: Knowledge gaps in the context of agriculture contribute to mistrust and negative worldviews of the agricultural sector. The purpose of this quasi-experimental study stood on three tiers: understand the knowledge and perceptions regarding animal agriculture, quantify participants' perceived connection to their food, and determine if university roles and/or food familiarity scores contributed to knowledge and perceptions of animal production. A southeastern land grant institution served as the convenience sample for this study, where 265 completed responses were returned. Participants were grouped based on university roles, where 81 undergraduate students, 115 graduate students, and 69 employed faculty returned survey responses. The electronic survey collected several types of data including a Gapminder influenced (Rosling et al., 2019) Agricultural Knowledge and Perceptions Questionnaire, a Food Familiarity Index questionnaire, and demographic questions. The study reports that almost 50% of participants demonstrate a negative worldview of animal agriculture, regardless of university role or food familiarity scores. Questions addressing animal welfare were significantly different with increasing food familiarity scores ($p<.05$) in contrast to health of animal products and environmental impact categories. Further studies should be conducted to replicate the study with larger question pools and other demographic groups to pinpoint weaknesses in agricultural communications efforts and correct misinformation.

Title: Assessing resistance to Fipronil in field collected mole crickets

Primary Author: Gracie Cotter

Additional Authors: ;David Held;Amanda Vinson

Department/Program:

College: College of Agriculture

Abstract: Mole crickets (Orthoptera: Gryllotalpidae) in the genus <<*Neoscapteriscus*>> are among the worst pests of turf and pasture grasses in the Southeast. Because damage from mole crickets can destroy grass, insecticides, such as fipronil, are used to prevent damage. Due to reports of poor control with fipronil, we hypothesized that populations of mole crickets had become resistant to fipronil. Mole crickets were collected from a golf course in Miami, FL and Spring Hill College in Mobile, AL. The Miami population, collected late February 2022, was adult southern mole crickets. The Mobile population, collected September 2022, consisted primarily of tawny mole cricket nymphs. Solutions of 1000, 100, 10, 5, and 1ppm were created using technical grade fipronil in acetone. A 0ppm solution of acetone was used as a control. Twelve mole crickets received 5 µL of each fipronil solution via topical application on the ventral side of the thorax. Once dried, individuals were placed in a labelled Petri dish prepared with approximately 30mL of sand and 10mL of water. Mole crickets were provisioned with one mealworm and then dishes were sealed with tape. Mortality was assessed after 24, 48, 72, and 96 hours. Treatments of 5ppm or more cause a 100% mortality within the Mobile population after only 72 hours. Within the Miami population, 1000ppm was the only treatment to cause 100% mortality after 96 hours. It is unknown whether these results are caused by differences in site, species, or time of year. Southern mole crickets are typically less susceptible to some insecticides than tawny mole crickets. Both species typically have higher levels of detoxification (cytochrome P450) enzymes in the spring than in the fall. This work establishes methodology for future experiments to evaluate insecticide resistance in mole crickets. The label rate of fipronil is 26x the highest dose used. Given this, our results do not support a concern for resistance to fipronil at either site.

Title: The Role of Artificial Intelligence (AI) in the Treatment of Amyotrophic Lateral Sclerosis (ALS)

Primary Author: Katie Couture

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Amyotrophic lateral sclerosis (ALS), or more commonly, Lou Gehrig's Disease, is a rare but fatal, progressive, neurodegenerative disease with no cure. The mean survival time for most patients is two to five years after diagnosis. The cause of ALS remains poorly understood and current treatments only help to prolong survival and manage symptoms. With emerging advances in technology, artificial intelligence (AI) has the potential to revolutionize healthcare delivery, improve patient outcomes, and reduce healthcare costs. AI can impact the treatment of ALS by improving diagnostic, preventative, and therapeutic methods. ALS can be challenging to diagnose because there is no specific test to confirm the presence of disease. Additionally, ALS can be mistaken for other common neurological disorders. AI can improve accuracy of diagnoses and predict disease progression by algorithms that analyze medical data such as patient reports, genetic information, and medical imaging. AI-powered algorithms could also detect changes in speech patterns and motor movements that are typically associated with onset and worsening disease. This can lead to earlier interventions to help slow disease progression. Due to the limited treatment options for ALS patients, AI can be utilized to identify potential targets for treatment and assist in discovery and development of novel therapeutic approaches. AI may allow for healthcare providers to personalize treatment plans by predicting which patients are most likely to respond to certain treatments. AI can also control assistive technology such as speech synthesizers or robotic equipment to aid in symptom management. Ultimately, there is a massive potential for the implementation of AI in healthcare to positively impact those suffering with ALS.

Title: A review of interventions impact on college students mental health

Primary Author: Abby Cox

Additional Authors: ;Linda Gibson-Young

Department/Program: Kinesiology

College: College of Education

Abstract: College students are heavily impacted by mental health as growing trends indicate a crisis with mental health. Mental health problems in college students can affect academic attainments, social patterns, and quality of life. A large amount of college students are experiencing a decline in their mental health and subsequently other areas of their life. The objective of this review was to explore the literature on mental health in college students as well as Auburn Universities' own data regarding students well fare, to determine strategies to improve college students' mental health. This is on both the individual level and systematic level. We conducted a systematic review of the literature using the databases CINHAL, Medline/PubMed, and Academic Search Premiere, as well as the website for the organization Active Minds and entered keywords of college students, mental health, anxiety, health survey, depression, young adult, and universities to select articles. After a review of 8 articles, five articles were included. All of the studies focused on college student's mental health, with four of those studies providing interventions that could improve college students' mental health (CSMH). The most common interventions consisted of implementing exercise, routine, and socializing. Feeling a sense of belonging was a large indicator of good mental health, suggesting that socializing and connecting are one of the biggest factors in mental health. Different based interventions also varied in their effectiveness, depending on the individual, and when combined demonstrated a high level of success in obtaining better mental health. It is clear there is a need to further investigate this topic, in order to deduce what can be done not only at the individual level but a systematic level in order to improve the quality of college student's mental health. Auburn University would benefit from further investigation into this topic through the use of stud expansion of mental health programs. Interventions can improve the mental health of college students thus increasing success.

Title: Contextualizing the development of emotion regulation in early adolescence: Results from the ABCD study

Primary Author: Brianna Crumly

Additional Authors: ;Diana Samek

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: Emotion regulation (ER) is a crucial transdiagnostic factor underlying many psychopathologies. Yet little is known regarding predictors of ER in early adolescence, which is a sensitive developmental context with the onset of substantial brain development and environmental changes, such as increased autonomy, greater susceptibility to peer influence, and less adult supervision. Guided by ecological systems theory, we evaluated processes related to multiple micro- and macro- contexts concurrently as predictors of ER use during early adolescence. The study utilized data from a nationwide, longitudinal study known as the Adolescent Brain Cognitive Development (ABCD) study to evaluate predictors over four waves. ER measures were added at the most recent wave; thus, analysis focuses on those that have completed that assessment 6,251 participants with an average age of 12.9 years (SD = 0.64) and demographics mostly representative of the target population (58.1% White, 12.8% African American, 13.1% Hispanic; 47.3% female). Structural equation modeling was used to model ER. Significant predictors of ER included family conflict, school environment, anti- and pro-social peer affiliation, as well as SES. For both child-report measures of ER, school environment demonstrated larger effects while anti-social peer affiliation and SES only demonstrated significant effects for the Expressive Suppression ER sub-scale. For both parent-reported measures of ER, family conflict demonstrated larger effects while pro-social peer affiliation and SES only showed effects for the Attuned ER subscale. Results were in line with an ecological systems perspective, results showed micro- and macro-factors are meaningfully associated with ER in early adolescence. The small effects suggest other factors may be more relevant to ER at this time or that these associations depend on other contextual variables not yet evaluated.

Title: The Effects of Interior Design on Mental Health in Extended Stay Hotels

Primary Author: Ansley Daniel

Additional Authors: ;Anna Ruth Gatlin

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Although long term hotels often serve as a temporary housing solution for communities, they are seldom equipped to satisfy the mental well-being of guests occupying the spaces. Many extended stay hotels in America were built before 1998 and have not been updated since. In the last 20 years, America has seen a significant decline in mental health, with psychiatric appointments reaching an all-time high. In the past few years, the extended stay lodging concept for work travel has grown vastly, but the need for a model that addresses mental health solutions is evident. Thoughtful interior design can be a solution to this problem. Factors that could assist in improving the mental health of occupants include the evidence-based application (EBA) of lighting, color, access to daylight, space planning, and intentional shared spaces. The purpose of this research project is to design a prototypical extended stay hotel that utilizes the correct use of design aspects that would equip guests with the environmental tools needed to maintain a healthy wellbeing. A series of guest rooms, a community space, and an outdoor space will be fully designed and annotated to reflect EBA factors. Experts in the field will serve as raters to assess the spaces designed with the EBA factors, generating data about the effectiveness of the design. Inter-rater reliability will serve as a measure of consistency. Research shows that these factors have the ability to significantly increase the mental health of guests, but if not used the right way, could be detrimental to guests and the extended stay industry. As the need for extended stay hotels increases with the rise of globalization, it is important to proceed intentionally with evidence-based application of design factors. This prototype could serve as a model for an extended stay hotel solution that prioritizes mental health through color, lighting, access to daylight, and space planning.

Title: Evaluation of the immunoregulatory effects of mesenchymal stem cell derived extracellular vesicles

Primary Author: Nikolia Darzenta

Additional Authors: ;Maria Naskou

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Novel regenerative research highlights the in vivo and in vitro immunoregulatory properties of Mesenchymal Stem Cell's secretome attributed to Extracellular Vesicles (MSCs-EVs). EVs is a heterogenous population of cell – free carriers that deliver signal molecules, which contribute to the intracellular communication. Stem cell derived EVs have been proved to alleviate neuroinflammation and neurodegeneration. They can also cross the brain - blood barrier, making them a promising tool to fight the CNS pathology. Sandhoff disease (SD) is a GM2 Lysosomal Storage Disease that causes progressive, rapid and fatal neurodegeneration in children. It is characterized by inflammatory features such as astrogliosis and microgliosis. Therefore, using a well characterized single gene disorder will allows us to demonstrate the anti-inflammatory effects of MSC-EVs on immune cells mainly involved in neuroinflammation before proceeding to in vivo experiments. Our objective was to evaluate the immunosuppressive properties of MSCs-EVs on astrocytes and, microglia in the feline in vitro SD model and compare to those normal cats. For that purpose, brain tissue and whole blood from cats with SD and normal cats was used to isolate astrocytes and, microglia. Phenotypic characterization was performed while isolated from serum free conditions and characterized umbilical cord derived hMSCs – EVs were added to naïve and LPS-stimulated cells to assess their immunoregulatory effect. Cell culture supernatants were collected and analyzed for the production of pro-inflammatory cytokines. Our preliminary data indicate an immunomodulatory effect of hMSCs – EVs, through alteration in the mRNA expression of the pro – inflammatory cytokines in naïve and stimulated microglia and, astrocytes isolated from SD cats. These findings provide novel insights on how the hMSCs -EVs can be a promising tool against neuroinflammation in the SD feline in vitro model and their potential use in translational studies.

Title: Explainable detection of online sexism using fine tuned RoBERTa

Primary Author: Amit Das

Additional Authors: ;

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: Discriminatory ideas and sentiments, particularly those directed at women, are frequently found in online and social media. This typically indicates the presence of additional hazardous content types like hate speech or misinformation. It might be difficult to identify such remarks because sexism and misogyny can take many different forms and vary across linguistic and cultural boundaries. Sexism is defined by the Oxford English Dictionary as *prejudice, stereotyping or discrimination, typically against women, on the basis of sex*. Sexist attitudes and languages undervalue the contribution of women. Furthermore, considering that a sizable portion of internet users, particularly those who utilize social networks, are teenagers, the rise in online sexism necessitates urgent research and social debate that results in action. However, detecting online sexism may be difficult, as it may be expressed in very different forms. In this research, we primarily concentrate on using NLP techniques and cutting-edge models for two key tasks: (i) sexism detection, which seeks to determine whether a given sentence contains any sexist content; and (ii) sexism classification, which seeks to determine which class a sexist sentence belongs to (from a series of defined and widely used classes in the domain). In the specific context of this work, we seek to solve the issue of sexism identification and classification in social media posts using a fully autonomous, machine learning technique. We developed a model by fine tuning RoBERTa for detection of online sexism in twitter. For the preliminary data an accuracy of 83.64% was obtained, which is higher than the other models we used. The efficiency we got demonstrates effectiveness of the suggested strategy.

Title: Depression screening training and implementation for pharmacists in rural areas

Primary Author: Brandy Davis

Additional Authors: ;Kimberly Garza;C. Edward Chou;Salisa Westrick;Cherry Jackson

Department/Program: HORP

College: School of Pharmacy

Abstract: Depression is a leading cause of disability in persons over 15 years old, however only 33-50% of people with depression seek and receive treatment. Inadequate treatment of depression has sweeping adverse effects like decreased work productivity, school dropouts, and suicide. While the prevalence of depression is comparable in urban and rural areas, suboptimal care is more common in rural areas. Rural pharmacists can help "bridge the gap" by offering depression screenings. Depression screenings in pharmacies have been shown to be feasible and effective by increasing screenings of patients, improving medication therapy, and maintaining patient satisfaction with their mental healthcare. However, even though implementing depression screenings in pharmacies improves patient care, the uptake of pharmacy implemented depression screening services has been slow. This study investigated current practices, stigma toward patients with mental health conditions, and barriers and facilitators associated with implementing a depression screening service in rural pharmacies. A web-based survey was developed with a stakeholder panel consisting of two rural pharmacists, two rural community members, and one mental health provider. The validated survey was sent to 621 rural pharmacists in Alabama and Mississippi. Of 83 pharmacist respondents, 79 (92%) did not offer a depression screening in their pharmacy and 71 (84.5%) had not used the PHQ-9 (depression screening tool). Stigma toward patients with mental health conditions was 2.9 (SD=0.564) on a 1 to 5 scale, with lower values representing greater stigma. The indicated average confidence in performing a depression screening was 2.5 ([SD]=1.1) on a scale from 1 to 5, with 1 being low and 5 being high). Barriers identified were staff and pharmacists' lack of skills, knowledge, and time, as well as insufficiency of reimbursement. Findings demonstrate that training may improve uptake of depression screenings in rural pharmacies.

Title: Student social media use and connections to Auburn

Primary Author: Olly Davis

Additional Authors: ;Sara Driskell;Sydney Quinn;Jiya Lewis;Molly Martini;Alex Barton

Department/Program: Psychology

College: College of Liberal Arts

Abstract: For prior generations, the dissemination of news was limited to major outlets and the stories they chose to tell. Now, social media is an integral part of many young people's lives, along with the choice of what stories to see and focus on. Along with that power of choice, there also comes the threat of misinformation. How modern consumers obtain, share, and filter information and misinformation is a struggle unique to this generation, given that information can be posted and disseminated publicly in a matter of seconds. We investigated how and when people receive and share news, especially through social media. We surveyed 331 undergraduate Psychology students (mean age=20.23; 74% women, 83% white american). Overall, participants tended to group social media platforms into two categories: platforms for academic purposes and platforms for leisure. In terms of academic platforms, such as Canvas (M=3.31, SD=1.97) or GroupMe (M=5.42; SD=1.71), participants tended to trust the information and news they received there more, especially when using Canvas (M=5.09; SD=1.72). Conversely, participants tended to use platforms such as Instagram for the purposes of coping with boredom (M=5.47; SD=1.69) or communicating with friends (M=5.17; SD=1.76). Students who used these platforms to connect with people on campus also showed a stronger sense of place at Auburn, r=.39, p<.001.Although participants did obtain a large portion of their news from online leisure platforms (M=2.12; SD=1.56), they also reported trusting news information from television more; in these circumstances, they reported feeling more willing to pass news obtained from television more (M=2.98; SD=1.83. Many participants say they also use social media to follow accounts associated with auburn university, whether it's sports, academics, or other news (93%). Importantly, following Auburn social media, especially the Auburn Plainsman, was correlated with a stronger sense of place at Auburn, r=.13, p=.03.

Title: The role of cdk5 in alzheimer's disease

Primary Author: Hailey DeFreese

Additional Authors: ;Amal Khalil Kaddoumi;Amer Al khalifa

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Alzheimer's disease (AD) is a progressive decline in memory function due to degeneration of the brain which can result in dementia. AD is categorized as a late-onset or early-onset disease that leads to a loss of neurons in the hippocampus and cortex in the brain. One of the main proteins correlated to AD in the endothelial cells that comprise the blood-brain barrier is cyclin-dependent kinase 5 (Cdk5). Cdk5 is functional for migration, synaptic functions, and memory consolidation. When a pathogenesis disease progresses in the brain like AD, there become irregular functions with Cdk5 that leads to senile plaques, synaptic damage, irregular mitochondrial dysfunction, and apoptosis of neuronal cells. This irregular function leads to the brain creating leakage in the blood-brain barrier. Cdk5 has an important role in AD because Cdk5 is linked to several functions in the brain that must regulate properly for normal brain function. Cdk5 is activated by p35 and p39 which are neuronal activators. When these neuronal activators are stressed, p35 and p39 turn into p25 and p29 which leads to disrupted phosphorylation in several substrates in the endothelial cells once bound to Cdk5. Cdk5 is a new target in research for understanding AD better and for potential therapeutic targeting.

Title: Investigating effects of cannabinoids on the endocannabinoid system.

Primary Author: Jahnavi Dhingra

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Sindhu Ramesh;Jack Deruiter;Timothy Moore;Manoj Govindarajulu;Dylan Bowen;Payton Lowery

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The endocannabinoid system was discovered and named because of the extended historical use of Cannabis throughout history for fiber, medicinal, and psychoactive reasons by many different cultures. The major biosynthetic pathways of the endocannabinoid system produce anandamide and 2-arachidonoylglycerol. From there on, the endocannabinoid system became seriously studied and researched in multiple scientific fields. The current study investigated novel and innovative neuropharmacological approaches to regulate cannabinoid neurotransmission. Understanding those approaches and then refining the research to see the effects it might have on the endocannabinoid system is the goal. The observational result was the molecular signaling systems in neuroscience have become increasingly important to understand and perform research to discover the physiological and pathologic roles of the endocannabinoid system. The worldwide in-depth research in this field has, in a brief period, created effective and selective drugs targeting the endocannabinoid system that have provided innovative ways to potentially treat significant diseases such as cancer, pain, and neurodegenerative diseases, anxiety, and addiction. This approach can be a new initiation for the modern age that learns from the ancient use of Cannabis as a therapeutic approach.

Title: Revealing spatial and temporal effects of crop irrigation to foster climate smart agriculture

Primary Author: Issa Diaz Flores

Additional Authors: ;Thorsten Knappenberger;Joey Shaw;Adam Rabinowitz

Department/Program:

College: College of Agriculture

Abstract: The Food and Agriculture Organization predicts a world population of up to 9 billion by 2050. Therefore, food production must increase by 70% to meet the demand. Crop irrigation is a management practice used to increase yields. An increasing population, together with climate change and the stress of water resources lead us to the implementation of climate-smart agriculture, which is necessary to reduce impacts on water resources and maintain surface water quantity and quality. Many farmers in Alabama invested in pivot irrigation systems. However, the soils in some regions of the state are challenging to manage, and irrigation effects on crop yield are difficult to measure because of spatial soil variability. The goal of this project is to improve our understanding of how crop yields respond to irrigation, and the objective of this study is to relate crop yield and irrigation management to spatial soil patterns to identify areas of high yield. Two hundred and eighty yield datasets from 32 fields were obtained from a combine harvester in pivot irrigated and rainfed fields in a total area of 3,400 ha in the Alabama blackbelt region. Elevation data from the National Elevation Database (NED) at a 10 m resolution was used to compute spatial derivatives, such as slope, catchment area, landform, etc. Soil data was retrieved from the National Soil Information System (NASIS). All data layers were correlated with corn and soybean crop yield. In eight out of nine years, the corn yield was higher in irrigated fields. In seven out of nine years, the soybean yield was higher in irrigated fields. Crop yield differs depending on landforms indicating that terrain parameters are important for optimized irrigation crop management. These results will be used to determine irrigation effects and how to reduce irrigation water use while maintaining or even increasing crop yields.

Title: Anti-hormone therapy as an alternative to traditional spay and neuter

Primary Author: Anniston Dodson

Additional Authors: ;Arthur Zimmerman;Emma Hruska;Malia Walton;Douglas Martin;Aime Johnson

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: It has been widely accepted in the United States that broad-scale pet sterilization via spay/neuter is necessary to prevent cat and dog overpopulation and to reduce the rate of euthanasia. However, there are long-term risks to pet sterilization in both cats and dogs that necessitate alternative options to surgical interventions. For example, spayed/neutered cats and dogs have increased risks for feline cognitive dysfunction (FCD) or canine cognitive dysfunction (CCD), respectively, as well as increased incidence of obesity, urinary incontinence, certain cancers, diabetes mellitus, and decreased life expectancy when compared to intact counterparts. Dysregulation of hormone feedback mechanisms along the hypothalamic-pituitary-gonadal (HPG) axis significantly contributes to these long-term risks, and therefore, we hypothesize that the development of an anti-hormone antibody treatment to disrupt fertility would both functionally “sterilize” cats and dogs while simultaneously reducing the risk of the long-term consequences associated with surgical spay/neuter. To study this, we used an innovative adeno-associated virus (AAV)-mediated anti-hormone antibody treatment in CD1 mice to test this alternative approach. Here, we examined changes in estrous cyclicity, ovarian follicle maturation and hormone receptor expression within various tissues. We report that treatment with anti-hormone antibodies significantly disrupts estrous cyclicity, specifically leading to an increased time spent in the follicular phase of estrous that may lead to changes in fertility. We also see changes in both number and maturation of ovarian follicles as well as hormone receptor expression within different tissues. Overall, AAV-mediated antibody treatments alter estrous cyclicity and other biologically relevant variables that may affect fertility. Future studies will examine fertility via mating trials and will examine changes in hormone concentration following anti-hormone antibody treatment.

Title: Effect of physical feed form on crop fill and growth performance of 3-d-old broiler chickens

Primary Author: Randy Nickli Domer

Additional Authors: Charles Starkey;Brittany Wall;Jessica Starkey;Jorge Enrique Banegas Duron;Jorge Luis Sandoval Escobar

Department/Program: Poultry Science

College: College of Agriculture

Abstract: An experiment was conducted to determine the effect of different feed forms on crop fill, crop diameter, and growth performance of broilers 3 d post-placement. On d of hatch, chicks (n = 480, Ross 708 x Yield Plus) were assigned to 24 pens by sex (20 birds per pen; 12 pens per sex) and fed 1 of 3 feed forms which were: meal (M), pellets (P), and crumbles(C) for 3 d. Pen BW and feed intake (FI) were recorded at d 0 and 3 for performance calculations and crop fill assessments were done in all birds at 24 and 48 h post-placement. Data were analyzed as a 2-way ANOVA using SAS 9.4 PROC GLIMMIX and least square means were separated at $P \leq 0.05$. No feed form × sex interaction was observed for any variable ($P \geq 0.1648$); therefore, only the main effects were discussed. No differences were observed among treatments for crop fill at 24 and 48 h post-placement ($P > 0.1343$). Birds fed C diets had greater crop diameter compared with those fed P and M diets at 48 h post-placement ($P = 0.0284$). Female broilers had larger 48-h-crop diameters than male birds ($P = 0.0474$). On d 0, chick BW was similar among all treatments ($P > 0.5646$). On d 3, BW was higher in birds fed C diets and decreased in birds fed P and M diets ($P < 0.0001$). From d 0 to 3, C-fed birds had greater BWG and daily BWG than birds fed P and M diets ($P < 0.0001$). FI was greater in P-fed birds than those fed C and M diets ($P = 0.0026$). From d 0 to 3, female birds had higher FI than male birds ($P = 0.0348$). Birds fed C diets had lower FCR than those fed other feed forms ($P = 0.0002$). As expected, male birds had lower FCR than female birds ($P = 0.0073$). In conclusion, early growth performance and crop diameter were affected by both sex and physical feed form provided at placement. Male chicks had lower FI and FCR compared with females. Overall, providing chicks with starter feed in C form increased crop diameter and improved growth performance compared with those offered P and M diets.

Title: Developmental food restriction impairs foraging strategies in zebra finches

Primary Author: Anderson Duke

Additional Authors: ;Tori Coutts;Haruka Wada;Anna Musulman

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: When the environment deteriorates such as with harsh winters, drought, or habitat destruction, resources can be depleted. This depletion of resources can cause a change in the foraging strategies of an individual, where they may be more willing to approach and feed from novel food resources or food resources near foreign objects. One way this is studied in the lab is through neophobia, or fear of novelty. However, the impacts of developmental stressors on neophobic behavior are understudied, and many neophobia studies do not capture true neophobia due to experimental design issues. Here we address this gap by conducting a study on developmental food restriction and neophobia in zebra finches. At the nestling stage, birds were exposed to one of two different dietary plans: a control diet (ad libitum food) or a food-restricted diet (60% of what the control group consumed). During the juvenile stage, after the treatment ceased, they were single housed in trial cages and went through 6 neophobia trials over 6 days. These trials included exposure to 2 novel objects, 2 novel foods, a control trial, and a startle test. Birds were recorded during their trials and videos were analyzed using a behavior video analysis software (BORIS), where latency to approach the bowl and latency to feed were recorded. Food-restricted individuals had increased latency to approach the bowl and latency to feed compared to control individuals. However, there was no effect of treatment on startle response, suggesting the neophobia trials captured true neophobia rather than a fear response. These results show food restriction impairs foraging strategies and food-restricted individuals become more specialists rather than generalists.

Title: Spatial Temporal and Humidity Analysis of Natureform Incubators using Simulated Eggs

Primary Author: Olamide Isaac Durodola

Additional Authors: Kattie C. Elliott;Brittany Wall;Jessica Starkey;Jeremiah Davis;John Linhoss

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: The optimal development of egg embryos during incubation is heavily dependent on maintaining consistent temperatures and relative humidity. Variations in temperature and relative humidity can lead to increased embryonic mortality, egg moisture loss, and reduced hatchability and post-hatch growth. The study's objective was to evaluate the spatial temperature and humidity dynamics in Natureform Incubators NMC 2000 with a dimension of 104.5 x 116.8 x 119.4 cm using simulated eggs. Each of eight incubators used 12 egg trays, each holding 90 eggs for a total of 1080 eggs for the egg tray, and six hatch trays that held 180 hatching eggs during thatch. The air temperature and relative humidity were measured using self-contained data loggers (DS1922L-F5 and DS1923-F5) fitted to the top of 3D-printed eggs for the egg tray and a 3D-printed T-holder inserted in a perforated sphere for the chick tray that allowed the measurement of air temperature and relative humidity at the egg's surface and in the chick basket during the first and the second stage of incubation. Each egg tray and the six hatch trays were fitted with eight iButton-eggs and nine iButton-ispheres spatially arranged and filled with 984 simulated plastic eggs. The incubator was set to 37.5 °C with 60 % RH for the egg tray comparison and 36.67 °C with 65 % RH for the chick tray each for three days. During the egg stage, comparisons were made horizontally (Left tray vs. Right trays) and vertically (Levels 1 - 6) and then spatially within each tray (eight locations). During the hatching stage, comparisons were made vertically (levels 1 – 6) and spatially within the basket (nine locations). Data were analyzed with one-way ANOVA with the MIXED procedure of SAS ver. 9.4. This paper will discuss the egg trays and chick baskets' spatial temperature and humidity variation. The result from this study shows that 3D-printed eggs fitted with iButtons can be used to capture air temperature and humidity near the egg surface.

Title: The role of EGFR-ERBB4 and ERBB2-ERBB4 heterodimers in BRAF WT melanomas

Primary Author: Vipasha Dwivedi

Additional Authors: ;Jessica Vail;Lauren Lucas;Connor Kelley;Elizabeth Knerr;Joelle Woggerman;Rees Cooke;Jen Davis;Kaitlyn O'Daniel;Ella Wilson;Maddy Ingrao;David Riese

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Approximately half of metastatic melanomas harbor a *BRAF* V600E mutation and respond to inhibitors of BRAF pathway signaling. However, the metastatic melanomas which possess wild-type (WT) *BRAF* alleles are just as aggressive as *BRAF* V600E tumors and no therapeutic targets have been identified for these tumors. Thus, our goal is to identify candidate targets for therapeutic intervention in *BRAF* WT melanomas. ERBB4 (HER4) is a receptor tyrosine kinase that is closely related to the epidermal growth factor receptor (EGFR/ERBB1/HER1), ERBB2 (Neu/HER2), and ERBB3 (HER3). Our unpublished *in silico* analyses of *BRAF* WT melanoma genomes suggest that *ERBB4* gain-of-function mutations or elevated *ERBB4* transcription are tumor drivers. Indeed, preliminary data indicate that ERBB4 is both sufficient and necessary for the proliferation of *BRAF* WT melanoma cell lines. However, in a variety of tumor model systems, ERBB4-EGFR and ERBB4-ERBB2 heterodimers are oncogenic, whereas ERBB4 homodimers function as tumor suppressors. Thus, we hypothesize that ERBB4-EGFR or ERBB4-ERBB2 heterodimers drive *BRAF* WT melanomas. We are determining whether the proliferation of ERBB4-dependent, *BRAF* WT melanoma cell lines is inhibited by a dominant-negative *EGFR* (K721A) mutant, *EGFR* silencing, a dominant-negative *ERBB2* (K753A) mutant or ERBB2 silencing. Using a heterologous model system, we are determining whether EGFR or ERBB2 are required for *ERBB4* mutants found in *BRAF* WT melanoma tumor samples to cause increased cell proliferation. The anticipated results will suggest that ERBB4-EGFR or ERBB4-ERBB2 heterodimers drive *BRAF* WT melanomas and that targeting EGFR or ERBB2 in these tumors may be a viable treatment strategy.

Title: Examining the relationship between muscle dysmorphia and perfectionism in college students

Primary Author: Palmer Dykes

Additional Authors: Lily Watson;Lily Wilson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: With the relatively recent addition of muscle dysmorphia (MD) as a subcategory of body dysmorphic disorder (BDD), research regarding the role of MD in relation to other mental health conditions is limited. Previous literature has examined the broad relationship between perfectionism (PF) and BDD, finding PF as a significant predictor of BDD symptoms. However, research has yet to investigate a potential bidirectional relationship between MD and PF. The aims of the study were to investigate if 1. PF was predictive of MD symptoms and 2. if MD symptoms were predictive of PF. It was hypothesized that both of these constructs would be predictive of the other. The exploratory aim of the study was to explore the relationship between MD and PF using subscales of the PF measure. Participants (N=107, Mage= 18.81, 88.4% female, 90.1% white) completed two sets of self-report measures four weeks apart. These measures included the frost multidimensional perfectionism scale (FMPS) and muscle appearance satisfaction scale (MASS). For aim one, a linear regression was conducted where FMPS scores at time one were entered as predictors of MD at time two (b=-.027, p=.832) and did not yield significant results. For aim two, a linear regression with MASS scores as predictors of PF was conducted (b=.543, p=.034), indicating higher levels of MD were associated with higher levels of PF. For the exploratory aim, a linear regression found that MD elevations were associated with elevations in the Excessively High Personal Standards subscale of the FMPS (b=.145, p=.019). This suggests that MD symptoms are predictive of elevations of personal standards regarding PF. Targeting behaviors of PF throughout treatment of MD may be beneficial to improve feelings of compulsion related to increasing muscularity, as well as feelings of distress in association to feelings of inadequacy in one’s body size or muscularity. Future studies should replicate these analyses with a larger, more diverse sample.

Title: Comprehensive immunohistochemical analysis of various immune checkpoint molecules in canine cancers

Primary Author: Hannah Eady

Additional Authors: ;Bruce F. Smith;Jonathan Marable;Alana Kramer;Damien Ruiz;Payal Agarwal;Maninder Sandey

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Cancer is a leading cause of death in dogs over ten years of age. Although current treatments such as surgery, chemotherapy, and radiation therapy are effective in early-stage cancers, they tend to be ineffective in advanced-stage diseases. However, recent advances in immunotherapy have revolutionized the treatment of human cancer patients. The use of monoclonal antibodies to block immune checkpoint pathways (CTLA4 and PD1) has become the standard of care for certain tumor types, including advanced melanoma. Tumor cells often exploit immune checkpoint pathways, such as cytotoxic T-lymphocyte antigen 4 (CTLA4) and programmed cell death-1 (PD-1), to evade the immune system and promote their own growth. There have been few studies on the expression of these immune checkpoints in canine cancers. Our study aims to use canine-specific nanobodies to detect PD1, PD-L1, and CTLA4 expression in various types of canine cancers, including oral melanoma, osteosarcoma, glioma, and hemangiosarcoma. The nucleotide sequences for anti-PD1 and anti-PD-L1 nanobodies were cloned into the periplasmic expression vector pET22b (+) containing the C-terminal Strep II Tag and 6 X histidine tag. The anti-CTLA4 Nbs were expressed in E. coli (DE3) and purified from the periplasmic fraction by affinity chromatography on AKTA explorer. Our purified nanobodies specifically bind to cells expressing canine PD1 and PD-L1. Our next goal is to perform flow cytometry and immunohistochemistry analysis to examine the expression of CTLA4, PD1, and PD-L1 on both tumor-infiltrating lymphocytes and tumor cells in various canine cancers.

Title: Evaluation of fracture properties of additively manufactured IN718 under quasi-static and dynamic loading using optical metrology

Primary Author: Alex Edwards

Additional Authors: ;Hareesh Tippur

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Inconel 718 is an additively manufactured superalloy with many applications in the aerospace and automotive industries. For its strength under intense heat, Inconel 718 is used in extreme environments such as rocket engine manifolds and racecar exhaust systems. In this work, edge notched three-point bending specimens are manufactured using laser beam powder bed fusion and tested to evaluate the fracture behaviors under quasi-static and dynamic loading. Electrical discharge machining (EDM) is used to cut a notch into the edge of the specimens. Specimens are sprayed with a random speckle pattern to allow optical measurement of deformations using digital image correlation (DIC). Under quasi-static loading, notched beams are slowly loaded until the crack initiates, grows, and fractures. To evaluate the fracture behavior under high strain-rate loading, notched specimens are tested using a split-Hopkinson pressure bar apparatus. The fracture event is recorded using an ultrahigh-speed camera. In both quasi-static and dynamic experiments, images are analyzed using DIC to measure surface displacement fields. A least-squares analysis based on two orthogonal in-plane displacement components is formulated to evaluate stress intensity factors and fracture toughness at crack initiation and during growth. The stress intensity factors are also extracted using a hybrid DIC-Finite Element (DIC-FE) approach. These values are compared to the linear elastic theoretical solution.

Title: Oncolytic adenoviruses as a canine cancer therapy

Primary Author: Luke Eller

Additional Authors: ;Bruce F. Smith;Atonu Chakrabortty;Payal Agarwal;Maninder Sandey;Terri Higgins

Department/Program: Agriculture

College: College of Agriculture

Abstract: Cancer is the second leading cause of death worldwide. One proposed treatment for cancer is immunotherapy, specifically using oncolytic viruses. Due to the high incidence of cancer, shared genetics with humans, and an availability of a large population of pet dogs for the study of cancer pathogenesis, dogs have been deemed suitable as a comparative model for human osteosarcoma. Oncolytic viruses remodel the tumor microenvironment and turn the "cold" tumor (immunity-wise) into a "hot" tumor. CRAds (conditionally replicative adenoviruses) are designed to replicate only in tumor cells with low or minimal infection intensity in normal cells. The lab has already created two vectors (CAV2-AU-M1 and CAV2-AU-M2), which have shown that CRISPER-cas/9 is able to modify a virus with enough precision to be effective. This will be taken further, creating CAV2-AU-M4. CAV2-AU-M2 is an armed oncolytic virus that expresses anti-PD1 antibody. The limitation of the current vector is that it cannot secrete anti-PD1 ab. Therefore, to make the next-generation virus, a secretory signal will be added to CAV2-AU-M2, making it CAV2-AU-M4. CRISPER-cas/9 will be used to remove a section of the E3 region. Then, using a homologous recombination in yeast, anti-PD1 gene will be inserted, which contains (1) a CMV promoter, (2) a secretory signal, (3) a Fc-region, (4) ^-HIS tag, and (5) a Poly-A tail. The recombinant plasmid will be taken and transfected into a packaging cell line, DKcre, in order to produce more of this new virus. PCR and electrophoresis will be used to verify the genetic modification. Additionally, western blotting will be used to verify the single domain antibody as well as infection assays to verify that the virus is still infectious. These results will be compiled and analyzed to determine if these viruses are viable to continue. In the future, variations of these treatments will be able to be taken to clinical trial on canines and further our advancement of cancer treatments.

Title: The relationship between stride mechanics at foot contact and hitting performance in collegiate softball athletes

Primary Author: Maia Engelkes

Additional Authors: Nicole M. Bordelon;Billy Lozowski;Anthony Fava;Adam Nebel;Gretchen Oliver

Department/Program: Kinesiology

College: College of Education

Abstract: A relationship between exit velocity and stride mechanics in slow-pitch softball and amateur baseball hitting is established. However, the examination of hitting mechanics and ball exit velocity in elite fast-pitch softball athletes has yet to be investigated. The purpose of this study was to determine if there is a relationship between stride mechanics and hitting performance in collegiate softball athletes. Sixteen collegiate softball athletes [right-handed (n = 11); 19.4 ± 0.9yrs; 171.0 ± 7.0cm; 72.2 ± 9.4kg], active on a team roster and injury free for the past six months, participated. Participants performed three maximal effort swings off a stationary tee. Kinematic data at stride foot contact [stride length, stride foot angle, stride foot position in the z-direction, stride knee flexion, stride hip flexion, pelvis rotation, and percent center-of-mass (%COM)] were collected at 240 Hz using an electromagnetic tracking system. A force plate with a sampling frequency of 1200 Hz determined stride foot contact. Ball exit velocity was measured with a Rapsodo® 2.0 hitting unit with the highest value used for analysis. Simple linear regression analyses were performed to determine if there was a relationship between kinematics at stride foot contact and hitting performance. Regression analyses indicated stride length (R2 = .003), stride foot angle (R2 = .093), stride foot position in the z-direction (R2 = .013), knee flexion (R2 = .002), hip flexion (R2 = .034), pelvis rotation (R2 = .045), and %COM (R2 = .080) were not related to hitting performance in this population (all model p-values > .288). Regardless of stride positioning at foot contact, hitters must also optimize timing and mechanics throughout the subsequent acceleration phase to maximize performance. Therefore, future research should investigate whether stride timing or mechanics (e.g., rotational velocities) during the acceleration phase has greater influence on performance in collegiate softball athletes.

Title: *Fusarium solani s*pecies complex isolates act as transkingdom pathogens in clinical and agricultural environments

Primary Author: Harrison Estes

Additional Authors: ;Jeffrey Coleman

Department/Program:

College: College of Agriculture

Abstract: Members of the *Fusarium solani* species complex (FSSC) are transkingdom pathogens thought to act as either a clinical or agricultural pathogen. Previously, a single clade within the FSSC was found to contain the species most frequently responsible for human infections. Over the past several years the same species within the FSSC have been isolated from cotton and soybean fields in Alabama. We sought to determine if isolates of the FSSC from agricultural environments could cause infections in clinical models, and if those from humans could cause disease in agricultural models. Fifty-eight FSSC isolates sourced from humans and the environment were tested in a variety of scenarios to analyze thermotolerance, minimal inhibitory concentration, and ability to grow on vegetables. These tests showed that these isolates were able to thrive at both environmental temperature (28°C) and human body temperature (37°C). Also, the isolates were able to grow on the vegetables with varying degrees of virulence, with some clinical pathogens being more virulent than the agricultural isolates. In the future, the host range of these isolates will be further evaluated using multiple other plants, including cotton and soybean. Additionally, we will evaluate the virulence of the isolates in *Galleria*, a heterologous animal model.

Title: Effectiveness of Medicare part B preventive service educational brochures on uptake intention.

Primary Author: Oluchukwu Maureen Ezeala

Additional Authors: ;Salisa Westrick;Nick McCormick

Department/Program: HORP

College: School of Pharmacy

Abstract: Medicare Part B beneficiaries can receive preventive service at little to no cost. However, due to limited beneficiaries' awareness, the uptake of these services is low. As such, we developed 5 educational brochures to raise beneficiaries' awareness and increase their intention to obtain new preventive services. The objectives were to: 1) identify preventive services beneficiaries already received and intend to receive after reviewing the educational brochures, 2) compare uptake intention, and 3) assess Medicare beneficiaries' perceptions of the educational brochures. A post-test only experimental design was conducted with 56 Medicare Part B beneficiaries who were 65 or older. Participants were recruited from community centers in Alabama from July - November 2022. All participants received three unique brochures. All received two brochures on a) a comprehensive list of Medicare-covered preventive services and b) how to navigate MyMedicare. Next, participants were randomly selected to get one of the followings: annual preventive services, biennially & less often preventive services, and counseling & educational services. Measures included whether they already obtained or intended to obtain each preventive services (response categories = yes, no), participants' perceptions of the brochures (not at all (1) to extremely (5)), and overall assessment of brochures (strongly disagree (1) to strongly Agree (5)). The most received preventive services were COVID-19 vaccine (78.6%) while abdominal aortic aneurysm screening was the most intended service (25%). A greater proportion of participants with the annual preventive services brochure indicated their intention to obtain at least one of annual preventive services, compared to those who did not receive this brochure ($p < 0.05$). Over 90% of the participants found the brochures to be very informative and clear. These educational brochures have potential to impact beneficiaries' intention to obtain these preventive services.

Title: Data-enabled mesoscale simulations of virus capsid self-assembly

Primary Author: Mohammadreza Fakhraei Ghazvini

Additional Authors: ;Michael Howard;Christopher Kieslich

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Understanding the spontaneous assembly of proteins into viral capsids is critical for developing therapeutics and advanced biotechnologies. Experimental methods cannot fully characterize the dynamic process of protein self-assembly. Computer simulations can give unprecedented molecular insight into how this dynamic, mesoscale process depends on a variety of physicochemical conditions. Unfortunately, though, many conventional protein models are too computationally demanding to simulate at length and time scales relevant for self-assembly. Here, we are investigating a strategy for developing ultra-coarse-grained protein models for self-assembly. We are using a data-driven strategy to efficiently approximate the potential energy function describing the interactions between two proteins using polynomial interpolation on sparse grids that are generated with the Smolyak method. This approach efficiently samples phase space of the proteins using a small number of simulations. We have tested our model on known potential energy functions, finding favorable approximations even with small amounts of data. We anticipate that our approach will enable new computer simulations that interrogate fundamental mechanisms of viral capsid assembly at previously inaccessible scales.

Title: Spatial modeling of floor area within target brooding and growout light intensity levels in commercial broiler barn

Primary Author: Olumide Babatope Falana

Additional Authors: Joseph Purswell;Jeremiah Davis;John Linhoss;Carson Edge;Abigail Lane;Martha Sabine Rueda Lastres;Kelly Griggs;Cody Smith;Jesse Campbell

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Twenty commercial broiler houses in South Alabama were measured for floor area within target light intensity (LI) levels for brooding and tunnel ventilation conditions. Houses ages ranged from new to aged (8 years old) and had three rows of lights. Target LI was ≥ 43 lx for brooding and 0.2 lx ± 10% for tunnel ventilation. Data was collected at 70 different locations in evaporative pad (PAD), center house (MID), and tunnel fans (FAN) sections. LI data during brooding was categorized as above or below 43 lx in the pad and center sections. Data during tunnel ventilation was categorized as above, below, and at target values (0.2 lx ± 10% or 0.18 – 0.22 lx) in all sections of the houses. Light intensity distributions were mapped using the kriging process in the GSTAT package (1.1.423; RStudio, Vienna, Austria). A two-way ANOVA (age and house section) was performed in SAS using PROC MIXED. Fishers' LSD was used to separate means at $P \leq 0.05$. During brooding, percent of floor area below target (< 43 lx) was significantly higher for older houses than new houses in the pad (old = 99.8%; new = 2.8%) and center sections (old = 99.9%; new = 2.8%). During tunnel ventilation in the new houses, 4.5, 6.0, and 0.0% of the floor area at the pad, center, and fan sections were within the 0.18 – 0.22 lx target. However, in the old houses, only 0.6, 0.7, and 0.0% of the floor area at the pad, center, and fan sections, respectively, were at the target level. All floor area in the fan section was above target due to light intrusion from operating fans. Percentage of floor area above the tunnel ventilation target was significantly higher in new houses in both the pad (old = 12.5%; new = 91.3%) and center sections (old = 10.9%; new = 84.7%). Generally, newer houses successfully met or exceeded the target light intensities. Little floor area in new and old houses during tunnel ventilation was within ±10% of the target. Periodic checking of light intensity is recommended in older houses.

Title: The role of artificial intelligence (AI) in depression

Primary Author: Ashleigh Farmer

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Depression is a common illness that affects over three hundred million people around the world per year. Depression affects mood, causing people with it to suffer from low motivation, sleep hygiene, productivity at work/home, and through almost every aspect of their life. Individuals with depression experience sad and empty moods for many days and weeks in a row. They feel hopeless and tend to have thoughts related to hurting themselves. If not treated, depression can become a serious health condition, leading to possible adverse outcomes like suicide. Suicide takes more than seven hundred thousand lives per year. Although treatments for depression exist, most sufferings do not have access to them due to affordability, lack of professional health providers diagnosing, and the social stigma associated with mental disorders. Due to these challenges, an alternative treatment plan involving artificial intelligence (AI) has been developed, attempting to overcome depression and its symptoms. Recent studies have shown that certain computer-assisted therapy and conversational chat boxes can provide another treatment option for individuals suffering from depressive illness. This AI option supplies suffering persons with a more reasonable, reachable, and cost-effective solution. Another possible role AI could take on regarding depression includes detecting signs of the illness itself. AI can do this by interpreting data from social media and other platforms. The AI could potentially aid trained health professionals to make a targeted diagnosis of the illness. With depression affecting so many throughout the world, this testing and discovery of AI within the medical field could lead to more healing and prevent poor outcomes of depression like suicide. The role and effects of AI on depression are the subjects of the current section of this study.

Title: Testing interoceptive dysfunction as a mediator between sleep disturbances and suicidal ideation relationships among military service members

Primary Author: Walton Ferguson

Additional Authors: ;William Grunewald;April Smith

Department/Program: Clinical Psychology

College: College of Liberal Arts

Abstract: Suicide among military service members (MSM) is a major public health problem. Veterans are at increased risk for suicide compared to non-veterans, and the suicide rate for active-duty members is comparable to the general population. One potential factor contributing suicide among MSM is sleep disturbances. Sleep disturbances are particularly prevalent among MSM and show associations with suicidal thoughts and behaviors. Mechanisms linking the sleep-suicidality relationship among MSM are unknown. However, interoceptive dysfunction may underlie these relationships, given its theoretical and empirical associations with both constructs. Therefore, using archival data, a longitudinal autoregressive mediation model was created to analyze relationships between measures of sleep disturbances, interoceptive dysfunction, and suicidal ideation across three timepoints (baseline; post-test; one-month), with interoceptive dysfunction hypothesized to mediate longitudinal relationships between sleep disturbances and suicidal ideation. This model was examined among a sample of 195 MSM (majority White, Non-Hispanic, Male, and Heterosexual) who enrolled in a randomized control trial meant to improve interoceptive accuracy. Results indicated that sleep disturbances longitudinally predicted several forms of interoceptive dysfunction. Furthermore, several forms of interoceptive dysfunction predicted increased suicidal ideation severity over time. However, our hypothesized mediation pathways were not discovered. Results confirm that interoceptive dysfunction and sleep disturbances longitudinally predict increased suicidal ideation among MSM. Given these results, we recommend that future suicide prevention interventions for MSM should consider targeting both interoceptive dysfunction and sleep disturbances. Given the absence of mediation effects, future research should investigate mechanisms potentially underlying the sleep disturbances and suicidality relationship.

Title: Thyroid treatment induces *Dhcr24* expression in steroidogenic tissues in *Dhcr24-lacZ* reporter mice

Primary Author: Yanthrawaduge Fernando

Additional Authors: Dr. Chen-Che Jeff Huang;Jeff Huang

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: DHCR24 or 3 beta-hydroxysteroid-delta 24 reductase is an important catalyst in cholesterol biosynthesis. It is regulated universally by sterols, dexamethasone, sex steroids, adrenocorticotropic hormone, thyroid hormone, neurotrophins, and xenobiotics at the transcriptional level. The deficiency of this enzyme causes desmosterolosis by accumulating desmosterol in plasma and tissues which causes congenital malformations during development. We have recently reported the spatial and temporal expression patterns of DHCR24 in the adrenal gland inner cortex. In addition, thyroid hormone can induce DHCR24 expression in the adrenal cortex. However, the thyroid hormone-induced DHCR24 expression in other endocrine tissues such as testis and ovary is not well characterized. In this study, we used *Dhcr24-lacZ* reporter mice to confirm the spatial and temporal expression pattern of DHCR24 in steroidogenic tissues including the adrenal gland, testis, and ovary. Mice were treated with thyroid hormone in drinking water from postnatal day (P) 25 to P35. Then mice were sacrificed at P35 and the tissues were collected from thyroid hormone-treated and saline-treated mice. The DHCR24 expression was detected by Beta-Galactosidase reporter gene (X-Gal) staining. Our results showed that DHCR24 is highly expressed in the adrenal cortex and in the interstitium of the testis under thyroid hormone treatment in *Dhcr24-LacZ* mice. In addition, DHCR24 expression in the adrenal gland showed sexual dimorphism. In euthyroid conditions DHCR24 expression was observed in female mice at P21, P28, and P35 and in male mice only at P21. The induced expression of DHCR24 under thyroid treatment suggests a possible role of DHCR24 in steroidogenic tissues which needs further investigation.

Title: Effect of forming agent inclusion and probe type on shear force texture analysis of pet treats developed from broiler wing tips

Primary Author: Orlando Benjamin Fiallos Soto

Additional Authors: Charles Starkey;Jessica Starkey;Cristopher Isaac Almendares Sanchez;Diego Ernesto Ventura Urbina;Jorge Enrique Banegas Duron;Hilary Gisselle Carrera Arcia;Jorge Romero Garcia;Justin Dunavant;Wesley Rogers;Haisten Smith;Josh Renew;Luis Jose Guzman Sabillon;Said Joel Herrera Vallejos

Department/Program: Poultry Science

College: College of Agriculture

Abstract: The broiler chicken processing industry produces many low value co-products such as wing tips (WT). Hydrocolloids, such as ALGIN which contains sodium alginate (SA) and encapsulated calcium lactate (ECL), are often used to restructure ground meat products. One common analysis performed to assess the textural characteristics of pet treats is the shear force (SF) test. The objective of this study was to evaluate the impact of different texture probes on values generated when performing the SF test on pet treats with and without inclusion of a forming agent. Previously frozen WT were grounded and mixed. Mixtures with and without ALGIN were then extruded into casings, wrapped in plastic wrap, stored overnight, and then frozen prior to slicing. After slicing, half the samples were dehydrated until water activity reached 0.80. Prior to dehydration, 30 samples were cut to be analyzed with the Warner Bratzler V blade (WBVB) probe. The shear force test was performed using a texture analyzer TA-HDplusC with 4 different texture probes. The TA-42, TA-43R, KRAMER probes were used to analyze raw samples. Dehydrated samples were analyzed using the TA-42, TA-43R, and WBVB probes. Data were analyzed as a 2-way ANOVA using SAS PROC GLIMMIX with mean separation at $P \le 0.05$. No ALGIN × probe type interaction was observed for firmness ($P = 0.2800$) or toughness ($P = 0.8212$) of raw treats. However, raw treats tested with the KRAMER probe generated the greatest force over distance and peak force values ($P \le 0.0001$). In dehydrated treats, the greatest force to shear values were observed in those without ALGIN analyzed with the TA-43R probe whereas all treats evaluated with the WBVB produced the lowest values ($P \le 0.0001$). Dehydrated treats without ALGIN tested with the WBVB probe produced the greatest force to distance values compared with all other treatments ($P = 0.0024$). TA-43R probe appears to be the most appropriate probe type for assessing toughness and firmness.

Title: Immunoproteasome expression in PDX of MLL-AF4 ALL patients

Primary Author: Elise Fitzgerald

Additional Authors: ;Tyler Jenkins;Alexei Kisselev

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: The t(4;11)(q21;q23) chromosomal translocation is the most common cause of a rare and aggressive form of acute lymphoblastic leukemia (ALL) in infants, which leads to the expression of the mixed lineage leukemia 1 (MLL)-AF4 fusion protein. MLL-AF4 ALL leads to an abysmal prognosis and only about a 40% 5-year survival rate. The MLL-AF4 fusion protein renders leukemia cells more sensitive to proteasome inhibitor (PI) bortezomib (Btz), an FDA-approved drug for the treatment of multiple myeloma. Proteasomes are large protein complexes solely responsible for the degradation of misfolded and abnormal nascent polypeptides and for the targeted destruction of numerous proteins that regulate cell proliferation. The inhibition of proteasomes can lead to increased cell stress and apoptosis. Although cancer cells are more dependent on proteasome function than normal cells, treatments with PI are limited to toxicities associated with inhibiting proteasomes in normal tissue. We believe that such toxicity can be avoided by targeting lymphoid tissue-specific immunoproteasomes, which exhibit low levels of expression in the gut, kidney, and heart. Immunoproteasomes contain a set of three catalytic subunits that are distinct from the ubiquitously expressed constitutive proteasomes. Specific targeting of immunoproteasomes will be effective only if expression of immunoproteasomes in leukemia cells is much higher than expression of constitutive proteasomes. The goal of this work was to determine expression ratios of immunoproteasomes to constitutive proteasomes in patient derived xenografts (PDX) that express MLL-AF4 fusion protein. We found that more than 75% of proteasomes in the majority of the samples (7/10) are immunoproteasomes. Furthermore, these PDX models are highly sensitive to immunoproteasome inhibitor ONX-0914 *ex vivo*. These data strongly suggests that immunoproteasome is a target in this leukemia. This conclusion will be tested *in vivo* in the future.

Title: Prevalence of anxiety and/or depression among Auburn University pharmacy students

Primary Author: Maggie Flaherty

Additional Authors: ;Noah Sanford;Cherry Jackson

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: The amount of stress that healthcare professional students experience can negatively affect their mental health. There are many contributing factors that increase stress while students are enrolled in professional programs, such as increased academic pressure, lack of sleep, financial instability, and rigorous workloads. The COVID-19 pandemic has also played a role in students developing anxiety and/or depression. This event caused an increased incidence of depression and anxiety occurring in students coming into professional healthcare programs as well as those students already participating in those professional programs. Medical, nursing, dental, and pharmacy students have all been shown to have increased risk of anxiety, depression, or both. The stigma of mental health treatment can hinder students from getting the help they need, so it is necessary to have open conversations about the importance of being mentally healthy. Not only are students negatively affected while in their respective programs, there is evidence that anxiety and depression originating in school can continue while these individuals are in practice. Although personal resources have been shown to assist those coping with these mental illnesses, a recent study has suggested that these available resources for professional students are lacking. This reason alone shows that it is imperative that professional programs not only develop ways to identify struggling students, but also provide them with adequate resources and outlets that assist them with the management of stress, anxiety, and depression. The primary goal of the study is to identify the frequency of depression and anxiety among students at the AUHCOP. Data was acquired from a Qualtrics survey that was sent to all currently enrolled AUHCOP students. The questions were directed to gain information on the students' status of depression and/or anxiety as well as the factors affecting their mental health.

Title: Trauma exposure, fearlessness about suicide, and suicide risk: The moderating effects of anxiety sensitivity

Primary Author: Hailey Fox

Additional Authors: Brian J. Albanese;Hannah Sawyer;Dorothy Dreelin;Brian Albanese

Department/Program: Psychology

College: College of Human Sciences

Abstract: Trauma exposure has been linked with heightened suicide risk purportedly through habituation to the threatening stimuli, thereby reducing fear of suicide. However, no research has examined variables that may influence this process. Anxiety sensitivity (AS) is one cognitive-affective factor that may strengthen the relationship between trauma exposure and reduced fears of suicide by amplifying peri-traumatic affective responses therefore hastening habituation. The present study tested this by examining the interaction of AS and trauma exposure predicting fears of suicide and self-reported suicide risk. Participants (n=118) were recruited based on their previous participation in a clinical trial targeting suicide risk factors and were asked to complete self-report measures of trauma history, AS, fear of suicide, and suicide risk. Significant interactions emerged such that a greater number of type of traumas experienced predicted lower fear of suicide and greater suicide risk among those with greater AS. Results remained even after including relevant covariates. The current findings suggest that exaggerated AS augments the effects of repeated trauma exposure on fear of suicide and suicide risk, perhaps by amplifying peri- or post-traumatic affective responses that yield greater habituation to threat. Future research examining the longitudinal relations is needed.

Title: The effects of cotton stalk management and cover crop use on soil properties and CLRDV incidence

Primary Author: Sam Frazier

Additional Authors: Kip Balkcom;Alana Jacobson;Steve Brown

Department/Program: Crop, Soil, and Environmental Sciences

College: College of Agriculture

Abstract: Cotton leafroll dwarf virus (CLRDV) was reported in cotton (*Gossypium hirsutum*) in Alabama in 2017. This study recorded CLRDV presence in cotton following three cotton stalk destruction methods with and without a cover crop, as well as the effect on soil properties. Stalk destruction methods were major tillage, mowing, and mowing-pulling. A mixture of cereal rye (*Secale cereale*) and crimson clover (*Trifolium incarnatum*) was used for the cover crop treatment. Two cotton varieties were included, DP 2055 B3XF and PHY 400 W3FE. Trial locations were in the Alabama Agricultural Experiment Station System at the E. V. Smith Research Center (EVREC), Shorter, AL; Wiregrass Research and Extension Center (WGREC), Headland, AL; and Gulf Coast Research and Extension Center (GCREC), Fairhope, AL. Data collection included soil moisture and soil penetrometer values, cover crop biomass, various cotton growth measurements, pre-bloom aphid presence, CLRDV infection, and cotton lint yield. Soil moisture values were relatively consistent across stalk management treatments. Soil penetrometer values showed elevated soil strength values across all stalk destruction methods when no cover crop was present. In 2021, CLRDV infection results showed 33% incidence at EVREC, 19% at WREC, and 2.7% at GCREC. Due to low results, re-sampling was implicated after harvest and indicated 72% incidence at EVREC, 76% at WREC, and 32% at GCREC. In 2022, CLRDV infection results showed 42% incidence at EVREC, 25% at WREC, and 17% at GCREC. Re-sampling results indicated 83% incidence at EVREC, 89% at WREC, and 74% at GCREC. A higher positive rate was seen after three months, showing possible sensitivity in our diagnostic testing as it takes time for titer levels to become detectable, as well as a significant presence of the virus in the environment. Neither cotton stalk management methods nor cover crop use seemed to significantly impact CLRDV.

Title: Evaluation of assessment data collected by nursing staff and assistive personnel in a simulation environment

Primary Author: Melissa Freeman

Additional Authors: ;Tiffani Chidume;Pao-Feng Tsai;Loren Lankford;Meghan Jones;Teleshia Cooper

Department/Program: Nursing

College: School of Nursing

Abstract: Accurate collection of assessment data obtained by nurses, nursing students, certified nurse assistants (CNA), and unlicensed assistive personnel (UAP) plays a critical role in the early detection of patient deterioration. Obtaining accurate vital sign data, timely documentation, and the implementation of clinical bundle protocols for patient deterioration requires clinical experience and sound nursing judgment. The objectives of this study are to determine: if routine assessments by clinical staff include vital sign data, if collected data is accurate, and if data obtained by licensed nurses has higher accuracy rates than UAP, including CNAs. This study examines a potential correlation between the respondent's attitude toward the data and the accuracy of the data collected. A two-part model is utilized to study assessment techniques, data accuracy, and the respondent's attitudes toward the data. High-fidelity mannequins are utilized in a simulation environment to assess the method of collection and accuracy of vital sign data collected by licensed and unlicensed nursing staff. The V-Scale is then administered to measure the respondent's attitudes toward vital sign monitoring to identify potential knowledge, attitude, and skills deficits. Data collected suggests that licensed nurses and nursing students understand the importance of vital sign assessment but find the task repetitive and time consuming, leading to poor clinical performance and inaccuracies in data collection. Data further suggests that CNAs and UAPs may lack the education and clinical judgment necessary to appreciate the need for accuracy and recognize abnormal findings on a per-patient basis, delaying the implementation of clinical deterioration bundles. Overall, this limited study indicates a correlation exists between the attitude toward and the accuracy of vital sign assessment. Future research on a larger scale is necessary to confirm the correlation.

Title: Health of the police force

Primary Author: Katherine Frick

Additional Authors: Christopher Brooks Mobley;Julia Swinford; Mick Harris; Philip Agostinelli; Nicholas Bordonie; Frances Neal; Ann Robbins; Joellen Sefton

Department/Program: Kinesiology

College: College of Education

Abstract: Police officers operate in a high-demand environment requiring them be physically, mentally, and tactically capable of handling motor vehicle accidents, robberies and foot pursuits while wearing required equipment weighing over 20 pounds. Additionally, daily duties often involve sedentary work, such as conducting car patrols, completing paperwork, or interviewing individuals. The physically and mentally challenging nature of the job combined with long work hours and shift work combined with high incidence rates of musculoskeletal injury have resulted in serious challenges for the health of our law enforcement personnel. Police officers have an increased risk of musculoskeletal injury and cardiovascular disease compared to the general population. Metabolic syndrome, hypertension, and an overall sedentary lifestyle both in and out of work is also common in this population. Finding ways to decrease these life-taking, preventable diseases in our public safety officials is imperative. Our team conducted a general health fitness assessment on 80 local law enforcement officers, (male = 76, female=4; ages 21-65 years old) for comparison to general population norms. This data will be used to guide individual officer fitness and lifestyle recommendations as well as implementation of a program focusing on life-style education, strength and conditioning instruction, and ways to decrease morbidity rates specifically among first responders and police officers. We will again administer the health assessments in a year to assess the efficacy and sustainability of the implemented programs for the local law enforcement officers.

Title: Interior design of telehealth spaces to address the mental health crisis among adolescents in rural areas

Primary Author: Lillian Friel

Additional Authors: ;

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Rural healthcare in America is a long underfunded and understudied topic. Socioeconomic and locational limitations make it exceedingly difficult for people living in underpopulated areas to access and afford life-saving care. In addition to difficulties obtaining life-saving healthcare, there is a plethora of important medical needs for which rural residents commonly have difficulty accessing care. For example, hospitals and medical centers in rural areas cannot handle long-term, in-house needs like cancer treatment or surgery recovery. Physical therapy is limited and expensive. Finally, virtually no in-person resources are available for mental health care in rural areas, particularly for adolescents. Residents of rural areas, statistically, face higher levels of mental health issues than individuals living in suburban and urban locations. The higher propensity of rural residents to face mental health issues results from a variety of factors, many of which are systemic issues. On average, rural residents experience lower levels of education and income status and face higher isolation and social stigma compared to peers living in areas with greater opportunity. The lower educational attainment and income can in turn exacerbate mental health conditions. While some research has been conducted reviewing adults' struggles in accessing and receiving mental health care in rural areas and presenting telehealth as a potential solution, very little research examines adolescents' experiences with mental health solutions in rural areas. Additionally, there is no literature investigating rural adolescents' preferences for the interior design of telehealth counseling spaces. This study will implement an interior design solution to increase adolescents' access to mental health providers in a rural area by providing telehealth pods in two locations: a medical office building (MOB), and a secondary school.

Title: Sex trafficking indicators and predictors: An analysis of 1,264 case files of survivors of commercial sexual exploitation in Atlanta

Primary Author: Courtney Furlong

Additional Authors: ;

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: Commercial sexual exploitation (CSE) occurs when anything of value is given in exchange for a sex act. Sex trafficking, a form of CSE, is a complex and multifaceted phenomenon that involves the CSE of individuals by means of force, fraud, or coercion. The experience of CSE can include rapes, assaults, sexually transmitted illnesses, anxiety, depression, posttraumatic stress disorder (PTSD), and murder. Negative health outcomes for individuals who have experienced sex trafficking result from physical violence, addiction, unsafe and violent sex acts, unsanitary living/working conditions, and restrictions in access to healthcare. Due to the illegal nature of CSE, individuals who have experienced CSE are a notoriously difficult population for researchers to reach, creating a profound dearth in the literature. To develop a better understanding of the lived experiences of adult, female survivors of CSE, case files (<<N>> = 1,264) from the Out of Darkness' Safe Home program in Atlanta, GA were analyzed. Key predictors including mental health diagnoses, childhood sexual abuse, and educational achievement of relevant outcomes such as age of entry into exploitation and length of exploitation were considered. Regression analyses (e.g., linear, binomial, or zero-inflated Poisson) were conducted based on preliminary analyses of the outcome variables. Results suggest that educational achievement is a potential protective factor of exploitation. Further, mental health services are determined to be a critical component of recovery for survivors of CSE. The findings provide a more authentic portrait of CSE, informing services, interventions, and policy to support survivors in their promising futures.

Title: Internalizing problems and declines in academic achievement: mechanisms and protective factors

Primary Author: Elena Gagliano

Additional Authors: ;Wendy Gordon

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: Internalizing symptoms and disorders can have a marked effect on students' academic performance. However, some students who exhibit internalizing symptoms continue to excel academically. One mechanism through which internalizing problems may contribute to achievement difficulties is school disengagement. Previous literature has highlighted the protective effect of close student-teacher relationships for students struggling with emotional problems. It is possible that children with internalizing problems stay engaged in the classroom and maintain a trajectory of strong academic achievement if they have a relationship with the teacher that is high in closeness and low in conflict. Accordingly, this study investigated whether: a) classroom engagement mediates the association between internalizing problems and academic development, and b) closeness or conflict with the teacher moderate the association between internalizing symptoms and classroom engagement. Data from a longitudinal study of 457 children were utilized. Analyses were conducted on measures of school achievement, closeness and conflict within student-teacher relationships, internalizing problems, and classroom engagement. Analyses showed that a within person increase in engagement predicted a subsequent increase in achievement, and a within person increase in achievement predicted a subsequent increase in engagement. Unexpectedly, internalizing problems were not associated with a concurrent change in engagement. Rather, internalizing problems were associated with a decrease in academic achievement and indirectly predicted subsequent lower school engagement. However, these effects were found only for children who had a relationship with their teacher low in closeness or high in conflict. These findings highlight how internalizing problems in combination with a poor relationship with the teacher may contribute to poor school performance and a cascading effect of worsening engagement and achievement.

Title: Compassionate community: A case study in Spanish for specific purposes (SSP) and Hispanic health outreach in Lee County, Alabama

Primary Author: Anna Galarza

Additional Authors: ;Jana Kerns

Department/Program: Foreign Language

College: College of Liberal Arts

Abstract: This study analyzes how community building is successful when there is competence culturally and linguistically. When educating and interacting with a group of people from different cultures, it can be difficult to gain trust due to language or culture barriers. Intercultural fluency and health-care professional cultural competency are essential when building a community. Outreach is an effective tool by which to understand the key components of language learning and community building. Compassionate Community is a non-profit community-based organization that aims to help Latino immigrant families integrate into their new environment. Though being a young and smaller organization in Lee County, CC makes a positive impact through befriending a demographic that is normally underrepresented. The non-profit organization uses a tripart outreach structure: healthcare, education, and food security. The previous semester, I completed a service internship with CC. My role was to provide nutritional educational content in Spanish in-person and on the application WhatsApp to immigrants who may not know the English language, U.S. healthcare system, or are in need. The National Council for State Supervisors for Languages-American Council in the Teaching of Foreign Languages (NCSSFL-ACTFL) provides standards that emphasize the importance of successfully negotiating communications in a diverse, multicultural context. I used the NCSSFL-ACTFL Can-Do Statements for Intercultural Communication and Communication (ICC) Standards to improve and measure my personal ICC while serving the Hispanic Community of Lee County. Compassion is defined in the Oxford Dictionary as “suffering together,” while Community is defined as a “unified body of individuals with common interests.” Experiences from real-world interactions put classroom knowledge to the test. Through serving with CC, I learned that the more successful the communication efforts and the greater the understanding of cultural differences, the greater the likelihood that the health education could occur through the efforts of CC.

Title: Dissemination of antibiotic resistance genes across the food chain of commercial antibiotic-free poultry farms

Primary Author: Pankaj Prakash Gaonkar

Additional Authors: ;Yagya Adhikari;Courtney Higgins;Matthew Bailey;Ken Macklin;Laura Huber

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Antimicrobial resistance (AMR) is a major concern for "One Health" and injudicious antimicrobial use (AMU) contributed to its spread. However, despite reducing AMU, antimicrobial resistant pathogens can persist in the environment promoting their spread. The objective of this study was to: i) determine AMR levels in the environment of antibiotic-free poultry farms in different stages of production; and ii) determine the potential for AMR spread between and within poultry farms. A total of 16 antibiotic-free poultry farms were screened (3 pullet, 3 breeder, and 10 broiler). Litter samples were collected from inside the poultry house. Soil and any fecal samples found around the house were also collected. To determine the frequency of 2 mobile element genes (MEGs) and 15 antimicrobial resistance genes (ARGs) belonging to 8 classes of antimicrobials commonly used in poultry, we performed qPCR and analyzed the data using RStudio. On breeder and broiler farms, ARGs were most frequently found in litter followed by fecal and soil samples. On pullet farms, fecal followed by litter and soil had the highest AMR levels. Broiler farms had highest levels of AMR followed by breeder and pullet farms. Tetracycline and macrolide-lincosamide-streptogramin B genes were more abundant on broiler and breeder farms. On pullet farms, sulfonamide and tetracycline ARGs were the most frequent. In soil and litter samples, tetracycline and quaternary ammonium compound ARGs were most frequently observed. In fecal samples, tetracycline and sulfonamide ARGs were most frequently observed. MGEs were most frequently found on broiler farms and in litter samples from all farm types. There is a potential for AMR spread between inside and outside environments and between farm levels in antibiotic-free poultry farms due to the high levels of MEGs and ARGs present in the environment. The understanding of dissemination of ARG will facilitate identification of critical control points to tackle AMR in poultry production.

Title: Drug treatments in prostate cancer

Primary Author: Melissa Gathman

Additional Authors: ;Amit Mitra

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Prostate cancer is the most common non-skin cancer in men in the United States. One form of treatment for prostate cancer are drugs that inhibit cell division. My research goal is to validate new therapies against drug-resistant and aggressive forms of prostate cancers. Over the summer and fall semesters, I worked on practicing techniques for culturing prostate cells, as well as shadowing to learn how to perform MTT- assays, which are used to determine cell toxicity, and is vital to understanding how a drug impacts cell viability. Additionally, I have learned protocols concerning extracting genetic material, such as DNA or RNA, and running gels to look at properties of DNA or proteins. Being well-versed in these techniques and protocols, I am able to perform experiments that will now enable me to produce impactful results going forward. With these, I will be able to contribute to developing a targeted approach for cancer treatment and identify if there are any genes that influence response to these drugs, and predict which molecular pathways are activated or inhibited following treatment with novel drugs.

Title: Role of type VI secretion system of *Xanthomonas* in manipulation of phyllosphere microbiome

Primary Author: Palash Ghosh

Additional Authors: ;

Department/Program:

College: College of Agriculture

Abstract: Type VI secretion system (T6SS) is a contact-dependent secretion system in Gram-negative bacteria that delivers toxins and effectors directly inside the target prokaryotic and eukaryotic cells. T6SS has been proposed to be important determinant in mediating interactions of pathogenic bacteria with the resident microflora. However, we have little evidence on importance in T6SS in mediating plant-pathogen-microbiome interactions. Our previous work has indicated hypervirulence phenotype and compromised epiphytic colonization of the T6SS mutant of *Xanthomonas perforans,* a foliar pathogen causing leaf spot disease on tomato. This finding has led to us to hypothesize that T6SS offers epiphytic fitness to the pathogen by offering competitive advantage in presence of resident flora and creating its niche in the phyllosphere. In this study, we have screened a library of phyllosphere bacterial residents for their interaction with *X. perforans* and for their ability to induce T6SS of *X. perforans* under in vitro conditions. Our results have identified phyllosphere residents that may interact with *X. perforan*s via activation of T6SS i3*and/or with i3***. A parallel culture-independent approach was also employed to evaluate influence of T6SS in microbiome manipulation. Our findings reveal how *Xanthomonas* can alter the tomato microbiome during its colonization of leaf surface.

Title: An exploratory study of emotion and movement in healthy young adults

Primary Author: Morgan Gladson

Additional Authors: ;Chad Rose;Kristina Neely;William Murrah;Howard Chen;Hannah Heavlin

Department/Program: Kinesiology

College: College of Education

Abstract: The present study was conducted to determine if current emotional state was associated with movement output. Fifty-six healthy young adults (nwomen = 34, Mage= 20.3, + 3.1 years) completed the 6-minute walk test (6MWT), the timed-up-and-go (TUG) test, and four conditions of the Purdue pegboard task (PPT). Emotional state was evaluated with the Positive and Negative Affect Schedule (PANAS-X), which was completed immediately before all movement tasks. We hypothesized that negative affect would be associated with slower movement speeds across all tasks, whereas positive affect would be associated with faster movement speeds. Each participant completed the 60-item PANAS-X, rating each item on a 1-5 scale. After five minutes of seated rest, blood pressure, heart rate, oxygen saturation, and perceived level of fatigue and dyspnea (i.e., vitals) were recorded. Participants then completed the 6MWT in accordance with the original test parameters and total distance was recorded. Participants then completed another five minutes of seated rest, after which vitals were recorded. Next, an inertial measurement unit (IMU) was secured to the upper right thigh of each participant before completing the TUG task. Last, participants completed three trials of the PPT, each trial had four tasks where the score was recorded. We used linear regression to predict negative and positive affect from the movement output variables. The results demonstrated that affect is not linearly related to our movement output variables. Post-hoc exploratory analyses demonstrated correlations between items of the PANAS-X and movements outputs. As a result, we will use exploratory techniques to create composite variables that may better explain emotional state.

Title: Influences of overstory pyrophytic and mesophytic trees and understory solar irradiance on leaf litter and woody debris fuel moisture retention

Primary Author: Luiza Goncalves Lazzaro

Additional Authors: Jeffery Cannon;Heather Alexander

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Following decades of fire exclusion, open-canopied, fire-tolerant oak and pine (i.e., pyrophytes) landscapes across the central and eastern U.S. are shifting to closed-canopied forests with a dense midstory occupied by shade-tolerant, often fire-sensitive species (i.e., mesophytes). As species encroach into historically pyrophytic landscapes, changes in crown traits and understory microclimate impact fuel conditions, fire behavior, and fire effects. The primary objective of this study was to understand how fine fuel moisture dynamics beneath overstory trees vary by functional groups: fire-tolerant longleaf pine (*Pinus palustris*), fire-tolerant upland oak (*Quercus argaretta* and *Q. laevis*), and fire-intolerant oak (*Q. laurifolia*) to better understand potential impacts on prescribed fire effectiveness in systems with varying levels of mesophyte encroachment. We hypothesized that overstory functional groups have distinct microclimates that drive fuel drying rates of litter and woody fuels. The study was conducted at the Jones Center at Ichauway, Georgia, where we selected 15 trees representing the functional groups. In summer 2022, we implemented a fuel drying experiment, in which 60 fully hydrated bags of leaf litter and fine woody fuels from the three functional groups were placed under each tree and weighed every two hours from 9h to 17h. We measured vapor pressure deficit beneath each tree during the study period. Based on preliminary data, we found that fuels under longleaf pines dried faster than under pyrophytic and mesophytic oaks. We also observed that mesophytic fuels dried slower than pyrophytic fuels. Understanding the relationship between pyrophytic and mesophytic overstory, fuels and microclimate can reveal important feedbacks between vegetation and fuel, inform models of fire behavior and effects, and ultimately improve conservation management in fire dependent forests.

Title: Effects of sleep on memory, anxiety, and depression-like states in mice

Primary Author: Natasha Wendy Grabau

Additional Authors: ;Vander LeKites;Daniel Kroeger;Emma Brousseau

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Sleep influences various cognitive and physiological processes; however, the mechanisms through which sleep affects these systems are not fully understood. One of the brain centers that regulate sleep/wake states is the Nucleus Accumbens (NAc). We hypothesized that manipulation of sleep via activation of NAc affects memory, anxiety and depression-like states in mice. We used chemogenetics to activate specific sleep-active neurons in the NAc of A2AR-Cre transgenic mice to increase sleep for 4h. In two separate conditions, the mice were either left to sleep normally, or were sleep deprived for 4 h prior to testing. We performed three behavioral tests to evaluate the effects of varying degrees of sleep - Novel object recognition (NOR) test for memory, open field test (OFT) for anxiety and forced swim test (FST) for depression-like states. During the first 4 hours after chemogenetic activation of NAc A2AR neurons, we observed an increase in NREM sleep by 105%. Mice with increased sleep following treatment had a comparatively higher exploration index in the NOR test, demonstrating a trend towards increased memory performance and ability to identify the novel object. In the OFT, sleep deprived mice showed a significant increase in %time spent in the center zone and total distance travelled within the arena. They also spent significantly less time immobile. The affinity to enter the center zone and explore rather than remain in the periphery indicates lower levels of anxiety. Sleep deprived mice also exhibited a trend towards spending more time swimming in the FST, indicating lower levels of depression-like states. These results suggest that increased sleep improves memory performance but does not significantly affect levels of anxiety or depression-like states. Instead, reduced sleep significantly decreases anxiety and tends to reduce depressive-like states.

Title: Validation of the measurement of parental styles in court-involved male youth.

Primary Author: Caroline Greene

Additional Authors: Kelli R. Thompson;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Establishing a valid measurement of the parent-child dynamic is an important factor in developing treatments for adolescence, especially given the unique social and familial changes characteristic of this developmental phase. The purpose of this study was to add to the overall validity of the “Measurement of Parental Styles” (MOPS) questionnaire. This tool has been validated in multiple languages across diverse samples; however, this study would be the first to validate the measure in a sample of court-involved youth. The Brazilian-Portuguese version of the (MOPS) was found to be an appropriate measurement of parental influence. A longitudinal study with a French version found that the MOPS was useful in explaining substance use disorder in relation to both genetics and the environment in an adult male sample. The current study used archival from a sample of adjudicated male youth ($n = 504$) in residential treatment. A linear regression was used to test if the MOPS scales could predict substance abuse proneness on the Millon Adolescent Clinical Inventory (MACI). The results indicated the overall model was significant, $F(6, 503) = 5.38$, $p = .001$, and the Father abuse scale accounted for nearly all of the variance in the predictors ($t = 3.8$, $p = .001$) of substance abuse proneness. Since court involved adolescent males are a developing population, acknowledging their adverse experiences with parental figures using the MOPS is useful in determining their treatment needs. The future of this research would suggest a division of maternal and paternal measurements to specifically define these parent-child relationships since each authority figure likely has a differing parental style than the other.

Title: Culturing at physiological temperature alters myogenesis of broiler chicken pectoralis major muscle satellite cells

Primary Author: Caroline Gregg

Additional Authors: ;Brittany Wall;Joshua Flees;Jessica Starkey

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Culture temperatures for broiler chicken cells are largely based on those optimized for mammals although broiler body temperature is typically over 3 °C higher. The objective was to evaluate the effects of simulating broiler peripheral muscle temperature, 41 °C, compared with standard temperature, 38 °C, on *in vitro* proliferation and differentiation of primary muscle-specific stem cells (satellite cells; SC) from the *Pectoralis major* (PM) of broilers. Immediately following euthanasia of 18-d-old Ross 708 × Yield Plus male broilers (n = 6), peripheral PM temperature was recorded (41.14 °C +/- 0.08), then primary SC were isolated. SC were plated on triplicate, gelatin-coated wells at 40,000 cells per well. Parallel plates were cultured at either 38 or 41 °C in separate incubators. At 48, 72, and 96 h post-plating, cultures were immunofluorescence stained to determine expression of myogenic regulatory factors, Pax7 and MyoD. The remaining plates were switched to reduced-serum media at 96 h. After 168 h in culture, cells were immunofluorescence stained to determine myosin heavy chain and Pax7 expression, myotube characteristics, and assess SC fusion. This was replicated 3 times with independent pools of cells. Data were analyzed using PROC GLIMMIX of SAS 9.4 and means were declared different at $P \leq 0.05$ and tendencies at $0.0501 \leq P \leq 0.10$. Doubling times were not impacted by temperature ($P \geq 0.1148$). Culturing broiler SC at 41 °C promoted rapid progression through myogenesis while 38 °C maintained primitive populations ($P \leq 0.0029$). Culturing at 41 °C reduced overall myotube fusion ($P < 0.0001$) and tended to result in thinner myotubes ($P = 0.061$) without impacting total myonuclear density ($P = 0.7551$). These results indicate culture temperature alters primary broiler PM SC myogenic kinetics and has implications for future *in vitro* work as well as improving understanding of how thermal manipulation can alter myogenesis during embryonic and post-hatch muscle growth.

Title: Additive manufacturing of braided cylinders

Primary Author: Katie Griffin

Additional Authors: ;Ajay Jayswal;Sabit Adanur

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Braided patterns are often used to provide structural reinforcement in other materials, but traditional methods of fabricating these braided structures are time consuming and limited in their abilities. 3D printing, a form of additive manufacturing, continues to develop many new possibilities in the realm of manufacturing because it can often achieve more complex designs. The objective of this project is to test the abilities of 3D printing technology as it applies to the manufacturing of braided patterns in multidimensional space. Five differently patterned braided cylinders (Diamond, Regular, Hercules, Tri-axial, and Bifurcated) were designed in SolidWorks and 3D printed from both polylactic acid (PLA) and thermoplastic polyurethane (TPU). To compare the abilities of these structures of different materials, a combination of compression and tensile tests have been and continue to be performed to gain knowledge of a few of the mechanical properties of the structures. Results thus far have provided the modulus of elasticity, force at yield, and displacement at yield for each of the differently patterned structures from PLA compression tests. It is anticipated that the results of the PLA tensile tests will show similar, if not nearly identical, results. Since PLA is a rigid plastic and TPU is much more flexible, it seems likely that the values for the TPU prints' moduli of elasticity will be lower than those of the PLA prints. As this pertains to new possibilities and advancements in 3D printing, it is very promising that continual research can be performed in this area to develop newer, more efficient methods in manufacturing braided structures.

Title: The impact of stress on EEG frontal alpha asymmetry and its relationship to current and future problematic cannabis use

Primary Author: Michael Griffin

Additional Authors: ;Brandon Schermitzler;Richard Macatee

Department/Program: Psychology

College: College of Liberal Arts

Abstract: EEG-measured frontal alpha asymmetry (FAA) is thought to represent the behavioral activation/inhibition system, with a greater relative right or left hemispheric FAA corresponding with increased approach or avoidance motivation, respectively. Furthermore, FAA may be sensitive to acute stress. Although stressors are believed to maintain Cannabis Use Disorder (CUD) through negative reinforcement, little is documented of the neural mechanisms at play. In cannabis users, we aim to show that stress exposure increases relative left frontal alpha activity, indicative of greater state avoidance motivation, and that alterations in this FAA response are associated with disordered cannabis use. Cannabis users (N=102) completed several self-report measures of cannabis use, as well as a clinician-administered interview for CUD. During a lab session, resting state EEG data were collected before and after stress exposure, and a three-month follow-up consisted of another administration of the CUD diagnostic interview and self-report measures. Multilevel models were created to determine the effect of stress on FAA, the effect of baseline CUD severity on stress-induced FAA change, and the effect of stress-potentiated FAA on CUD severity at follow-up. As predicted, stress had a significant effect on FAA, $F(1,338)=283.6$, $p<.001$, exemplified by increased left frontal alpha activity following stress exposure. A reduced effect of stress on FAA was predicted by higher CUD symptom counts, $F(1,167)=7.246$, $p=.008$, and self-reported problems with cannabis, $F(1,166)=5.579$, $p=.019$, but not the number of past-month use sessions, $F(1,163)=.023$, $p=.879$. This blunted FAA stress response predicted greater maintenance of baseline CUD symptoms at follow-up, $F(1,127)=6.007$, $p=.016$. Thus, problematic cannabis use is associated with a dampened neural response to stress, possibly suggesting that a reduced inhibition of approach motivation is a factor in the maintenance of disordered use.

Title: Gait analysis as a marker of progression in feline models of neurodevelopmental and neurodegenerative diseases

Primary Author: Olivia Grigsby

Additional Authors: ;Emily Graff;Douglas Martin;Taylor Towns;Jordan Doss

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: The domestic cat is a well-established model for the study of brain development and degeneration in gyrencephalic species, including humans. Evaluation of neurological deficits, including changes in gait analysis, allow researchers to document changes in neurological disease progression and response to treatment. Cerebral dysgenesis caused by PEA15 loss of function is a stable non-progressive neurodevelopmental disease. Lysosomal storage disease such as GM2 gangliosidosis is a progressive neurodegenerative disease. Our aim is to determine normal gait parameters in normal kittens during development and then to assess differences in cats with a neurodevelopmental and neurodegenerative disorders.Gait analysis was performed at timepoints of 1, 2, 4, 6, and 12 months and into adulthood in normal domestic cats to assess variation in gait analysis associated with growth. Gait analysis was also performed in cats with neurodevelopmental and neurodegenerative diseases and age-matched controls. A digital platform was used to measure the front and rear stride lengths, front and rear base lengths, and right and left crossover values. A repeated measures ANNOVA was performed to evaluate changes during development and a t-test was performed to determine differences between affected and control cats.For normal cats there is a significant difference in front and rear stride lengths by 4 months of age compared to older cats. Rear base width stance was significantly different by 3 months of age, and there was no significant difference in front base width stance. There was no difference in crossover for either side across age. We conclude stride length changes with age, indicating the importance of age matched controls. Future studies plan to use this data to compare to treated groups at the same developmental periods to determine the degree of success of treatment and to establish an expected degree of success for the therapeutic response in humans undergoing clinical trials.

Title: Use of polystyrenehydantoin in water dechlorination for hemodialysis

Primary Author: Dakota Grimes

Additional Authors: ;S. Worley;Royall Broughton

Department/Program: Chemistry

College: College of Science and Mathematics

Abstract: Hemodialysis requires water of extreme purity, and existing procedures of purification are lengthy, expensive, and have a short lifespan. Granular activated carbon systems, the current primary method of removing free chlorine and chloramines from water for use in dialysis, require lengthy contact times and offer a short bed life when exposed to chloramines. Polystyrenehydantoin (PSH), a previously synthesized modified polystyrene bead containing a hydantoin ring, offers an alternative that requires significantly shorter contact times, a longer bed life, and the ability to be "recharged" after exposure to sodium thiosulfate. The capacity of PSH to remove chlorine from both solutions of free chlorine only (at the maximum chlorine level allowed by the EPA) and Auburn, Alabama tap water has been evaluated. PSH has shown to reduce chlorine concentrations in stationary solutions of free chlorine in 20 minutes, while the same reduction of flowing free chlorine solutions through a PSH bead bed occurred in 14.9 seconds of contact time. In tap water samples, 2.26 seconds of contact time was required to reduce chlorine concentrations to below the requirements for hemodialysis. Polystyrenehydantoin offers an alternative to current methods of water dechlorination in hemodialysis water purification with a significantly shorter required contact time, a longer lifespan, and the ability to be reused when compared to current methods of water dechlorination.

Title: Effects of prescribed fire on water quality and stream dwelling crayfish (order: *Decapoda*)

Primary Author: Josiah Gullatte

Additional Authors: Jim Stoeckel;Kaelyn Fogelman;Jim Stoeckel

Department/Program: Fisheries and Allied Aquacultures

College: School of Forestry

Abstract: Fires are a common disturbance in terrestrial ecosystems, occurring with increased frequency and duration in North America. Fires are less volatile in the humid southeast than in the dry western United States, but they are still an important ecological and management issue. Alabama has the highest diversity of crayfish in North America, with 100 species. The effects of fire on crayfish have never been quantified. To evaluate how runoff from a wildfire or prescribed burn might affect water quality and stream dwelling crayfish, I designed two experiments. The first experiment compared the effects of burnt vs non-burnt vegetation and woody debris runoff on water quality parameters including: dissolved oxygen, pH, conductivity, total suspended solids, nitrogen species, alkalinity and hardness, chloride, sulphate, and heavy metals. The second experiment evaluated the effects of fire debris runoff on crayfish standard metabolic rates. For both experiments I collected leaf litter and woody debris, burning half of the collected litter to mimic a fire event, and designed an experimental set-up that simulated a rainfall and runoff event through the litter into a stream. For the second experiment, I trapped and collected crayfish in coordination with US FWS, acclimated and held them in laboratory systems, and cared for them daily. In the first experiment we found that water exposed to fire debris runoff was higher in copper immediately after exposure, pH and total suspended solids 6 hours during exposure and was higher in dissolved oxygen, conductivity, alkalinity, hardness, and iron for 24 hours. Water exposed to unburnt leaf litter was higher in chloride, aluminum, and nitrites for 24 hours. Experiments evaluating the effect of burnt runoff on crayfish metabolic rates are still ongoing due to unanticipated crayfish disease issues. This novel research can be used by managers when considering the relationship between fire events, water quality, and crayfish physiology.

Title: Simulated longleaf pine (Pinus palustris) restoration leads to increased streamflow in the Mobile River Basin-AL

Primary Author: Henrique Haas

Additional Authors: ;Latif Kalin

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Longleaf pine (Pinus palustris) restoration (LLPR) is an important land management objective in the Southeastern U.S. (SE-US). Longleaf pine is considered to have superior water use efficiency and lower stocking than commercial pine stands such as loblolly pine (Pinus taeda). These characteristics may reduce the amount of water lost through evapotranspiration and consequently increase the water yield of areas dominated by longleaf pine ecosystems. The Mobile River Basin (MRB), which is largely covered by loblolly pine, contributes approximately 95% of the freshwater discharged to the Mobile Bay estuary. Freshwater inflow to the Mobile Bay has seen a declining trend in the last few decades. It is hypothesized that increasing the extent of longleaf pine stands in specific areas of the basin could counteract these ongoing trends and increase regional water yield. To assess the effects of LLPR on basin-level water quantity/quality, this study applies the Soil and Water Assessment Tool (SWAT) model to the MRB under two modeling scenarios: (i) current basin conditions (baseline model), and (ii) a LLPR model. A physically meaningful parameterization of longleaf pine will be presented for SWAT and predictions of streamflow, total suspended solids (TSS), nitrate (NO3-), and phosphate (PO4+) from the baseline and LLPR models will be compared. The baseline model was calibrated for daily discharge and monthly water quality loads using the automated calibration software SWAT-CUP. Our findings could be extremely valuable in guiding watershed-scale LLPR plans in the SE-US and shed light on the effects of LLPR on watershed-scale discharge, water yield, sediment loss, and nutrient loads.

Title: Utilizing CLAN and PHON for Analyzing Speech and Language Skills in Children

Primary Author: Cameron Hall

Additional Authors: ;Katie Wallace;Katelyn Gilson;Gregory Spray

Department/Program: Communication Disorders

College: College of Liberal Arts

Abstract: Evaluating the speech and language skills of children is a tedious task involving the collection of a communication sample. During this process a speech-language pathologist (SLP) or communication partner will have a conversation with a child to gain a greater understanding of the child's ability to use spoken language in context. After this sample has been recorded, the SLP transcribes each utterance produced by the child to conduct a language analysis. Although this process is the gold standard, it takes a considerable amount of time to count the number of words a child generates to produce meaningful measures such as: mean length of utterance (MLU), vocal diversity (VOCD), type-token ratio (TTR), along with several others. The current project introduces Computerized Language ANalysis (CLAN), which is a freely available tool that automatically provides several useful measures of childhood language. CLAN has previously been used in several studies ranging from the examination of syntax in children who stutter to the language skills of typically developing children. In addition, transcriptions created in CLAN, can be imported into Phon, which is a second program used to examine speech production as it relates to articulation and phonology. Previous studies have used this software to study phonological development in children who stutter as well as phonological development in children who are bilingual. Taken together, these programs reduce the amount of time needed to complete analysis of multiple aspects of language and phonology. If both CLAN and Phon were used by clinicians in the clinical setting at a higher rate, this would allow for more reliable and efficient analysis. Moreover, this increased efficiency enables clinicians to have more time for treatment of the clients they serve.

Title: Gene therapy for peripheral disease in feline GM2 gangliosidosis

Primary Author: Paige Hall

Additional Authors: Emily Ingle;Amanda Gross;Courtney Garrett;Douglas Martin

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: GM2 gangliosidosis is a neurodegenerative disease and lysosomal storage disorder caused by the lack of beta-hexosaminidase (HEX) and the accumulation of GM2 ganglioside. The feline model closely resembles the human condition in clinical and biochemical parameters. Adeno-associated viral (AAV) gene therapy aims to restore HEX, and therefore enable GM2 ganglioside degradation. Although GM2 is a neurodegenerative disease, patients have peripheral disease that needs to be treated alongside the neurological symptoms. The objective of this study is to determine the efficacy of gene therapy for the treatment of peripheral disease manifestations. Cisterna magna (CM) injection was evaluated in addition to a combination of CM+IV delivery to determine possible additive systemic results. Each treatment cohort was further divided, with half being followed 16-weeks post treatment (short term) and the other followed to humane endpoint (end point). Untreated GM2 animals survived 4.1 ± 0.1 months. The end-point group for the CM survived to 9.4 ± 4.9 months and CM + IV survived to 14.1 ± 5.3 months. All treatment groups, on average, showed a delay in clinical disease progression. The elastography was evaluated in liver, spleen, kidney, pancreas, and skeletal muscle. Less elastic organs are a sign of further progression of the GM2 disease due to the buildup of lipids in the tissues. There was a decrease in elasticity in the liver, spleen, and kidney when comparing untreated GM2 animals to normal animals. There was no difference between CM treated animals and untreated animals. However, CM+IV treatment showed improvement in elasticity in liver in comparison to untreated animals. This gene therapy method is effective in treating neurologic symptoms, as demonstrated by the increase in lifespan and delay of symptom onset. However, due to the modest peripheral improvement, additional studies need to be conducted.

Title: Interior design for educational spaces of adults with intellectual disabilities

Primary Author: Lanie Hammond

Additional Authors: ;

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Intellectual disabilities (IDs)—cognitive and learning disabilities—are typically indicated by an IQ of 70 or below and are present in between 6.5 and 7 million people living in the United States. Adults with IDs are frequently dependent on family or healthcare workers for daily living tasks; however, educational interventions specifically targeted towards this adult population can assist in helping them develop independent living skills that may diminish their dependence upon others or diminish the workload of their caregivers. The purpose of this research is to discover design elements that are beneficial to the comfort and educational success of adults with IDs, a specific area understudied within the practice of interior design. A thorough review of literature regarding design principles for these adults' mental health and comfort was conducted with a specific focus on studies adapting evidence-based design principles into design practice. The literature indicated three distinct areas of design impacting the usability of a space for people with IDs: 1) space adjacencies and flow; 2) lighting choices; and 3) finish (material) choices within the space. These principles were analyzed and used to inform the design of Next Step Farms—an educational facility providing hands-on teaching of critical life skills to adults with LDs. The resulting design prototype implements these research findings. The future use of this building and the success of the company's clients can be used to study the success of the evidence-based design.

Title: Temperature acclimation of leaves and stems in southeastern U.S. tree species

Primary Author: Hang Li

Additional Authors: Michael J. Aspinwall;Heather Alexander

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: As global warming increases, plant respiratory thermal acclimation is playing an increasingly important role in climate models. Although it is well-discussed, few studies have been investigated on the respiratory thermal acclimation of plants throughout the growing season, and typically are conducted on leaves instead of stems. Therefore, we investigated the thermal acclimation of leaves and stems of 11 different species (*Quercus shumardii, Quercus phellos, Liriodendron tulipifera. Quercus Texana, Quercus alba, Quercus virginiana, Acer rubrum, Liquidambar styraciflua, Pinus taeda, Quercus lyrate, Nyssa aquatica*) native to the southeastern U.S. that were grown outdoors throughout the whole growing season. To determine acclimation, we measured the respiration rate of each individual at standard temperature (25°C) from May to November 2022. In agreement with results of previous studies, we found that in leaves, the respiration rate curve over the growing season was consistent with the effect of temperature acclimation on respiration rate, indicating that leaf tissues were thermally acclimated. In contrast, in stems, respiration rate curves only showed thermal acclimation of respiration when analyzed monthly and not when evaluated over the entire growing season. By analyzing stem respiration rates at standard temperatures throughout the growing season, we found that stem respiration rates decrease with a plant growth. This is an indication that the stem has a lower energy requirement in the later stages of plant growth and its respiration rate decreases accordingly. Reducing respiration requirements of stems are swamping out the effects of acclimation over the growing season as a whole. Our results indicate that the variability of the growing season should be taken into account when studying the respiratory thermal acclimation of plant stems. The curve of stem acclimation can be incorporated into climate models.

Title: The impact of familial abuse on incarcerated youth

Primary Author: Grace Hanson

Additional Authors: ;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Incarcerated youth experience greater amounts of trauma exposure, within schools, neighbourhoods, and family systems than the average adolescent. The media and journalists often paint these youthful offenders as young predators on a path to a life of crime. Yet, research suggests this is simply not the case, as adolescence is a key developmental phase marked with high neuroplasticity, allowing youth to respond better to mental health treatment and behavioural interventions. Furthermore, not all youthful offenders are the same, as one study found four distinct classes based on trauma histories. The *Anxious* class, the *Depressed/Anxious* class, the *Dysthymic/Disorganized* class, and the *Antisocial* class were identified and those who report sexual abuse were twice as likely to be part of the *Dysthymic/Disorganized* class. Many adolescent males with illegal sexual behaviour either witnessed family discord or experienced abuse themselves in the home. Thus, understanding the unique characteristics of the victim-offender cycle, or how victims of sexual abuse become offenders of sexual abuse, can help guide intervention models. Archival data (n = 1,551) from a juvenile correctional facility was used in the current analyses. A one-way ANOVA was used to test for significant mean differences in family discord and child abuse across 10 categories describing the relationships of the abuser to the victim. Those who were abused by a female step-sibling and step-dad reported the highest levels of family discord, F (12, 1550) = 2.64, p = .001, compared to those who experienced abuse from a stranger. And those that experienced abuse by a biological mother reported the highest levels on the child abuse scale, F (12, 1550) = 49.94, p = .001, which was expressed as worse than abuse reported by those with male relatives. Clinical implications for interventions involving family will be discussed.

Title: Developmental toxicity of the trichloroethylene metabolite DCVC in zebrafish

Primary Author: Maryam Hariri

Additional Authors: ;Katharine Horzmann;Quintan Rossow

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Trichloroethylene (TCE), historically used as an industrial solvent and degreaser, is a legacy environmental pollutant that is found at over half of Superfund sites in the United States and can contaminate ground and drinking water sources. TCE is a known carcinogen and is associated with reproductive and developmental toxicity, immunotoxicity, and neurotoxicity. Some of the toxic effects of TCE are thought to be caused by its metabolites and this study tests the hypothesis that S-(1,2-dichlorovinyl)-l-cysteine (DCVC), a glutathione pathway derived metabolite of TCE, contributes to the toxicity observed in zebrafish (*Danio rerio*) with developmental TCE exposure. In this study, after a 120 hour LC50 for DCVC was determined to be greater than 100 parts per million (ppm; mg/L), zebrafish embryos were dosed immediately after fertilization with 0, 5, 50, or 500 parts per billion (ppb; µg/L) of DCVC. Survival and hatching was monitored every day for 120 hours, behavior assays were performed at both 24 hours post fertilization (hpf) and 120 hpf, and heart rate and body morphology measurements were recorded at 120 hpf to screen for potential toxicity. Although no differences in survival or hatching were observed, there were significant alterations in behavior at both 24 hpf and 120 hpf. All three DCVC exposures had altered behavioral endpoints in the 24 hpf photomotor response test while the 5 and 500 ppb exposures had significantly decreased movement in the 120 hpf visual motor response test. The morphology of the 50 and 500 ppb exposures was significantly altered with these exposures having significantly smaller head length and head width measurements and the heart rate was significantly increased in the 5 and 500 ppb exposures. The results suggest that DCVC does contribute to TCE associated developmental toxicity.

Title: Confidence and barriers regarding mindfulness-based stress reduction for treatment of chronic pain: a national cross-sectional survey

Primary Author: Klaudia Harris

Additional Authors: Lindsey Hohmann;Lindsey Hohmann;Yinyin Zhao;Holly Webster;Jillian Farrow;Jazmyne Jackson

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Meditation and yoga, key components of mindfulness-based stress reduction (MBSR), are effective in chronic pain management. Despite this, little is known surrounding stakeholders' confidence and barriers to accessing MBSR for chronic pain management, especially in the community pharmacy setting. Accordingly, the purpose of this study was to evaluate the US general public's confidence and perceived barriers to care related to the utilization of MBSR for chronic pain management and community-pharmacy delivered MBSR. Using a cross-sectional study design, US adults ≥18 were recruited to participate in an online anonymous survey via the Amazon Mechanical Turk (MTurk) survey recruitment and distribution platform. Primary outcomes were measured using 5-poing Likert-type scales (1=strongly disagree, 5= strongly agree) and included: 1) confidence in seeking MBSR for chronic pain management (5-items); and 2) perceived barriers to receiving and accessing MBSR (10-items). Data were analyzed using descriptive statistics. The majority of respondents were female (50.7%), White (79.1%), and mean 44.65 years (N=302). Confidence was fairly low on average (mean[SD] scale score: 2.65[0.87]), and 64.8% disagreed or strongly disagreed that they would feel confident seeking MBSR from their community pharmacist. However, 44.3% and 55.0% agreed or strongly agreed that they were confident seeking MBSR from their physician or community center/gym, respectively. Perceived barriers were generally low (mean[SD] scale score: 2.22[0.53]), with the most frequently cited barrier being difficulty finding MBSR classes nearby (39.0% agreed or strongly agreed). Overall, there is a gap knowledge regarding how and from whom to seek MBSR care, and a lack of services within close proximity to stakeholders. This is an area of opportunity for community pharmacists to implement new MBSR services and educate their patients. Future studies may explore the best way to build community pharmacy-based MBSR capacity.

Title: Structural maturation of cardiac cells was improved by increasing the initial hydrogel microspheroid axial ratio

Primary Author: Mohammadjafar Hashemi

Additional Authors: ;Ravi Nataraj;Elizabeth Lipke;Yuan Tian;Ferdous Finklea;Katherine Wright;Hanna Hammons

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Engineered cardiac tissue (ECT) that accurately recapitulates the human heart structure and function is crucial for medicine and drug testing. A spheroidal production platform is advantageous for production of ECTs from human induced pluripotent stem cells (hiPSCs) and can be used for suspension culture which is vital for the scale-up processes needed for biomanufacturing. Maturity of hiPSC-derived cardiomyocytes (CMs) is another major barrier to the implementation of ECTs because hiPSC-CMs have an immature phenotype as compared to adult CMs; this issue is accentuated in suspension culture. We used a microfluidic system to produce cell-laden microspheroid hydrogels with controlled size and axial ratio (AR). In this study, we investigated the effect of encapsulating and differentiating hiPSCs in microspheroids of differing ARs and examined the morphological maturation of resulting hiPSC-CMs in scalable suspension production. ECT microspheroids with a range of ARs were produced through direct differentiation of encapsulated hiPSCs in PEG-fibrinogen (PF) hydrogels. We used an unbiased algorithm for cell morphological assessment. Microspheroids were highly consistent in size and shape (AR) both within and between batches. Shaker flask microspheroid cardiac differentiation was appropriately efficient with 75.7±4.6% MF20+ (cardiac marker) and 9.4±8.3% TE7+ (fibroblasts), reflecting the desired CM: fibroblast ratio for ECT production. HiPSC-CMs dissociated from microsphere (MS) and microrod (Rod) platforms were stained with aSA and Hoechst, and confocal images were analyzed using the unbiased algorithm. CMs from the Rod platform were found to have greater structural maturation as compared to MS CMs. Cell elongation and sarcomere organization scores (features of maturity) were 1.3 and 4.3 times higher for Rod CMs compared to MS CMs, respectively. In conclusion, initial geometry affects hiPSC-CM maturation, implying aspect ratio control may improve CM scale-up production.

Title: The impact of ecology on the quality of life of the urban population

Primary Author: Emily Hatcher

Additional Authors: Anna Ruth Gatlin

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: A projected 89% of people will be living in urban areas by the year of 2050. Such dense proximity of people means that urban areas can do one of two things– expand upwards or expand outwards. In most cities, both historically and in the present day, the best option for growth is to expand upwards; thus, the skyscraper dominates the urban cityscape. Skyscrapers present a few challenges– one of most urgent challenges is the lack of exposure to nature. Nature exposure is something that has been proven to positively impact the health of its population greatly. With the implementation of urban ecology into densely populated urban buildings, productivity, holistic health, and quality of life is shown to increase. San Francisco, CA, and Seattle, WA, are two standout cities, ranking within the top 10 of The United States' happiest, healthiest, and most productive Urban cities; they are also among the top 10 cities with the highest percentage of parkland and nature. It can be inferred that the amount of passive and active exposure to nature may also positively impact the cities productivity. In order to match the growth and evolution of the human population, it is essential that modern interiors implement ecological communities into their designs. The purpose of this research is to explore options for this implementation through "ecological retreat" for the modern skyscraper. The term "ecological getaways" will be operationalized and three detailed options for integrating ecological getaways will be presented along alongside supporting literature. These options may serve as a prototype for existing skyscrapers as well as new construction, and may serve to support design's effects on the quality of life of the urban population.

Title: Restoration, stress, and future plans of Auburn students

Primary Author: Hunter Hathorn

Additional Authors: ;Sara Driskell;Jaxi Arterburn;Josie Thomas;Bailey Hunter;Alexander Breen

Department/Program: Psychology

College: College of Liberal Arts

Abstract: For students at college, the campus itself is a major aspect of their life and makes up a large share of where they spend time. In supporting its students, Auburn works to create restorative and stress relieving spaces so that students are better able to study, be productive, and decompress. This healthy balance also helps support students' motivations and future career plans. Students (N=331) were asked about what spaces on Auburn's campus they felt restored or refreshed and their favorite places. They were also asked about their plans after graduation and their feelings about how Auburn prepares them for their future. Overall, students were found to prefer outdoor spaces or private areas such as their dorm room when it came to their preferred restorative space. When it came to their favorite space, students picked more varied places, but they rated their choices as being important to them because they felt were beautiful (69%) and peaceful (61%), and they are places where they could spend time with friends (68%) and could eat at a rate (58%). Having a strong sense of place at Auburn through these spaces correlated with both motivations for their future plans (r=.277, p<.001) and future ties to Auburn (r=.350, p<.001). When asked about their future plans on a scale from 1-7, students reported feeling very motivated to pursue their future career goals (M=5.97, SD=1.61), but they also reported wanting to return to campus after graduation (M=5.05, SD=1.78) and stay connected with other alumni (M=5.49, SD=1.63). Importantly, both connecting with Advising (r=.478, p=.021) and staying connected with other alumni (r=.554, p<.001) correlated with wanting to return to campus after graduation. They also agreed that their current major is preparing them for knowledge (M=5.84, SD=1.86) and skills (M=5.74, SD=1.91) they will need after graduation. This shows how important it is to take a holistic approach to supporting students at Auburn.

Title: Determination of the dissolution profile for *Euterpe oleracea* constituents in simulated fed and fasted intestinal states

Primary Author: Zalaya Haynes

Additional Authors: ;Angela Calderon;Zarna Atul Raichura

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Euterpe oleracea Mart., also known as açaí, is a palm species fruit native to Northern Brazil that is often used in botanical dietary supplements (BDS). Due to various health benefits açaí BDS have, such as antioxidant and anti-inflammatory properties, many cancer patients have been using them alongside chemotherapy. Because BDS are not considered drugs by the Food and Drug Administration (FDA), dissolution profiles are not required and are less readily available. However, it has become apparent of its need for a variety of BDS formulations for quality assurance. Using an *in-vitro* dissolution study, we aimed to gain a better understanding of açaí chemical constituents soluble in the GI tract, the absorptivity, and pharmacological activity. In the proposed study, we used two different oral BDS formulations from different manufacturers to determine the dissolution range of compound classes including poorly soluble weak bases and highly lipophilic phytoconstituents. A preliminary performance Verification Test was performed using USP Apparatus II (Paddle) for instrument calibration. The data showed inaccuracy within the apparatus with multiple samples from different vessels reporting the amount dissolved to be more or less than predicted. Due to instrumental inaccuracy, a shaker was used instead. This approach has been used as an alternative to an Apparatus and has yielded similar results. For experiments involving shakers, biorelevant media (Fed and Fasted State Simulated Intestinal Fluid) simulating physiological conditions of the GI tract was used for evaluation. The solubility samples were obtained for a period of 24 hours followed by sample cleaning using solid phase extraction (SPE). The clean samples were further analyzed by LC-MS. We plan to further evaluate the samples at staggered time points to precisely determine the time interval for solubilization of açaí constituents. The dissolution of botanical constituents is required to understand BDS health benefits.

Title: Unraveling the mysteries of vascular diseases with novel microfluidic technology

Primary Author: Farnaz Hemmati

Additional Authors: ;Farshad Amiri;Ayuba Akinpelu;Panagiotis Mistriotis

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Vascular disease, which refers to a range of conditions that affect the blood vessels, is a major health concern affecting millions of people globally. Despite advancements in medical technology and treatments, there is still a lack of understanding about the underlying mechanisms of these diseases. Microfluidic devices have the potential to greatly advance our understanding of the underlying mechanisms of vascular disease. For this reason, we developed, tested, and validate an innovative high-throughput microfluidic platform technology that enables long-term culture of single cells in microenvironments of prescribed dimensions. This device integrates photopatterning and imaging tools to create a 3D confining microenvironment for cells. By employing parallel microchannels of fixed (L)ength (200 µm) but varying (W)idth (3-10 µm) and (H)eight (3-10 µm), we could simulate the confinement experienced by cells in the body under condition of vascular disease. The results showed that vertically confined channels resulted in increased cell death and decreased cell proliferation, indicating that the physical environment plays a crucial role in the health of cells. Additionally, the study also revealed that the translocation of certain key molecules, such as Anillin, from the nucleus to the cytoplasm occurred in vertical confinement. Overall, the use of microfluidic devices in this study provided new insights into the ways in which cells convert physical signals from their local microenvironment into biochemical cues. This has helped to establish new, physiologically relevant assays for better understanding cellular behavior in disease conditions. The findings from this study demonstrate the potential of microfluidic devices to advance our understanding of the underlying mechanisms of vascular diseases, which can lead to improved diagnostic and therapeutic approaches.

Title: Role of impulsivity and risk taking in substance use

Primary Author: Mollie Henry

Additional Authors: ;Samantha Fede;Alexandra Romines

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Impulsivity is a complex construct encompassing both normal variation and a number of maladaptive behaviors. High rates of impulsivity are often observed in clinical populations, such as individuals with substance use disorders (SUD). Previous research has shown multiple dimensions of impulsivity that operate independently from one another and may individually contribute to the onset of substance use. This includes trait impulsivity factors, like negative urgency and non-planning, as well as behavioral impulsivity as measured by monetary delay discounting. Individuals with substance use disorders have greatly increased delay discounting when compared to non-users, and there is some evidence that acute administration of drugs and alcohol may also increase impulsive behavior. In the present study (n = 485), we examined the association between young adult substance use, impulsivity, and risk taking as measured by the Barratt Impulsivity Scale (BIS-11), the Zuckerman–Kuhlman Personality Questionnaire (ZKPQ), and the Domain Specific Risk-Taking Scale (DOSPERT). Participants also completed a monetary delay discounting task that assessed an individual's impulsive decision-making by asking them to choose between an immediate small reward and a larger delayed reward. Finally, we asked participants to self-report the frequency of alcohol and illicit substance use. We found that heavy drinkers, compared to nondrinkers, had higher motor impulsivity, impulsive sensation seeking, risk taking, and delay discounting. We found that illicit substance users, compared to non-users, had higher attentional impulsivity, impulsive sensation seeking, risk taking, and delay discounting. These results replicate previous literature and suggest that impulsivity may predate clinical substance use disorders.

Title: Strawberry (*Fragaria* × *ananassa*) growth evaluation under hydroponic systems in Alabama

Primary Author: Nelda Raquel Hernandez Martinez

Additional Authors: Amanda McWhirt;Bernardo Chaves-Cordoba;Melba Salazar-Gutierrez;Daniel Wells;Wheeler Foshee

Department/Program: Horticulture

College: College of Agriculture

Abstract: Strawberries in Alabama have been increased substantially over the last years and many are the challenges affecting its performance such as pests, weeds, diseases, and cold damage in outdoor systems. Hydroponics systems come as an alternative production system providing tools to manage the most critical biotic and abiotic factors and promising increased yield, high-quality berries, and extended seasons. The main goal of this study is to evaluate the performance of two day-neutral cultivars Albion and San Andreas under a hydroponic system. Measurements including photosynthesis, growth and development, and phenology are being done. Albion has showed higher photosynthetic performance than San Andreas. For phenology the stage 8 (fruit development) has been the longest one for both cultivars; however, San Andreas reached maturity first. Growth of structures showed an increased from day 13 to 27 after transplanting. It is expected that this system will extend the production season allowing the grower to participate in off-season market demand to get higher incomes. Further evaluations will be done for fruit quality, yield, and dry matter accumulations to completely know these cultivars performance. This study is the first of its kind at Auburn University, thus its results will be of significant help to Alabama growers by providing relevant information on strawberry cultivation under protected environments.

Title: Evaluation of instrumental color over time using two different thicknesses of dehydrated jerky pet treats generated from broiler chicken wing tips

Primary Author: Said Joel Herrera Vallejos

Additional Authors: Charles Starkey;Cristopher Isaac Almendares Sanchez;Diego Ernesto Ventura Urbina;Jorge Enrique Banegas Duron;Jorge Luis Sandoval Escobar;Jorge Romero Garcia;Justin Dunavant;Wesley Rogers;Josh Renew;Luis Jose Guzman Sabillon;Tristan Reyes;Madison Wagoner;Gerardo Abascal Ponciano;Marc Presume

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Broiler chicken wing tips (WT) are processing co-products that can be upcycled into pet treats. Color of these treats is an important quality-related parameter that may impact the consumer purchasing decision. The objective was to evaluate instrumental color over time of two different thicknesses dehydrated pet treats derived from WT containing 1 of 4 concentrations of a structure forming agent (ALGIN) containing sodium alginate (SA) and encapsulated calcium lactate (ECL). Chicken wing tips are Frozen WTs were ground and mixed with 1 of 4 concentrations of ALGIN: 0x (no ALGIN), 0.5x (0.50% SL + 0.425% ECL); 1x (1.00% SL + 0.85% ECL), and 2x (2.00% SL + 1.70% ECL). Each mixture was stuffed into casings, stored at -20 °C to facilitate gelation, and sliced into 5-mm and 10-mm-thick slices. Slices were dehydrated in a convection oven at 93 °C until reaching an internal temperature of 74 °C before lowering the temperature to 65 °C. Slices were removed once water activity decreased to 0.8. Instrumental color was assessed by taking 3 surface measurements with the CIE color space L*, a*, b* color scale using a HunterLab MiniScan EZ 4500 spectrophotometer. Data was analyzed as a three-way ANOVA using the GLIMMIX procedure of SAS. Least square means were separated using the PDIFF option at $P \leq 0.05$. On d 5, 10-mm-thick treats containing 1x and 2x ALGIN were the lightest compared to other treats. Whereas 5-mm-thick treats containing 0.5x ALGIN were the darkest on d 0 of storage time. On d 3, 5 and 7, 10-mm-thick, treats containing 0x ALGIN where the reddest. No three-way interaction between ALGIN concentration, days and thickness were observed for yellowness. However, 0x and 1x, 10mm-thick treats on d 7 were the yellowest compared with other treats. While minor differences were measured for color when ALGIN was included, overall color was not affected to an extent that should influence visual perception of the consumer and therefore their purchasing decision.

Title: Maximizing colonization & proliferation of donor stem cells for creation of xenogenic catfish: Identifying the best host age of triploid white catfish

Primary Author: Darshika Udari Hettiarachchi

Additional Authors: ;Ian Butts;Veronica Alston;Logan Bern;Jacob Al-Armanazi;Baofeng Su;Jinhai Wang;Rex Dunham

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: Xenogenesis is an innovative technology for hybrid catfish (♀ channel catfish × ♂ blue catfish) embryo production. The xenogeneic process can be accomplished by transplanting undifferentiated diploid germline stem cells derived from donor fish into sterile recipients. Until recently, the timing of transplantation of donor cells into hosts was done with limited knowledge of the best age to inject cells. The age of the host could critically affect the success of germ cell transplantation. The present study aimed to identify the best age of the triploid white catfish to transplant channel stem cells (CSSCs) and blue catfish stem cells (BSSCs) for the production of xenogeneic catfish. Triploid white catfish fry were injected with CSSCs or BSSCs labeled with PKH26 dye from 0 to 12 days post-hatch (DPH). Then at 45 and 90 DPH, total length (TL), weight (BW), survival, donor cells colonization (using PKH26 fluorescence dye) of recipients were evaluated. PCR determined the percentage of xenogens from gonadal tissues. Day of stem cell injection had an impact on TL and BW of recipient fish. At both sampling days significantly higher TL and BW resulted after 4 DPH. A significantly higher survival of recipients was detected when injected with stem cells after 4 DPH (≥87%). At 45 and 90 DPH in CSSCs treatments, significantly higher cell and cluster area were detected for fish injected between 5 to 6 DPH. At both 45 and 90 DPH in BSSCs treatments, significantly higher cell and cluster area were detected for fish injected between 4 to 6 DPH. When recipients were observed at 45 DPH, the highest percentage of xenogens were detected when recipients were injected between 4 to 5 DPH, while at 90 DPH, the highest percentage of xenogens was detected between 3 to 6 DPH. Our results show that 4 to 6 DPH is a suitable timespan to inject donor-derived stem cells into recipients. These findings will enhance the efficiency of germ cell transplantation in xenogenesis for commercial-scale hybrid catfish production.

Title: Food for thought: How influenceable is the next generation consumer

Primary Author: Karen Hiltbrand

Additional Authors: ;Katie Corbitt;Madison Coursen;Donald Mulvaney

Department/Program: Animal Sciences

College: College of Agriculture

Abstract: The saying ‘you don’t know what you don’t know,’ rings true with American consumers when it comes to knowing where their food comes from. This study examined consumer susceptibility to be influenced by inaccurate information about the food industry and their level of knowledge of it. A continuous response measurement (CRM) methodology was used to examine how an individual’s knowledge of the food industry affected levels of trust after watching two YouTube videos. This mixed-methods study included 15 Generation Z participants that viewed two YouTube videos about agriculture (one considered misinformation and one communicating accurate information). Study participants were also part of focus groups to learn about their perceptions of agriculture regarding three areas of concern: water, emissions, and nutrition. Through engagement in thought-provoking discussion and analyzing what encouraged higher levels of trust, this study contributes to the body of literature focused on more effectively communicating how food is produced and made available to the American consumer.

Title: Surface modification of carbon microfibers

Primary Author: Tripp Hinkle

Additional Authors: ;Andrew Adamczyk;Archana Bansode;Nima Alizadeh;Amulya Poudyal;John Thornhill;Anthony Bass;Xinyu Zhang;Thomas Elder;Maria Auad

Department/Program: Polymer and Fiber Engineering

College: College of Engineering

Abstract: Lignin is one of the most common naturally occurring macromolecules. It is found in association with cellulose and hemicelluloses in terrestrial plants, providing mechanical stiffness, and contributing to moisture control and defense toward insects and fungi. Lignin is typically a polymer of three different cinnamyl alcohols, para-coumaryl alcohol, coniferyl alcohol, and sinapyl alcohol, which varies with the plant species. Solubilized lignin from the kraft pulping process is mainly concentrated and burned as part of the liquor recovery cycle in the kraft pulping. Given its aromatic nature, other uses of lignin include the development of platform chemicals, polymers, and fuels. In this work, lignin is used to develop carbon fibers to act as supercapacitors. Lignin microfibers were produced using an electrospinning process, carbonized under an inert atmosphere, and activated to increase surface area and improve capacitance. The activation process is shown to improve the specific capacitance of the material. In addition to activation, nanocrystals were grown on the surface of the carbon microfibers as these nanocrystals have been shown to improve the specific capacitance. When both surface modifications are performed to the lignin-based carbon fiber, it improves the specific capacitance retention regarding scan rate increase during cyclic voltammetry. The specific capacitance for the carbon fiber, activated carbon fiber, Ni(OH)2 carbon fiber, and Ni(OH)2 activated carbon fiber at 10 mV/s are 189 F/g, 206 F/g, 10 F/g, and 103 F/g.

Title: Multielectron $[Ni(dmpe)_2]^{2+}$, where dmpe = 1,2-bis(dimethylphosphino)ethane, as anolyte for redox flow batteries

Primary Author: Md Musharraf Hossain

Additional Authors: ;Byron Farnum

Department/Program: Chemistry

College: College of Science and Mathematics

Abstract: Redox flow batteries (RFBs) are very attractive for applications in large-scale energy storage. Transition metal complexes are commonly used as redox active species in terms of anolyte and catholyte for RFBs. The energy storage ($\Delta G = -nFE_{cell}$) depends on the number of electrons (n) transferred per molecule and the potential difference between catholyte potential (E_c) and anolyte potential (E_a) ($E_{cell} = E_c - E_a$). The energy density of the battery depends on the concentration of redox active species. Therefore, solubility of molecules is also a big concern for commercial applications of RFBs. $[Ni(dmpe)_2]^{2+}$, where dmpe = 1,2-bis(dimethylphosphino)ethane, undergoes 2e- reversible reduction and oxidation at -1.28 V vs $Fc^{+/0}$ making it a suitable anolyte molecule which stores n = 2 electrons. The scan rate dependent cyclic voltammetry experiments showed peak ratios (ipa/ipc) nearly equal to 1, indicating high reversibility. Rotating ring-disk electrochemistry was performed to further understand the electron transfer process, while chronopotentiometry studies were used to measure charge-discharge capacity and cycling efficiencies. Finally, the solubility of $[Ni(dmpe)_2]^{2+}$ was determined by UV/vis spectrophotometry to be 0.25 M. Therefore, $[Ni(dmpe)_2]^{2+}$ can be a good candidate as an anolyte for nonaqueous RFBs when coupled with a suitable catholyte such as $Ni(dtc)_2$, where dtc = diethyldithiocarbamate. The study of these two molecules within a lab scale RFB device will also be discussed.

Title: Determining how bacterial motility affects pathogenicity in a gut-associated infection model

Primary Author: Jackson Howard

Additional Authors: ;Katherine Buckley;Jake Tatum

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The marine bacterium *Vibrio diazotrophicus* elicits a strong immune response in the larvae of purple sea urchin (*Strongylocentrotus purpuratus*). In response to high levels of *V. diazotrophicus* in the seawater, larvae up-regulate the cytokine interleukin-17 (IL-17) in gut epithelial tissues and exhibit an inflammatory response marked by the migration of immune cells to the gut. This response is initiated as the bacteria invade the gut tissue. Interestingly, following exposure to heat-or chemically-killed *V. diazotrophicus*, larvae display no signs of infection. The goal of this study is to understand the mechanism used by *V. diazotrophicus* to infiltrate the gut epithelial cells and elicit the immune response with a focus on bacterial motility. Unlike mammalian gut tissues, the gut epithelial cells of purple sea urchin larvae are not connected by tight junctions. Consequently, it is possible that one aspect of the pathogenicity of *V. diazotrophicu*s is its flagellar function. To test this hypothesis, non-motile strains were generated in which flagella were inactivated. Suicide plasmids were used to specifically eliminate the genes encoding the flagella motor proteins MotA and MotB. Larvae will be exposed to these non-motile strains and their immune responses will be assessed by quantifying immune cell migration. This study will help to better characterize the molecular mechanisms that enable this pathogenic *Vibrio* strain to successfully invade host tissues.

Title: 2-Year college/university student food security survey module (CS-FSSM): cognitive interviews

Primary Author: Mae Howell

Additional Authors: ;

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Food insecurity is the state of being without reliable access to enough affordable and nutritious food to live a healthy and active life. The rate of college student food insecurity (<50%), is much higher than the rate of US household food insecurity (11%). Most recently, 35% of surveyed college students were classified as food insecure during the COVID-19 pandemic. The majority of food insecurity data represent college students attending 4-year institutions. Thus, the importance of determining and addressing food insecurity at 2-year institutions will add to the body of literature and impact health and societal outcomes. Participants completed a demographic survey and complete the USDA 10-item FSSM module. Based on responses from the 10-item FSSM, students were determined to be food secure or food insecure. During the recorded semi-structured, virtual interview, participants responded to questions about the 10-item FSSM. The interviews were analyzed by theme using qualitative analysis software (ATLAS.ti) to determine needed modifications relevant to 2-year college students. These data will be used to inform modification of wording and verbiage of the current USDA 10-item FSSM to create a FSSM to use for 2-year college students.

Title: AAV-mediated anti-hormone antibody therapy as a treatment for Alzheimer's disease

Primary Author: Emma Hruska

Additional Authors: Darren T. Beck;Arthur Zimmerman;Anniston Dodson;Malia Walton;Douglas Martin;Aime Johnson;Miranda Reed;Henry Baker

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Alzheimer's disease (AD) is the most common form of dementia and is marked by abnormal accumulation of beta-amyloid proteins and the hyperphosphorylation of tau proteins that together lead to neuronal degeneration. It is estimated that by 2025, 7.2 million people aged 65 and older will have AD, an 11% increase from the 6.5 million people affected in 2022. Additionally, almost two-thirds of Americans with AD are women, and evidence suggests that menopause is a clear driver for AD development. During this period, hormone levels change due to lack of estrogen, and previous studies have implicated altered hormone levels as a potential factor for AD development. Thus, we hypothesize that increased hormone levels may contribute to the neuropathology and memory loss associated with AD. To test this, we used an innovative adeno-associated virus (AAV)-mediated anti-hormone antibody treatment in APP/PS1 hemizygous mice, a model of AD. We examined changes in estrous cyclicity and memory and learning behavior. Here, we report that treatment with anti-hormone antibodies significantly disrupts estrous cyclicity, specifically leading to an increased time spent in estrus. Additionally, treated APP/PS1 hemizygous mice appear to show improvement in a food choice test that measures social transmission of food preference (STFP), a behavior that deteriorates with neurodegeneration. Overall, AAV-mediated antibody treatments appear to not only disrupt estrous cyclicity likely due to alterations in hormone levels, but also restore learning and memory performance during STFP.

Title: Fast and high-resolution NLoS beam switching over commercial off-the-shelf mmWave devices

Primary Author: Xueyang Hu

Additional Authors: ;Tian Liu

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: The high directionality of mmWave communication makes its line-of-sight (LoS) path susceptible to blockage when the user is moving. Most existing solutions have very stringent requirements on the antennas of the transmitter and the receiver, which are hardly met by today's consumer-level commercial off-the-shelf (COTS) mmWave products. In this research, we develop a new method to support high-resolution mmWave multi-path channel resolving based on coarse-grained wide-beam phased array antennas. We design a novel real-time beam-switching algorithm that allows COTS devices to estimate the location and reflection coefficient of the dominant reflectors. Whenever the current LoS is blocked, our algorithm can compute in real-time the best alternative beam direction based on estimated reflectors to establish a strong NLoS link. We implemented the proposed algorithm on a COTS mmWave device and evaluated the system's performance on the physical and transport layer. Our experiments demonstrate the effectiveness of our algorithm on estimating dominant reflectors and calculating strong alternative beam directions, and its efficacy in providing robust connections for COTS mmWave devices.

Title: Developing a delivery system for a novel anticancer agent against pancreatic ductal adenocarcinoma

Primary Author: Chung-Hui Huang

Additional Authors: ;Adam Keeton;Gary Piazza;Xi Chen

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Pancreatic cancer is the fourth major cause of cancer-related death in the U.S. Nearly 50% of patients are diagnosed with stage IV, after metastasis, and their average survival does not exceed six months. Further, only a limited percentage of patients are eligible for surgery, and conventional chemotherapies have a poor outcome for pancreatic cancer. Mutations in KRAS are the most common oncogenic mutations in pancreatic cancer. KRAS protein modulates intracellular signaling networks by alternating between guanosine triphosphate GTP-bound (activated) and guanosine diphosphate GDP-bound (inactivated) states at the inner membrane. Numerous studies have demonstrated RAS mutations function as a driver of cancer development, metastasis, and angiogenesis. This discovery has clearly marked the RAS proteins as an important drug target, and motivated the search among academics and pharmaceutical companies in the search for therapeutics which inhibit activated RAS. Unfortunately, because of the high-affinity association between RAS and GTP, these efforts have only yielded minimal success, with the recent approval of an inhibitor of the relatively rare KRAS-G12C mutant. ADT-007, a compound developed in our lab, has the potential to inhibit the growth of KRAS mutant pancreatic tumor cells, regardless of the specific mutation, with high potency and selectivity via a novel mechanism involving direct binding to the RAS nucleotide-free form. However, because ADT-007 is poorly water soluble (hydrophobic) and is susceptible to secondary metabolic inactivation (glucuronidation) after oral or intravenous administration, we are developing an ADT-007-nanoparticle formulation. The present study describes the synthesis, characterization and performance of top candidates for preclinical testing. It is predicted these nanoparticle formulations will not only increase the solubility and bioavailability of ADT-007, but also protect ADT-007 from metabolic inactivation.

Title: Bittersweet: The conceptual history and therapeutic effects of nostalgia

Primary Author: Keith Huffman

Additional Authors: ;

Department/Program: Counseling

College: College of Education

Abstract: A bittersweet and profoundly social emotion associated with fond reflections on cherished memories, nostalgia is a self, social, and existential-oriented resource. For instance, research has shown that nostalgia can boost self-esteem, foster social connectedness, promote identity continuity, and inspire meaning. Despite these and other highlights that have been documented by social and cognitive theorists, researchers in counselor education have yet to evaluate nostalgia's therapeutic value. To address this gap in the counselor education literature and encourage future studies on nostalgia within a professional counseling context, a research position paper was developed that explored nostalgia's conceptual history (i.e., a medical illness rooted in homesickness that has evolved into a universally recognized sentiment associated with romanticism and yearnings for the past), as well as nostalgia's cautionary considerations and positive effects (e.g., increasing empathy and helpfulness toward others). Additionally, an experimental study is being developed to investigate the effects of nostalgia (compared with ordinary memories) on compassion among counselors. Following randomization, participants will be prompted to reflect and briefly write about either a nostalgic or an ordinary memory. Afterward, participants will be asked to complete a survey on compassion. It will be hypothesized that counselors who undergo nostalgic inductions will endorse greater self-compassion and compassion toward others. This will be the first study on nostalgia to directly involve professional counselors as participants, findings of which can provide insight about how counselors may use nostalgia as a plausible therapeutic resource to enhance their compassion while connecting with clients, in addition to practicing effective self-care.

Title: Hostile attribution bias and oppositional behavior in adjudicated adolescents

Primary Author: Abby Hung

Additional Authors: ;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Adolescents adjudicated for illegal sexual behavior (AISBs) need informed, individualized measures evaluating risk factors to maximize successful rehabilitation in residential facilities. Amongst these factors, identification of antisocial behavior is central. Antisocial behavior has been found to significantly increase risk for recidivism, or sexual re-offending after release from treatment. However, further exploration is needed to understand underlying contributors of oppositional tendencies. General research on adolescent antisocial tendencies indicates association between aggressive behavior and hostile attribution bias (HAB). This social information processing model suggests that youth incorrectly read more hostility into benign social interactions, respond aggressively to the perceived threat, and often end up pulling more aggressive reactions from peers. Thus, the aim of the current study is to examine the relationship between the two factors in a sample ($n = 350$) of detained AISB. Archival data from a court-mandated treatment program were used in the current analysis. Oppositional defiance and antisocial behaviors were measured using the Millon Adolescent Clinical Inventory. Hostile attribution bias was measured using ratings from 10 social vignettes describing a benign, but accidental event among peers. Youth rated the proactive, reactive, and benign motives of the characters in the vignettes, as well as anger to provocation and overall hostile attribution bias. The overall model was significant, $F(5, 349) = 9.24$, $p < .001$. Each of the hostile attribution scales was a significant predictor of antisocial behaviors, except for the reactive motive scale. The anger to provocation scale to be the best predictor, but only accounted for only 3% of the overall variance. Results suggest the need for adequate measures of factors related to antisocial tendencies within the context of rehabilitative treatment of adjudicated adolescents.

Title: Developing spatially comprehensive reference aboveground biomass estimates and validation of spaceborne biomass products from the GEDI mission

Primary Author: Md. Mozahidul Islam

Additional Authors: ;Lana Narine

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Forest aboveground biomass (AGB) estimation is essential for understanding the status of a forest, and the ecological integrity of an area. While accurate AGB estimation is a challenge, recently available biomass products (L4A and L4B) from the Global Ecosystem Dynamics Investigation (GEDI) mission provide new opportunities for broad-scale biomass mapping. However, independent validation is still a critical step to understanding the utility of these products. Three national ecological observatory network (NEON) sites in Alabama, Florida and Georgia were selected for the evaluation of GEDI biomass data. Using up-to-date spatially comprehensive airborne lidar point cloud data and plot-based field surveys, reference biomass estimates were derived and mapped across the extent of each site using machine learning approaches. For each site, reference AGB estimates were generated for: i) trees >= 2.5cm dbh and ii) all trees and shrubs. Using these airborne lidar-derived products, comparisons with GEDI biomass data will facilitate an understanding of their potential and limitations, especially across sites with significant differences in terrain features, tree species and weather patterns.

Title: Algal turf scrubber community growth: a model

Primary Author: Ana Gabriela Itokazu Canzian da Silva

Additional Authors: ;David Blersch

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Algal Turf Scrubber (ATS) systems, which utilize filamentous algae for wastewater treatment, are a promising alternative or complement to traditional wastewater treatment processes. These systems are simple in design and function, with water flowing through an inclined flow lane where the algal community grows and removes nutrients from the wastewater. Despite their efficiency in large-scale applications, there is limited organized knowledge regarding the growth, competition, and dynamics of the species that comprise the periphytic community in these systems. To fully attain the potential of ATS systems for wastewater and water treatment, as well as for research purposes, it is crucial to develop a descriptive model that can be used for design and prediction. The model should account for the complex and dynamic interactions between hydraulic and biological factors, both within and outside the algal community, and the physical attachment of the algae to the surface in the flow lane. This project aims to start to address these challenges by developing a model that incorporates light-based effects in different strata of an ATS community, as well as a nutrient-based interaction model between two dominant genera of filamentous algae in this type of system, *Cladophora* sp. and *Stigeoclonium* sp. The model considers the competitive interaction between species, favoring the growth based on the available environmental conditions and with parameters established based on literature and laboratory experiments. In its simplicity, this model can incorporate more and other species, being limited to the need for more basic physiological data on filamentous algae. This model provides a first step towards a descriptive model of algal growth in an ATS system, to enable the use of ATS systems in wastewater and water treatment and as a research tool.

Title: Evaluating the effect of head removal during cervical dislocation on bird welfare

Primary Author: Ally Jackson

Additional Authors: ;Bethany Baker;Dianna Bourassa;Charlene Hanlon

Department/Program: Poultry Science

College: College of Agriculture

Abstract: The impact accidental head removal during euthanasia by cervical dislocation on welfare is currently unknown. To investigate this, time to insensibility and death was evaluated following head-removal during cervical dislocation. Over three trials, Broilers (n=180), 66 male and 114 female, were assigned to either cervical dislocation with head removal (HR) or a control treatment of only cervical dislocation (CD). For the HR treatment, birds were decapitated within 10 s post-CD to simulate HR. Broilers at 35, 44, or 50 days of age, with an average weight of 2.2, 2.8, and 3.7 kg, respectively were used. Responses recorded were time to loss of nictitating membrane reflex for time to insensibility, and time to total cessation of movement for time to death. Data were analyzed via two-way ANOVA for main effects of treatment and sex, with age as block effect (RCBD, PROC Mixed SAS 9.4). Data were (Log+1) transformed for normality. Differences were considered significant at $P \leq 0.05$. No effect of treatment, sex, or interaction was found for either the nictitating membrane reflex ($P = 0.91$, 0.21, and 0.86, respectively) or cessation of movement ($P = 0.65$, 0.07, and 0.10 respectively). Average time to loss of nictitating membrane reflex was 7 s for all treatments. Cessation of movement averaged at 150 s for HR and 159 s for CD. The range of time to loss of nictitating membrane reflex and cessation of movement over the three trials was 0 s to 60 s and 81 s to 258 s in HR then 0 s to 75 s and 93 s to 600 s in CD, respectively. In conclusion, head removal following cervical dislocation did not impact time to insensibility or death, suggesting that accidental head removal following broiler euthanasia via cervical dislocation does not affect the welfare of the bird.

Title: Sea urchin larvae exhibit organism-wide changes in gene expression in response to bacterial infection

Primary Author: Chandler Jacobs

Additional Authors: ;Katherine Buckley;Amelia Williams;Emily Wilkins;Tyler Smith

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: As invertebrate deuterostomes, echinoderms can provide an important evolutionary perspective on understanding animal immunity. Although these organisms lack adaptive immunity, there are notable similarities between echinoderm immune responses and vertebrate innate immunity. The larval stage of the purple sea urchin (*Strongylocentrotus purpuratus*) provides a morphologically simple, transparent system in which to study these immune responses. Because of this transparency, hybridization chain reaction (HCR) is an efficient method to localize transcript expression. Using previously collected transcriptome data, candidate genes were selected that displayed highly variable expression levels in larvae responding to infection with the marine bacterium (*Vibrio diazotrophicus*). To determine where these genes are expressed, we designed probes and performed HCR. Detailed characterization of how important immune genes are expressed during infection with can shed light on fundamental aspects on how this sophisticated system-wide network is regulated.

Title: Assessing Lycium Barbarum Polysaccharide as a therapeutic treatment for Duchenne muscular Dystrophy

Primary Author: Peyton Jacobs

Additional Authors: Muralikrishnan Dhanasekaran

Department/Program: Biomedical Sciences

College: College of Science and Mathematics, Harrison School of Pharmacy

Abstract: Duchenne muscular dystrophy is a deadly disease that affects mostly men and some women. It is a genetic disease that disrupts the production of dystrophin, a protein that is essential to keeping skeletal muscles strong. Without dystrophin, the muscles break down and die. Most patients lose their ability to walk while young, and the disease eventually becomes deadly when it progresses to the point of harming the respiratory and circulatory systems and their associated skeletal muscles. There is no complete cure for Duchenne muscular dystrophy, and there are limited treatments. Treatments for the diseases include exon-skipping therapy, injections of corticosteroids, and physical therapy. Lycium barbarum is a berry plant that grows in East Asia, particularly in China, Korea, and Japan. It has been used as a medicine in Traditional Chinese Medicine for around 2000 years, and has a number of medicinal uses attributed to it. Today, research shows it has antioxidant properties, aids the immune system, and more. Most of these properties are attributed to Lycium barbarum polysaccharide (LBP) found in the plant. A previous study conducted by a group of researchers from the Chinese Academy of Science has found that an extract made from Lycium barbarum increased the proportion of type IIa oxidative muscle fibers in rat muscle, which in turn increased muscle endurance. This effect was attributed to LBP. The study included that this was done by the activation of ERRγ, with the PKA-CREB signaling pathway being involved in the activation. Because of its mechanism of building muscle fibers, LBP may be able to be used as a therapeutic treatment for the muscle degeneration that results from Duchenne muscular dystrophy.

Title: What do Auburn students know and think about groundwater?

Primary Author: Charlotte Jannach

Additional Authors: ;Ann Ojeda

Department/Program: Geology

College: College of Science and Mathematics

Abstract: Groundwater is the main source of freshwater consumption for approximately 40% of the United States' population and closer to 50% worldwide (American Geoscience Institute, 2017). As the demand for freshwater increases, so does the need for protection and management of groundwater resources. Despite its importance, there are many misconceptions or inaccuracies about groundwater in the public. A critical aspect to improve groundwater management is to quantify groundwater knowledge within a target population and understanding what factors affect this knowledge. Our study goal was to understand the relationship between groundwater knowledge and 1) water quality perceptions, 2) student's field study, and 3) demographic factors. We designed and implemented a survey to quantify student's groundwater knowledge through a groundwater concept inventory. Each student's perception of water quality was measured using a Likert scale and factors of risk and worry about water contamination and control over water quality were extracted. Demographic information such gender, race, residential type, major, career path was also recorded. The survey data was analyzed using t-tests to compare between groups with the significance value at $\alpha=0.05$. Ultimately, this work can help to better understand the level of student understanding of groundwater that, in turn, can help to develop strategies to fill gaps in understanding and supplement groundwater management practices.

Title: Computational analysis of 3D printed plain weave fabric structures

Primary Author: Ajay Jayswal

Additional Authors: ;Russell Mailen;Jia Liu;Gregory Harris;Midhan Siwakoti;Sabit Adanur

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Additive manufacturing of fabrics is an emerging research topic with potential applications in wearable fabrics and fashion industries which require high mechanical strength and can often be exposed to varying temperatures depending on the necessity. Therefore, thermal, mechanical, and viscoelastic properties of such fabrics need to be determined. In this research, the thermo-mechanical behavior of additively manufactured plain weave fabrics at and above glass transition temperature (T_g) is studied. The time-dependent mechanical response using a viscoelastic material model is represented by a Prony series as a function of frequency (f). Unit cells of plain weave fabrics are additively manufactured using poly(lactic) acid (PLA). Tensile and compression tests were performed on unit cells in a thermal environment using dynamic mechanical analysis (DMA). A multi-physics finite element model is implemented to duplicate the experimental setup. The experimental results are compared with that of computational results. The error percentages in the peak forces are 23.60% at 60 ℃, −8.85 % at 65 ℃, and –6.25 % at 70 ℃. A better agreement in peak forces is seen for unit cells above T_g. The computational model developed for unit cells is used to predict the thermo-mechanical-viscoelastic response of large additively manufactured fabric structures which is difficult to evaluate experimentally.

Title: Immunoproteasome inhibitors for the treatment of ALL driven by the t(4;11) translocation

Primary Author: Tyler Jenkins

Additional Authors: Steven N. Fiering;Amit Mitra;Elise Fitzgerald;Alexei Kisselev;Peter Panizzi

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The t(4;11)(q21;q23) chromosomal translocation that creates the MLL-AF4 fusion protein, confers a poor prognosis in infant acute lymphoblastic leukemia (ALL). This translocation also sensitizes cells to proteasome inhibitors bortezomib and carfilzomib, which are approved by the FDA for the treatment of multiple myeloma. Clinical activity of bortezomib in combination with standard chemotherapy has been documented in several clinical trials of ALL patients, and a case of a single-agent activity against relapsed leukemia driven by the MLL-AF4 translocation has been described. However, the clinical effectiveness of PIs is limited by toxicities caused by inhibition of the proteasome in non-lymphoid tissues. We found that the overwhelming majority of proteasomes in this subtype of ALL are lymphoid tissue specific immunoproteasomes. Cell lines with MLL-AF4 translocations were highly sensitive to pharmacologically relevant concentrations of specific immunoproteasome inhibitors ONX-0914 and M3258. Furthermore, both compounds dramatically delayed growth of orthotopic xenograft tumors in mice. Combining bortezomib with selective immunoproteasome inhibitors leads to increased sensitivity and should increase inhibition of proteasomes in ALL cells without increasing toxicities associated with inhibition of proteasomes in non-lymphoid tissues. Thus, immunoproteasomes are therapeutic targets in ALL.

Title: Influence of dietary sodium and potassium on ambulatory blood pressure in healthy young adults

Primary Author: Soolim Jeong

Additional Authors: Jordan Kinnel;

Department/Program: Kinesiology

College: College of Education

Abstract: Dietary sodium (Na+) elevates blood pressure (BP) and blunts nocturnal BP dipping, which is prognostic of future target organ damage and adverse cardiovascular outcomes. Dietary potassium (K+) is associated with reduced BP, and Na+/K+ ratio appears to be more strongly associated with elevated BP than Na+ or K+ alone in young adults with hypertension. However, the association of Na+/K+ ratio on ambulatory BP remains unclear. Therefore, we assessed associations between dietary Na+ indexed to K+ and ambulatory BP in young adults. Sixty-two participants were included in the current analysis. Participants completed a food and fluid log for at least two weekdays and one weekend day. Participants wore a 24-hour ambulatory BP monitor with the brachial cuff on their left arm that measured BP during awake and asleep hours. Primary BP outcomes were average awake and asleep systolic BP (SBP) and diastolic BP (DBP), and SBP and DBP dipping. Associations between electrolyte and BP variables were evaluated partial correlations controlled for sex, BMI, and race all expressed as Spearman's Rho ($\alpha \leq 0.05$). When controlling for sex and BMI, dietary Na+ was associated with awake SBP and asleep SBP but not BP dipping. When controlling for sex and BMI, dietary K+ was not associated with awake SBP, asleep SBP, or BP dipping ratios. Dietary Na+/K+ ratio was not associated with awake BP, asleep BP, asleep BP dip, or dip ratios. When controlling for race, in addition to sex and BMI, associations between dietary Na+ with awake SBP and asleep SBP remained. However, no association was observed between dietary K+ with asleep SBP, but there was a trend for awake SBP. No associations between dietary Na+/K+ ratio with awake BP, asleep BP, BP dipping, or dip ratios were observed. These preliminary findings suggest that dietary Na+ is associated with 24-hour BP but not nocturnal BP dipping in a diverse sample of young adults. Dietary Na+/K+ ratio was not associated with 24-hour BP or nocturnal BP dipping.

Title: Battle of the sexes: the effects of incubation temperatures and hypoxia on sex ratios in zebra finch embryos

Primary Author: Alexa Johnsen

Additional Authors: ;Wonil Choi;Haruka Wada;Madeline Choi

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: Hypoxia is a physiological stress where an organism is exposed to an environment with inadequate levels of oxygen. Hypoxic conditions can cause a plethora of disturbances, such as a deterioration of cells and organ function, disruption of neurogenesis, and increased mortality. Embryos can experience hypoxia due to abnormally high temperatures and depletion of oxygen throughout incubation. Previous studies have shown that during the incubation period in avian species, suboptimal temperatures can alter the sex ratio, resulting in a male-biased sex ratio in finches and ducks. This experiment tested the combined effects of hypoxia and suboptimal temperatures during the incubation of *Taeniopygia castanotis* (zebra finches). A 2x2 factorial design was implemented in which half of the eggs received a beeswax coating, while the other half served as the control group. They were artificially incubated in either optimal (37.4°C) or high (38.9°C) temperatures. Previous work has shown that the combined effect of beeswax and high incubation temperatures increased the mortality rate in embryos. We used PCR amplification from embryonic tissue to determine offspring sex from zebra finch Z and W chromosomes. We hypothesize that male embryos are more tolerant to stressors experienced during incubation. We specifically predicted that the group that is exposed to both high incubation temperatures and hypoxia will yield the most extreme male-biased sex ratio. Our initial findings do not suggest any significance in sex biases in eggs that were incubated in 37.4°C, regardless of wax treatment. When eggs experienced only the high incubation temperature, we observed more male-biased hatching success. On the other hand, when both high incubation temperature and wax treatment were applied, we observed more female-biased hatching success. As seen in previous studies, males seem to be more tolerant to heat stress, but this may not be the case when they are exposed to enhanced hypoxia.

Title: Differentiation between yellow foxtail (*Setaria pumilla*) and knotroot foxtail (*Setaria parviflora*) via morphological characteristics and genetic markers

Primary Author: Mikerly Mistral Joseph

Additional Authors: ;Jinesh Patel;Scott McElroy

Department/Program: Crop, Soil, and Environmental Sciences

College: College of Agriculture

Abstract: Weeds are primarily identified through morphological characteristics. Nevertheless, weed identification using morphological aspects requires botanical expertise and is time-consuming since there can be slight differences between species. *Setaria pumila* (Poir.) Roem. & Schult. (1817) and *Setaria parviflora* (Poir.) Kerguelen, respectively known as yellow and knotroot foxtail, are two problematic weed species that share morphological similarities and are often misidentified. Yellow and knotroot foxtail have phenotypic plasticity inter and intra-species, which can bias their identification. The criteria to differentiate those two species, such as the seedhead and rhizomes appears late in the growth stage, long after identification is required for herbicide management. Nucleic acids, DNA or RNA, are obvious options for identifying yellow and knotroot foxtail across biological systems beyond physical or digital identification. Research was conducted in the herbicide resistance diagnostics laboratory at Auburn University in Alabama to differentiate yellow and knotroot foxtail beyond morphological characteristics using DNA barcoding. Twenty biotypes for each species were identified in Alabama using seedhead size, ligule size, and the presence of rhizomes. The presence of Rhizomes was confirmed in knotroot foxtail, making this characteristic a major morphological difference. DNA for each biotype was isolated from the leaves and amplified using polymerase chain reaction (PCR) with primers targeting trnH-psbA and ITS regions. Sanger sequencing results demonstrate the presence of different single nucleotide polymorphisms in the sequenced regions that can differentiate yellow and knotroot foxtail. Some biotypes initially identified as knotroot foxtail were later correctly identified as yellow foxtail by DNA barcoding. This study demonstrated that applying these DNA barcodes is relevant in accurately identifying foxtail species at an early stage and thus helps effectively manage them using proper herbicide selection.

Title: Development of macrophage-tumor fusion model

Authors: Juan Rodriguez

Additional Authors: Samantha Mejia; Aleah Wilson

Department: Department of Biology and Environmental Science

College/School: College of Sciences, Auburn University at Montgomery.

Abstract:
Metastatic disease is the cause of mortality in 90% of solid tumors, yet the underlying mechanisms whereby a cancer cell from a primary tumor travels to and colonizes a distant site has not yet been fully elucidated. While cell-cell fusion occurs as a normal and essential cellular process, aberrant cell fusion has been linked to disease including metastatic cancer. The cell fusion hypothesis was first put forward over 100 years ago by Professor Otto Aichel, a German pathologist, and has gained traction in recent years. The central tenet is that the fusion of tumor cells with bone marrow derived cells (BMDCs) may enhance the metastatic potential of the tumor cells due to changes in the gene expression pattern in the fused cell resulting from the addition of the BMDC nucleus, thus generating cells that are both motile and capable of continuous cell division. While the hypothesis above provides a compelling theory for macrophage tumor fusions as potentiators of metastatic disease, still much remains unknown about the post-hybridization gene activation driving events leading to this phenotype. The mechanisms by which hybrid cells activate genes that enhance cell migration remains unresolved, and has been identified as an important area for investigation as a potential target for therapy. In order to conduct these investigations, it is necessary to first establish a model that can be utilized to conduct further investigations. Using the macrophage cell line RAW264.7, transfected to express GFP (RAW-GFP) and polarized to an M2 phenotype, and the colorectal cancer cell line HT-29 transfected to express RFP (HT-29 RFP) and subjected to hypoxia, this recreates conditions of the tumor microenvironment in which to generate cancer-macrophage fusion hybrids. Once the hybrids are established, we will then have a model in which to compare the phenotype and function of these cells to the parental tumor cells, HT-29 RFP.

Title: Obesity and Type 2 diabetes accelerates skeletal muscle atrophy and NGF Ameliorates muscle regeneration

Primary Author: Lauren Jun

Additional Authors: ;Ramesh Jeganathan;Megan Robinson;Xiaowen Ding;Hassan Ali H Jafari

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: The skeletal muscle is the largest organ of the body with many essential functions. Because of its role in nutrient metabolism and the production of biological factors collectively known as myokines, skeletal muscle is important for the prevention of obesity and type 2 diabetes (T2DM). Recent studies have linked obesity and T2DM with skeletal muscle loss and dysfunction. Skeletal muscle atrophy, characterized by loss of skeletal muscle mass and its function, occurs when there is a greater rate of muscle degeneration than the rate of muscle regeneration or protein synthesis. Importantly, a Western-style diet that is high in fat and sugar, has been the leading cause of obesity and T2DM. We hypothesized that obesity and diabetes accelerate muscle atrophy by activating myostatin and upregulating proteins involved in ubiquitination and macroautophagy. We also hypothesized that Nerve Growth Factor (NGF) ameliorates muscle atrophy through phosphorylation of protein kinase B (Akt) and extracellular signal-related kinases 1 and 2 (ERK1/2) and thereby upregulating cell cycling and regeneration and muscle fibers. Male C57BL/6N mice were fed a control diet or a high-fat, high-sucrose (HFHS) diet with or without NGF treatment for 13 weeks. In gastrocnemius muscles of the HFHS mice, increased expressions of myostatin, autophagy markers, and ubiquitin ligases were observed. Although NGF treatment did not reduce these expressions, NGF was shown to ameliorate regeneration through upregulating CyclinD1. In summary, the HFHS diet increases muscle atrophy through upregulating myostatin level and subsequent autophagy and ubiquitination, and NGF treatment improves muscle regeneration by enhancing the cell cycling process.

Title: Connecting mind of Generation Z to the environmental issue: Communication strategies to increase participation of sustainable environmental campaign

Primary Author: Jonghyun Jung

Additional Authors: ;Kiwan Nam;Esther Kim

Department/Program: Computer Science

College: College of Engineering

Abstract: Many greenwashing corporations (Represented by the diverse corporations' ideas of greenwashing) have been recognized for providing environmental social responsibility. In order to increase the effective reputation of the corporation, they launch a Corporate Social Responsibility campaign that appeases individuals' ethical demands. Generation Z is acknowledged for being highly aware of environmental impacts that reflect views on social issues; and adapting how to utilize the web and access to social media. Recently, there have been cases where corporations demonstrated environmental social responsibility, however, resulting in "greenwashing". The current study aims to find communication strategies for environmental CSR communication targeting college students. Starbucks, for example, focuses on green marketing, disseminating green ideas on social media messaging sharing, and developing students' green consumption habits. Students' willingness to purchase green products is an essential expression of their participation in environmental improvement. Based on students' awareness of environmental CSR, the research proves diverse strategies for satisfying the groups with the engagements. Using an experimental study targeting college students, this data conducts an online experimental study with a 'Framing: Gain vs. Loss', and 'Motivation Direction: Altruism vs. Egoism.' The integration between framing theory and motivational direction is demonstrated by the online experimental conducted that occur afterward. Gain and loss constitute components of framing theory, whereas "Altruism" and "Egoism" are the consistent directions of motivation. Each component of the segments contributes different aspects of how targeting college students are responding to different levels of awareness of environmental CSR. The results of this experiment will propose active, aware, latent, and non-publics on the environmental CSR on campus, providing communication strategies.

Title: An investigation of the sweep effect on corrugated wings at low Reynolds numbers

Primary Author: Josh Kacmarzyk

Additional Authors: Zaeem Shabbir;Syed Hassan Raza Shah

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: Low-speed aerodynamics differ significantly from conventional flight regimes because of increasing viscous effects. Nature utilizes corrugated or pleated airfoils to exhibit better aerodynamic performance and higher maneuverability. Every insect species has its peculiar corrugation shape. The conventional smooth profiled airfoil exhibits poor aerodynamic performance when utilized for low-speed applications such as Micro Air Vehicles (MAV). The present research investigates the aerodynamic performance of corrugated airfoils for Micro Air Vehicles applications with a focus on wing sweep to have a flying wing configuration to meet design and mission requirements. The interaction between the corrugation profile and increasing sweep effect was investigated through wind tunnel testing and qualitative dye flow visualization. The results show that corrugated wing aerodynamics is insensitive to changes in speed and has a higher lift and lower drag as compared to profiled airfoils. The trapped vortices inside the corrugation valleys helped attach the flow and reduce drag. The introduction of sweep further helps to increase maximum lift and stall angle. Furthermore, two distinct regions were identified: outer flow and flow trapped in the corrugations. It was concluded that higher angles of sweep proved more beneficial for low-speed flight due to increased steadiness and more favorable near-stall characteristics.

Title: Novel selective PPARγ agonist hydrogel for the management of peridontitis

Primary Author: Xuejia Kang

Additional Authors: guihua chen;Jeff Huang;Chuanyu Wang;Jayachandra Ramapuram;Ian Steinke;Rajesh Amin;Bart Prorok;Pengyu Chen;Andrii Shmatok;Huifei Zheng;Alana MacLachlan;Siqi Wu

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: During periodontitis, accumulated bacterium produces lipopolysaccharide (LPS) that activates the macrophage via nuclear factor-kappa B (NF-Kb) pathway. The activated macrophage produces proinflammatory cytokines, which is involved in and accelerates the host immune response, including the generation of reactive oxygen species and pro-inflammatory factors. After which the alveolar bone homeostasis were disturbed and indicated by the increase of osteoclast and decrease of osteoblast. To manage periodontitis, we designed a novel PPAR r agonist compound (AU9) to inhibit the activation of NF-kb. Also, to effectively apply it in the clinical usage, we used a local ROS-scavenge carrier- hydrogel to deliver AU9. The AU9 hydrogel exhibited promising effects in eliminating ROS and curbing the proinflammatory factors and, consequently, the regulation of osteoclast and osteoblast were successfully achieved. Taken the effects together, our AU9 hydrogel shows potential for the treatment of periodontitis.

Title: Detection and characterization of bacteria in surface water using LC-IM-MS/MS

Primary Author: Kimberly Kartowikromo

Additional Authors: ;Orobola Olajide;Ahmed Hamid

Department/Program: Chemistry

College: College of Science and Mathematics

Abstract: Waterborne pathogens are dangerous to human health. One of the waterborne pathogens of public health concern is E. coli, an organism that is used as an indicator for the general microbiological quality of water. In this project, phospholipids in E. coli have been studied using liquid chromatography ion mobility mass spectrometry (LC-IM-MS/MS) to semi-quantify E. coli in creek water. In addition, paper spray (PS)-IM-MS was performed as a method to rapidly detect E. coli in water. Within six hours, water from a creek near the Auburn University campus was analyzed using an enrichment process. The optical density (600 nm) was obtained and converted into CFU/mL. The phospholipids in bacteria were detected without an extraction method using liquid chromatography (LC) as well as the paper spray method, which has an advantage in terms of rapid analysis. However, direct analysis of bacteria using LC led to a clogged column. In addition, using a membrane filter for PS-IM-MS also shows promising results compared to glass fiber. A preliminary study showed that incorporating IM into the PS-MS/MS workflow on the discrimination of E. coli strains can provide rapid detection and accurate discrimination in less than two minutes, making it an effective tool. In the positive ionization mode, multiple IM peaks were visible for the sodiated adduct, while tandem MS showed similar spectra for the different E. coli strains. However, in the negative mode, the deprotonated adduct, E. coli strains were distinguishable using the tandem MS spectra while the IM showed a single peak. In addition, a comparison between the experimental CCS and the theoretical CCS resulted in an error below 1% but also gave confirmation of the different conformers in the strains. Therefore, LC-IM-MS/MS can provide sensitive detection and accurate identification of E. coli present in surface water, while PS-IM-MS/MS allows rapid detection.

Title: Analyzing the genomic variations in the pathogenic population under host genotype x environment x pathogen interactions

Primary Author: Amanpreet Kaur

Additional Authors: ;Ivory Russell;Neha Potnis

Department/Program: Entomology and Plant Pathology

College: College of Agriculture

Abstract: Climate change accompanied by changes associated with modern agricultural practices has presented a threat of emerging novel pathogen lineages capable of compromising host resistance or expanding their host range. Here, we investigated how the pathogen population would adapt when challenged with resistant cultivar and when presented with altered climatic conditions during a single growing season. Using open-top chambers, we tested the influence of altered ozone levels on plant disease development and pathogen evolution under otherwise natural field conditions using X*anthomonas perforans*, a causal agent of bacterial leaf spot disease on resistant and susceptible pepper cultivars. We observed significantly higher disease severity, but with more variations, under combined stress compared to the ambient conditions. This led us to hypothesize that pathogen populations under combined stress adapt by accommodating higher plasticity. This altered plasticity would reflect in altered ecological interactions among pathogen genotypes and overall pathogen diversity at the genomic level reflected in accessory genes or mutations in core genes. Our data revealed that there was high strain turnover in the pathogen community under combined stress by the end season, accompanied by high and variable nucleotide diversity and higher mutation rates in contrast to the individual stresses. The pathogen population under combined stress experienced an overall reduction in certain high-cost effector genes. It showed a high degree of flux in dispensable genes indicative of pathogen adaptation to possibly limit the fitness constraints. In addition, signatures of parallel evolution with positive selection of different alleles at high frequency were observed in the pathogen gene pool under combined stress. Together, increased ecological and evolutionary plasticity in the pathogen population was observed during adaptation of the pathogen to the resistant cultivar in a single growing season under altered climatic conditions, indicating the need to further examine outcomes of this plasticity.

Title: Evaluation of selected commercial peanut cultivars under varying fungicide inputs for leaf spot control

Primary Author: Livleen Kaur

Additional Authors: ;Amanda Strayer-Scherer;Howard Campbell;Christopher Parker;Brad Miller

Department/Program: Entomology and Plant Pathology

College: College of Agriculture

Abstract: Early leaf spot (*Passalora arachidicola)* and late leaf spot (*Nothopassalora personata)* are destructive, foliar fungal diseases of peanuts in Alabama, which can cause up to 50% yield losses. These diseases can be managed by using host tolerance and fungicide applications. The goal of this study was to assess the susceptibility of selected commercial peanut cultivars to leaf spot diseases under the influence of two fungicide spray programs. Experiments were conducted at two locations (WGREC in Headland, AL and BARU in Brewton, AL) in a split plot design with twelve peanut cultivars: TUF 297, TUF 511, FloRun 331, GA-06G, GA-09B, GA-12Y, GA-14N, GA-16HO, GA-18RU, GA-20VHO, TifNVHiOL, and AU-NPL 17 as the main plot and two fungicide treatments: low input (7 applications of Bravo WS @ 24.0 fl oz/A), and high input (Bravo WS @ 24.0 fl oz/A, Priaxor @ 6 fl oz, Provysol @ 5.0 fl oz + Convoy @ 32.0 fl oz, Priaxor @ 8 fl oz) along with nontreated control as the subplot. At BARU and WGREC, both the spray programs significantly reduced leaf spot severity when compared to the nontreated control. There was no significant difference among varieties and spray programs at WGREC. At BARU, the low input spray program had better control of leaf spot as compared to the high input spray program. GA-12Y and GA-14N with low input spray program performed best among all the treatments. These results demonstrate the importance of fungicides in managing leaf spot diseases in peanuts.

Title: Effect of cover crops on X-Ray computed tomography derived soil pore characteristics

Primary Author: Preetika Kaur

Additional Authors: Thomas R. Way;Jasmeet Lamba;Vishawjot Sandhu;Kipling Balkcom

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Cover crops and conservation tillage have been used as effective soil management practices that enhance soil health. However, these practices can create connected pore networks which can cause preferential transport of contaminants to the groundwater or surface water via subsurface flow pathways. The main objective of this study was to compare the effect of cover crops on the pore size, shape, and connectivity distribution in the soil profile. The study was conducted in at EV Smith Research Center, Shorter, Alabama. Two varieties of cover crops were mixed namely Cereal rye (*Secale cereale*) and Crimson Clover (*Trifolium incarnatum*) and planted in late fall and the main crop growing on the field was cotton (*Gossypium*). Six replicates of intact undisturbed soil cores (150 mm diameter and 500 mm deep) were collected, and all the soil samples were then subjected to non-invasive computed tomography scanning which gave images of 0.35mm resolution. The high resolution images were analyzed in Image-J to get basic pore statistics such as pore area, pore number and pore volume from which all the soil pore characteristics such as porosity, pore number density, surface area density, circularity, tortuosity, interconnectivity, euler number density, and connection probability were derived. Results on comparison of pore characteristics as a function of treatments showed that the soil columns under cover crops had comparatively higher values of porosity and pore number density for the top 100 mm of the soil. Pore geometry metrics such as tortuosity did not show any significant differences among the treatments. Connectivity metrics such as connection probability and euler number density had significant differences for the subsurface depth i.e., 0-200 mm. Significant correlations were observed also observed between CT derived pore characteristics and root characteristics from which it can be inferred that cover crop roots influenced the X-Ray CT derived pore properties.

Title: Investigating the Effects of Reactive Oxygen Species Using Microfluidics on Confined Cell Motility

Primary Author: Collins Keith

Additional Authors: ;Farnaz Hemmati;Farshad Amiri;Panagiotis Mistriotis

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: In the normal progression of cancer, the establishment of secondary tumor sites in the patient's body, or metastasis, is associated with lower survival rates and treatment efficacy. This transition, incited by the detachment of cancer cells from the primary tumor site, sees cells move through confined spaces: channel-like tracks that vary from 3-30 micrometers in width. Understanding the mechanisms of a cancer cell's movement from a primary tumor through these small passages in our tissues and blood vessels is critical to improve the efficacy of patient treatment. How cells sense and respond to confinement is not well understood. Reactive Oxygen Species (ROS), a class of molecules associated with cellular respiration, can cause DNA damage in excess with profound consequences on genomic integrity. Although ROS levels increase in confinement, the impact of this increase on the modes and mechanisms of confined cell migration remains unclear. To address this gap in knowledge, human fibrosarcoma cells, and human dermal fibroblasts were seeded into polydimethylsiloxane-based microfluidic devices, consisting of arrayed, parallel channels with a fixed length and width (200 µm and 10 µm) and a variable height of 3 or 10 µm (confined/unconfined). N-acetylcysteine (NAC) in 10 µM was used to inhibit ROS. Time-lapse microscopy was used to image cells on an inverted Nikon Ti-2 microscope. Images were taken of cell migration, after fixing and staining of cells to visualize actin polarization and nuclear integrity, and ROS localization. Results were analyzed using ImageJ and MATLAB. Our results revealed that inhibition of ROS increased cellular migration speeds and markedly suppressed membrane bleb formation, causing cells to preferentially exhibit protrusive-based migration phenotypes. This was observed in confined but not unconfined channels. Furthermore, treatment with NAC reduced the extent of nuclear blebbing, suggesting that ROS promotes nuclear deformation and presumably nuclear envelope rupture which may have detrimental effects on cell survival.

Title: Categorizing collegiate softball athletes according to speed or power

Primary Author: Caroline Keller

Additional Authors: ;

Department/Program: Kinesiology

College: College of Education

Abstract: Speed and power are two categories that athletes can be assigned to when undertaking athletic activities. By identifying if individuals are speed or power athletes, coaches and athletic trainers can establish areas of strength or weakness and facilitate performance enhancement. The vertical jump is widely used for determining power capabilities, yet to the authors' knowledge, it has not been used for this purpose. Therefore, this study aimed to categorize collegiate softball athletes into either speed or power groups using the vertical jump. Seventeen NCAA Division I softball players were recruited (1.73 ± 0.05 m; 76.7 ± 10.8 kg; 19 ± 1 y). Participants performed two vertical jumps, with hands on hips (countermovement permitted) on a force platform (Bertec, OH, USA) sampling at 1200Hz. Using SPSS statistical software, a Pearson's R correlation analysis was performed on 5 variables: duration (bottom of squat - take-off), depth (% standing height), force (vGRF), relative force (vGRF%BM), and mass. Mass significantly correlated with vGRF ($r = .853$, $p < .001$), duration was significantly correlated with both vGRF%BM and jump depth ($r = -.564$, $p = .018$; $r = .592$, $p = .012$), and jump depth was significantly correlated with vGRF%BM ($r = -.482$, $p = .05$). Two additional correlations were identified (mass & duration: $r = .365$; mass and vGRF%BM: $r = -.322$); however, these were not significant ($p > .05$). Collegiate softball players could not be categorized as speed or power athletes. These findings suggest that although heavier individuals produce more force, they do so more slowly. Additionally, heavier individuals appear to produce less force relative to their body mass. Thus, one could argue that within this population, lighter individuals could be considered more power athletes than those who produce more absolute force. Since power is a measure of force over time, it might be more beneficial to instead categorize individuals as either force or velocity athletes.

Title: Production of biofuels from blends of biomass and waste plastics

Primary Author: Ayden Kemp

Additional Authors: ;Sushil Adhikari

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: In 2021, more than 40 million tons of plastic was produced in the United States of America. 34 million tons of which was not recycled, which marks a massive loss of energy and valuable material from our society. The stored energy in waste plastic can be reclaimed through either recycling or through various thermochemical processes, such as pyrolysis, which splits plastic polymers into small, high-energy molecules. Although some research has been conducted to determine the effectiveness of plastic pyrolysis, little is known about the possible synergic effects of blending waste plastics with biomass, which is a common feedstock for pyrolysis. It is hypothesized that blends of biomass and waste plastics will exhibit positive synergic effects resulting in an increased yield of pyrolysis oil and a higher heating value of pyrolysis oil than biomass or waste plastic will produce individually. As part of this thermogravimetric analysis will be performed on ground pine, polystyrene and 5 blends of pine and polystyrene (10% PS, 20% PS, 30% PS, 40% PS, and 50% PS) to determine the amount of solid ash produced by each blend and the optimum temperature for fast pyrolysis. Each of the seven feedstock blends will undergo fast pyrolysis at optimum temperature and the solid, liquid, and gaseous products by mass percent will be calculated. The produced pyrolysis oils will be analyzed to determine the heating value, moisture content, and chemical composition of each oil. The results will be analyzed to determine whether it is more efficient to pyrolyze the pine feedstock and plastic feedstock separately or whether the possible synergic effects of the pine and plastic blends will produce pyrolysis oil with a higher heating value. To determine this, both the percent yield of the oil and the heating value of that oil will be considered. These findings will determine the future of plastic waste management and energy production.

Title: Influence of avian reovirus infection on the intestinal microbiome

Primary Author: Zubair Khalid

Additional Authors: Erfan Chowdhury;Andrea Pietruska;Ruediger Hauck

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Avian reovirus (ARV) has been associated with runting-stunting/malabsorption syndrome. It is likely that the disturbance of the intestinal function affects the microbiota, potentially aggravating the disease. However, the impact of an ARV infection on the host microbiome composition has not been investigated. Herein, we report for the first time how an experimental ARV infection influences the intestinal microbiome of chickens in a dose-, strain-, and time-dependent manner. Seven-day-old specific-pathogen-free chickens were inoculated with 104 or 106 TCID50 of either an ARV field isolate or S1133 strain. Jejunal content was sampled from ten individuals before inoculation and seven individuals per group 7, 21, and 35days post-inoculation. The intestinal microbiome was investigated by 16S rRNA next-generation amplicon sequencing and analyzed using the Qiime2 pipeline and R-Studio. The alpha-diversity metrics including Shannon and Faith's phylogenic diversity indices revealed significant reduction in the richness of microbial communities among the ARV-inoculated groups compared to the negative control. Moreover, strain- and time-dependent distinct clustering patterns were observed on the emperor plots generated using Principal Co-ordinate Analysis. Similarly, Bray-Curtis and UniFrac distances revealed significantly differing beta-diversity among the groups at different sampling timepoints. A compositional analysis of relative abundance indicated differential enrichment of certain genera, such as *Lactobacillus* and *Escherichia-Shigella*, among the inoculated chickens. In addition, body weights of the infected chickens and their intestinal crypt depth and crypt width obtained using histomorphometry were correlated with the abundance of microbial genera. Conclusively, ARV inoculation induced time, strain- and dose-dependent alterations in the alpha- and beta-diversity of bacterial populations in the host intestine.

Title: Impact of Pharmacist-Led Interventions on Medication-Related Outcomes Among Cancer Patients: A Systematic Review

Primary Author: Asmita Priyadarshini Khatiwada

Additional Authors: ;Jingjing Qian;Ahmed Mostafa Ahmed Kamel

Department/Program: HORP

College: School of Pharmacy

Abstract: Toxicity associated with anticancer therapy highlights the importance of medication management for cancer patients. Research has demonstrated the effect of a pharmacist-led intervention on different medication-related outcomes in cancer patients in different settings. A systematic search of published research articles on Ovid MEDLINE, Embase, PsycInfo, and International Pharmaceutical Abstracts was conducted from inception till November 3, 2022 to synthesize existing evidence on the types and impact of pharmacist-led interventions on medication-related outcomes in cancer patient. Original articles, randomized clinical trials, and quasi-experimental studies assessing pharmacist-led interventions on medication-related outcomes in cancer patients in any setting were included. Among a total of 1937 records, 92 were included for full-text review after title and abstract screening, 12 articles eligible to be included in this review. Most of the studies (n=6) were conducted in oncology units of hospitals, and others in outpatient oncology clinics (n=2), hospital pharmacy (n=1), university pharmacy (n=1), and cancer center (n=1) and lung disease clinic (n=1). The common intervention approaches were patient education (n=6), medication review (n=6), patient counseling (n=3), and face-to-face consultations (n=2), with some studies involving more than one type of interventions. The medication-related outcomes observed in included studies were medication adherence (n=7), appropriateness (n=2), reconciliation (n=1), interaction (n=1), and adverse events (n=1). Pharmacist-led interventions showed a significant improvement in adherence rates in the intervention group in most studies (6 out of 7) and in studies assessing appropriateness, a significant decrease in adapted medication adherence index (aMAI) score (7.3 ± 6.1 to 5.4 ± 4.7, $p<0.001$) and adverse drug event (ADE) score (4 to 2, $p=0.023$) were observed. The involvement of pharmacists as part of a multidisciplinary team in patient care and medication management for cancer patients has improved medication-related outcomes.

Title: High-Performance Liquid Chromatography (HPLC) method development for quantification of Capsaicin in implant

Primary Author: Haley Kim

Additional Authors: ;Manjusha Annaji;Nur Mita;Jayachandra Ramapuram;Ishwor Poudel

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: High-Performance Liquid Chromatography (HPLC) is the most common method used in separation techniques, with various advantages. The development of a chromatographic method is an essential preliminary step in assessing drug products. This study aimed to develop an HPLC method to quantify Capsaicin as a drug in capsaicin-loaded implants. The method development was generated using a Waters HPLC system equipped with an Alliance e2695 separation module, an autosampler, 2998, and a thermostatically controlled column compartment. Isocratic elution was applied for the separation of Capsaicin. The data on retention time and the peak area of 100 µg/mL capsaicin were collected using Empower® 3 software. Prior to setting in the HPLC, the maximum wavelength of capsaicin was obtained from the literature and confirmed using a spectrophotometer UV-Vis. The column type, temperature, and pressure, mobile phase types and ratios; flow rate, sample injection volume, and running time were optimized. The results showed that chromatographic separation of Capsaicin was achieved on a Phenomenex, Luna® C18(2) 100A New column (5 µm, 250 x 4.6 mm, P/N: 00G-4252-E0), with a column temperature of 30oC. The mobile phase consisted of acetonitrile: water (60:40 %v/v), which was run at a flow rate of 1 ml/min. The samples injected in 10 µL volumes and the 13-minute run time produced an optimum result, where well-defined capsaicin chromatogram peaks were generated at a retention time of 7.23 ± 0.02 minutes.

Title: The toxic molecular mechanisms of natural polymer-based drug delivery systems used to treat various pulmonary disorders

Primary Author: Shannon Kim

Additional Authors: Kamal Dua;Randall Clark;Muralikrishnan Dhanasekaran;Suhrud Pathak;Satyanarayana Pondugula;Sindhu Ramesh;Jack Deruiter;Timothy Moore;Kruthi Gopal;Rishi Nadar

Department/Program: Pharmacy

College: College of Science and Mathematics

Abstract: Polymers can be used to create formulations or delivery devices that enable a regulated pharmacodynamic effect to be exerted by a bioactive substance. Over the last two decades, various pulmonary disorders have been treated by using polymers synthesized from natural sources, including polypeptides and polysaccharides, as drug delivery systems. The formulations and delivery devices created from polymers allow a pharmacologically active substance to be taken into the body in a regulated manner. Pulmonary disorders, which lower the quality of life and shorten the life expectancy of people of all ages, sexes, and lifestyles worldwide, can be treated using several available formulations/dosage forms. To avoid issues of decreased bioavailability, adverse effects, and other toxic complications, novel natural polymer-based therapeutic and prophylactic pulmonary drug formulations have come under particular scrutiny and use. The most common natural polymers found in natural polymer-based drug delivery systems are arginine, dextran, chitosan, sodium alginates, albumin, zein, and collagen. All of these polymers have been used for distinct applications such as extending drug release, alleviating aerosol flow, improving therapeutic effects, and enhancing bioavailability and cellular uptake. Despite the expanding list of known benefits of natural polymers, however, their toxic mechanisms are not well understood. The toxic effects, toxicodynamic mechanisms, and hemocompatibility of natural polymer-based drug delivery systems are elucidated in this book chapter.

Title: Are anti-Müllerian hormone receptor type 2 (AMHR2)-expressing cells responsible for the sexual dimorphism of the adrenal gland?

Primary Author: Su Kim

Additional Authors: ;Jeff Huang

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Many adrenal gland diseases are more likely to affect women than men. Genome-wide studies show that the adrenal gland is sexually dimorphic at the transcriptome level. However, the mechanism that drives this sexual dimorphism is not fully understood. During development, the adrenal gland and gonads have the same origin. It is hypothesized that the sexual dimorphism of the adrenal gland may be linked to the mechanism that controls sex differentiation. AMHR2 encodes the receptor for the anti-Müllerian hormone (AMH), which is the main factor controlling the differentiation of secondary sex organs. Although AMHR2 is mainly expressed in sex organs, our preliminary data showed that some adrenocortical cells are originated from the AMHR2(+) cell population. This study uses the AMHR2;DTA mice to determine the role of the AMHR2(+) cell population in the adrenal gland. This mouse model carries two genetic-modified genes thus the diphtheria toxin subunit alpha (DTA) transgene will be expressed in cells that are expressing AMHR2. In the AMHR2;DTA mice, all AMHR2(+) cells and their descendant cells will be killed. By comparing the adrenal glands from the mutant mice and the adrenal glands from their wild-type littermates, we can test whether AMHR2(+) cells are responsible for the sexual dimorphism of the adrenal gland. My preliminary data showed that testes in AMHR2;DTA mice are small. Because AMHR2 is highly expressed in testes, the small testes in the mutant mice indicate that AMHR2(+) cells are successfully removed in AMHR2;DTA mice. Although the testes are smaller in the mutant mice, the size of the adrenal glands in these mice remains unaffected. This finding is expected because the adrenal cortex continues renewing its cell population thus the loss of AMHR2(+) cells should not affect the size of the organ. We are using RNA-seq to test whether the sexually dimorphic gene expression in the adrenal gland is affected due to the loss of the AMHR2(+) cell population.

Title: Implementing a flexible events pipeline to improve user experience in Sat-Tycoon

Primary Author: Emily Kimbrell

Additional Authors: ;

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: To understand the dynamics of long-term economic strategies and interactions between satellite internet providers, a research game called Satellite Tycoon (Sat-Tycoon) has been in development for the past two years. The original mechanics simulated indirect interactions between players through customer acquisition but lacked complex event scenarios that encouraged truly challenging and insightful game play. During this introductory phase of the project, optimizing user experience was deferred to instead focus on core game mechanics defined by player actions such as building ground stations, buying satellites, launching satellites into orbit, and setting an internet subscription price for customers. Incorporating a level of stochasticity into the existing game would create a more immersive user experience as players are further challenged to co-opt existing game mechanics to respond to events such as natural disasters, launch failures, magnetic storms, etc. A flexible event pipeline was constructed to allow for a variety of event types to be simulated and the effects tracked throughout the game. The integration of this pipeline has created a more dynamic and engaging experience for players, as they must now consider probabilistic risks associated with their actions.

Title: Towards the design of Hydrogen-resistant metal alloys: Insights from DFT and machine learning

Primary Author: Vladislav Korostelev

Additional Authors: ;Konstantin Klyukin

Department/Program: Materials Engineering

College: College of Engineering

Abstract: Hydrogen interaction with structural materials can cause their embrittlement, ultimately leading to material destruction. For materials used under extreme conditions or for high-risk applications, it is necessary to impede hydrogen absorption into interstitial and defect sites. Unfortunately, no atomic-level theory quantitatively predicts hydrogen solubility or segregation in alloys of different compositions and its effect on mechanical properties. In this work, we focused on hydrogen solubility phenomena in metals, namely high-entropy metal alloys (HEAs). This class of materials received increasing attention in recent years due to excellent mechanical properties and high corrosion resistance exceeding those of current structural alloys. The goal of this project is to reveal factors controlling hydrogen absorption energies in metal alloys and predict hydrogen solubility in any alloy before such is synthesized. To gain a deeper understanding of the mechanisms controlling hydrogen solubility, we utilized a combination of Density Functional Theory (DFT) simulations and modern machine-learning algorithms. We identified a set of electronic structure and geometry features that correlate with hydrogen solubility and can be used to predict hydrogen adsorption energies. We demonstrated that both classical machine learning regressors (e.g., XGBoost, RF) and symbolical regression methods (e.g., SISSO) could be used to predict hydrogen solubility with high accuracy.

Title: Diffusion and sedimentation of shape-anisotropic nanoparticles using multiparticle collision dynamics

Primary Author: Grace Kovakas

Additional Authors: Arash Nikoubashman;Michael Howard

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Nanoparticles are a crucial, wide-reaching technology in the fields of material science and chemical engineering as they are used in biological systems for drug delivery (nanomedicines), in industrial processes such as oil recovery, and are frequently embedded into other materials like polymers to change their properties. Dynamics, such as diffusion or sedimentation from controlled forces, play an important role in many of these applications. The dynamics of spherical nanoparticles are well-characterized, but the dynamics of the rich toolbox of nanoparticles having more complicated shapes are far less understood. To address this knowledge gap, I am using computer simulations to study the diffusion and sedimentation dynamics of nanoparticles with anisotropic shapes dispersed in a solvent at varying concentrations. The simulations use the computationally efficient multiparticle collision dynamics (MPCD) method to describe important solvent-mediated hydrodynamic interactions between nanoparticles. I am simulating suspensions of octahedral and tetrahedral nanoparticles and calculating their diffusion and sedimentation coefficients as a function of nanoparticle concentration. I am also comparing my MPCD simulations to simulations without hydrodynamic interactions in order to assess their contributions to these dynamic processes. This work provides insight into how diffusion and sedimentation for experimentally relevant nanomaterials.

Title: Cereal Rye Residue Effects on the Germination of Troublesome Southeastern Weeds

Primary Author: Annu Kumari

Additional Authors: ;Andrew Price;Steve Li;Audrey Gamble

Department/Program: Crop, Soil, and Environmental Sciences

College: College of Agriculture

Abstract: Weed seed germination and early growth stage are a critical part of the weed life cycle that is controlled by both environmental and genetic factors. Therefore, weed control strategy should be focused on the most susceptible parts of the weed cycle to maintain sustainability and reduce the use of the chemical herbicide. Cover crops have been increasingly adopted to suppress weed germination and vigorous vegetative growth. A greenhouse experiment was conducted to evaluate the germination and growth response of several key weeds in the Southeast to various levels of cereal rye residue. Seeds of palmer amaranth, sicklepod, morning glory, and crabgrass were mixed with organic garden soil and placed over the top of the tray. The soil flats were covered uniformly by four different biomass of rye straw. Plant growth was quantified through weed counting and recording of dry weight. The results illustrated that morning glory was least responsive to increasing biomass, and palmer was the most responsive one due to small seed sizes. While germination and growth rate of crabgrass and sicklepod have fluctuated with different levels of biomass residue during this greenhouse study.

Title: Dynamic density functional theory for drying colloidal suspensions: comparison of free energy functionals

Primary Author: Mayukh Kundu

Additional Authors: ;Michael Howard

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Dynamic density functional theory (DDFT) is a promising approach for predicting structural evolution and self-assembly in a drying suspension containing one or more types of colloidal particles. The assumed free-energy functional is a key component of DDFT that dictates the thermodynamics of the model and, in turn, the density flux due to a concentration gradient. In this work, we compare several commonly used free-energy functionals for drying hard-sphere suspensions including local-density approximations based on the ideal-gas, virial-expansion, and Boublik-Mansoori-Carnahan-Starling-Leland (BMCSL) equations of state as well as a weighted-density approximation using fundamental measure theory (FMT). To determine the accuracy of each functional, we model one- and two-component hard-sphere suspensions in drying films with varied initial heights and compositions. We compare the DDFT-predicted volume-fraction profiles to Brownian dynamics simulations. In the one-component suspension, FMT accurately predicts the structure of the suspension even at high concentrations and when significant density gradients develop, but the virial-expansion and BMCSL equations of state provide reasonable approximations for smaller concentrations and gradients at a smaller computational cost. In the two-component suspension, FMT and BMCSL are similar to each other but modestly overpredict the extent of self-assembly into stratified layers compared to BD simulations. This work provides helpful guidance for selecting thermodynamic models for soft materials undergoing nonequilibrium processes such as drying.

Title: Understanding long Covid-19 patterns in pediatric patients using network analytics

Primary Author: Kushagra Kushagra

Additional Authors: ;

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: COVID-19 has had a significant long-term effect on quality of life, work, and society, expressed by the recently emerged condition of Long COVID. This is particularly true in pediatric populations, which make up 19% of Long COVID cases. We research three main questions. First, what are the most recurring chronic issues in pediatric patients suffering from Long COVID at different points post-diagnosis? Second, what are the most frequent non-chronic issues among pediatric Long COVID patients across different age groups? Third, what are the clusters of chronic and non-chronic conditions existing in pediatric Long COVID cases? To answer these questions, we analyze health records of ~500K pediatric Long COVID patients from over 72 different sites using National COVID Cohort Collaboration data. We then use network analytics to model chronic and non-chronic diseases that pre-exist in Long COVID patients. Subsequently, we create bipartite graphs and their projections to generate disease networks for Long COVID. We use Louvain and Leiden algorithms to detect clusters of diseases. Our research shows that 4 chronic conditions - asthma, anxiety, obesity, and lipoprotein metabolism disorders - commonly co-exist with Long COVID in pediatric patients. Five non-chronic conditions - acute upper respiratory infections, fever, acute pharyngitis, deficit hyperactivity disorders, and cough - were most frequent. Sleep disorders and severe stress were especially prominent in the 11-17 age group. Applying the Louvain Community detection algorithm, we identified 5 clusters of various chronic and non-chronic conditions associated with Long COVID - Cluster 1 (14% of data) had higher levels of teen pregnancies, infectious or parasitic diseases, and mental disorders, while Cluster 2 (5.5%) had higher cases of neoplasms and infectious or parasitic diseases. Our findings give an early indication of which pediatric patient is most likely to develop Long COVID.

Title: The Affordable Care Act associated with diabetes care - a systematic review

Primary Author: Tim Lai

Additional Authors: ;Jingjing Qian

Department/Program: HORP

College: School of Pharmacy

Abstract: Even though the Affordable Care Act has been signed into law for over a decade, its overall impacts on diabetes care have not been systematically evaluated. We systematically synthesized the policy impacts on diabetes care, including health insurance coverage, healthcare utilization, as well as diabetes management and control. We searched the Ovid MEDLINE, PsycINFO, CHNAHL, and Embase databases to include studies published from January 1, 2010, till October 1, 2022. The search terms included "Diabetes Mellitus," "diabetes," "Affordable Care Act," "ACA," "Obamacare," "Marketplace," "Health Insurance Exchange," and "Medicaid Expansion." We included cohort studies and quasi-experimental studies with a comparison group (i.e., pre-post or difference-in-differences designs). After removing duplicates, title/abstract screening, and full paper review of all 781 records identified from the databases, 28 articles were included. Among them, 22 (79%) studies specifically focused on the Medicaid expansion provision. Evidence showed that while the ACA and the Medicaid expansion significantly increased health insurance coverage, the Medicaid expansion showed more promising outcomes in diabetes care utilization and disease control. Regarding healthcare utilization, the Medicaid expansion was associated with an increase in anti-hyperglycemic prescriptions and a decrease in the hospitalization rate. The Medicaid expansion was also associated with a surge in newly diagnosed diabetes among Medicaid beneficiaries. For diabetes control, patients in the expansion states were more likely to have a lower mean HbA1c than those in states without Medicaid expansion. However, the policy's impact on diabetes management behaviors remained limited since most studies (83%) found no significant change in diabetes management behaviors after the policy implementation.

Title: Eco-evolutionary models of population decline: how and when can we use connectivity to support and restore populations on the brink of extirpation?

Primary Author: Gina Lamka

Additional Authors: ;Janna Willoughby

Department/Program: Wildlife Ecology and Management

College: School of Forestry

Abstract: In vulnerable species, loss of connectivity is concerning because the cessation of immigration bringing in new alleles into small, isolated populations can tip populations into an extinction vortex. This can cause increased inbreeding and an additional loss of genetic diversity, leading to lower adaptability and higher extirpation. To counter these trends, management actions such as assisted migration and establishing corridors aim to increase genetic diversity and extend population viability. Unfortunately, monitoring genetic diversity and predicting the extent of new genetic variation needed to prevent extirpation is difficult and costly *in situ*. Therefore, we designed an agent-based model to link population-wide genetic variability and the influx of unique alleles via immigration to population stability and extirpation. Using our model, we simulated vulnerable populations, namely populations with a stochastic drop in population size, decreased heterozygosity, and increased inbreeding, and instituted an extinction-vortex-like parameter whereby individuals that were more genetically diverse had higher fitness. We quantified the number of migrants carrying new alleles and the duration of increased migration required to demographically restore reduced populations. Importantly, we push the limits within this model to examine the severity of a crash where a population is not recoverable. Finally, we considered how the restored populations differ genetically from populations that would have remained if habitat conditions had not caused a crash. Combined, these data illustrate how management of connectivity can be critical in restoring at-risk populations, but that management actions have long-lasting effects on the genetic composition of populations. Understanding how at-risk populations change with management has broad implications for species adaptability and will require further efforts to protect locally adapted traits when connectivity is restored.

Title: Exploring the effects of fire return interval on resource-use strategies of pyrophytic and mesophytic species

Primary Author: Arthur Lamounier Moura

Additional Authors: Michael Aspinwall;Heather Alexander

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Fire exclusion in fire-structured forests in the southeastern United States has led to changes in forest species composition. The hypothesized process explaining these changes is mesophication, characterized by fire-sensitive, shade-tolerant species (i.e., mesophytes) replacing fire-tolerant, shade-intolerant species (i.e., pyrophytes), altering understory microclimate and flammability. To address mesophyte encroachment and restore fire-tolerant vegetation, managers reintroduce low-intensity, surface fires in these systems. However, fire often fails to achieve this goal, and even in frequently burned forests mesophyte recruitment often exceeds that of pyrophytes. We hypothesize that trait plasticity and a shift to a more conservative strategy can help explain the persistence of mesophytes in fire-disturbed areas, while a prolonged period of fire exclusion could cause pyrophytes to adopt an acquisitive strategy. To test this hypothesis, we investigated the effects of fire return intervals on functional traits of a pyrophyte, southern red oak (*Quercus falcata*), and two mesophytes, sweetgum (*Liquidambar styraciflua*) and red maple (*Acer rubrum*). This study was conducted in two fire-prone landscapes: Bankhead National Forest, AL, USA, a mixed pine-hardwood forest, and Tall Timbers Research Station, FL, USA, a loblolly (Pinus taeda) and shortleaf pine (P. echinata) woodland. Preliminary results support our hypothesis, suggesting a conservative response of sweetgum, exhibiting lower specific leaf area (SLA) and higher leaf dry matter content (LDMC) in burned sites, and an acquisitive response in southern red oak with higher SLA in unburned compared to burned sites. Our results indicate trait plasticity in both species, and convergence of resource-use strategies influenced by fire frequency. These findings may help explain the persistence of sweetgum across the landscape regardless of fire history and the constrained southern red oak recruitment in fire-excluded areas.

Title: Analyzing inter-synaptic vesicle exchange using 3D microscopy and computational methods

Primary Author: Nathan Landers

Additional Authors: ;Michael Gramlich

Department/Program: Physics

College: College of Science and Mathematics

Abstract: Mature presynapses share neurotransmitter-carrying vesicles with neighboring presynapses using a process called Inter-Synaptic Vesicle Exchange (ISVE). ISVE has been considered a pathway to support synaptic transmission by providing an extra pool of vesicles during activity. Understanding the mechanics of ISVE would thus allow us to better model the efficiency with which ISVE supports synaptic transmission. However, there are major gaps in our understanding of how ISVE vesicles transport along the axon in order to support transmission. ISVE vesicles utilize molecular motor transport, which is fast and efficient but predominantly rate-limited by vesicle pausing along the axon. We utilize high-resolution single-vesicle fluorescence microscopy in live cells to measure ISVE transport at the nanometer and millisecond scales. The axial and lateral positions of individual ISVE vesicles can be determined using three-dimensional imaging, which is made possible by the use of optical astigmatism. We distinguish vesicles undergoing axonal transport and use a computational approach to characterize motor-driven motion from pausing. We further developed a computational approach to quantify the mechanics of vesicle pauses along the axonal cytoskeleton.

Title: Establishing the neuroprotective effects of *Rhodiola rosea* on chronic traumatic encephalopathy

Primary Author: Bennett Lange

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Chronic Traumatic Encephalopathy (CTE) has recently become a hot-topic issue, with athletes of almost all contact sports and many members of the armed forces being considered high risk due to the increase in mild traumatic brain injuries. Symptoms of CTE include cognitive impairment, impulse control issues, depression, anxiety, an increase in suicidal thoughts, Parkinson's disease, and dementia. A current obstacle with CTE is the lack of specific diagnostic tests and the absence of specific biomarkers related to disease initiation and progression. However, an increase in CCL-11, a chemokine produced in response to inflammation, and an increase in free radical concentration, have recently been linked to post-mortem CTE diagnoses. The neuropathological mechanisms associated with CTE are microglia damage due to inflammation and neurofibrillary tangles deposition due to increased phosphorylated-tau proteins and augmented oxidative stress. *Rhodiola rosea* is a naturally occurring plant in East Europe/Asia and has recently been considered an adaptogen. It is rich in a natural bioactive, Salidroside (phenolic glycoside). It can readily cross the blood-brain barrier through a sodium-dependent glucose cotransporter-1 and is converted into p-tyrosol (antioxidant). Additionally, *Rhodiola rosea* can decrease inflammation, increase monoamine oxidase A & B inhibitor activity, and increase beta-endorphin production. However, its effect on CTE and CCL-11 is unknown. This study will investigate the possible neuroprotective mechanisms of *Rhodiola rosea*. Thus, our study will ascertain the potential for using *Rhodiola rosea* as an antioxidant and anti-inflammatory natural bioactive in combatting the initiation and progression of CTE.

Title: Establishing the future of artificial intelligence in the diagnosis and treatment of dementia

Primary Author: Bennett Lange

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Artificial intelligence (AI) has recently been across all news platforms for the leaps and bounds it has been making in writing, art, and most importantly, in medicine and health sciences. Globally, AI seems poised to become one of the most powerful tools mankind will have ever developed. However, it is also currently a very misunderstood tool. It is not a sentient being in medicine, but instead machine learning-based, taking in information (pictures or data, for instance) and comparing it to information about the patients that we have diagnosed. Based on this, it is able to draw inferences to other future patients off of the thousands of cases we will show it. This should hopefully allow healthcare to make medicine cheaper, decrease mortality, and decrease morbidity. Dementia, and more specifically Alzheimer's disease, is a disease that affects over six million Americans. There is no cure currently, and medicines approved by the FDA only treat the symptoms. AI is currently being researched to hopefully aid in both the diagnosis and treatment of Alzheimer's disease. Furthermore, a lot of research is being put into gene therapy. Thus, this study will emphasize the role of AI in dementia for improving healthcare globally.

Title: Commemorating Auburn's African American past

Primary Author: Aaliyah Lantigua

Additional Authors: ;

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: The history of Auburn's African American past rests in Baptist Hill Cemetery. Like many historic Black cemeteries, most burials remain unmarked, leaving the stories of these past souls untold and forgotten. For those marked burials, the mosaic of Auburn's Black history can be pieced together from the library of stories found underground. The successes and triumphs, as well as their hardships and griefs, are overlooked on printed documents later to be found on genealogical sites and courthouses and in the hearts of their descendants. Research to Preserve African American Stories and Traditions (RPAAST) aims to reclaim the stories of Auburn's African American ancestors by engaging students from Dean Road Elementary, Auburn Junior High, and Auburn High School. The Auburn Junior High and High School students gather research by talking to descendants and looking through census, military, marriage records, and property deeds. They piece together the stories of men like Moses Harper, Auburn's first documented person of African descent. John L. Vickerstaff, who was called upon by the county to recall local events, people, and places. Including several veterans such as Willie Dowdell, Walker Marshall, Robert Duke Foster, and Jesse Harris. Not only did the students learn about local African American history, but they were also able to restore history as well. In the research process, it was discovered that the historical marker for Ebenezer Baptist Church, Auburn's first African American church, contained several inaccuracies. The deed for Ross Cemetery, a cemetery taken from the Black community, was also found. Toward the end of the semester, the students engage in a clean-up at Baptist Hill Cemetery. The elementary students from Dean Road Elementary will then place their designed memory stones to commemorate the deceased at each grave site. Afterward, the students' findings will be presented at Ebenezer Baptist Church in front of family, friends, and the congregation.

Title: Investigating the role of fatty acid oxidation in the proliferation of ovarian cancer cells

Primary Author: LaTrell Huitt

Additional Authors: Azura Murphy

Department/Program: Biology and Environmental Science

College/School: College of Sciences, Auburn University at Montgomery

Abstract:

While convincing epidemiological evidence links obesity to increased cancer growth, the underlying molecular mechanisms remain elusive. Recent studies have investigated the role of adipocyte secretions as potential mediators of accelerated growth. Metabolic dysfunction, characterized by insulin resistance, frequently accompanies obesity. In adipocytes, this causes altered adipokine secretion, including increased serum leptin levels. The changes in adipokine levels may account for a more aggressive phenotype. The goal of this project is to investigate the effects of insulin-resistant adipocytes, and in particularly increased leptin levels, on the proliferation of cancer cells, and to assess if this is attributable to changes in fatty acid oxidation (FAO) in the cancer cells.

Previous work by our group indicated that, in the presence of conditioned media from insulin-resistant adipocytes (IRCM), both melanoma and breast cancer cells exhibit increased cell proliferation which may be in part due to the increased use of fatty acids as sources of fuel. The finding that genes for proteins involved in cell proliferation and fatty acid oxidation were upregulated in cells exposed to IRCM, including PCNA, Ki67, ACOX, and CPT1, corroborated this. We sought to extrapolate these findings to ovarian cancer cells and investigate the role of leptin in increased growth and altered fatty acid metabolism. Ovarian cancer cells were treated with either IRCM or recombinant leptin. After 48 hours, quantitative PCR was performed to determine the expression of Ki67 and PCNA as proliferation markers, and the genes CPT1, ACOX, and PPARα to investigate potential effects on FAO. Our results indicated that secretion from insulin-resistant adipocytes increased tumor cell proliferation, and resulted in the upregulation of genes in the FAO pathway. However, leptin's effects were insufficient to induce the effects of IRCM on tumor growth.

Title: pH-dependent mechanisms of peptide bond fragmentation and their impact on pharmaceutical protein stability

Primary Author: Katherine Lawson

Additional Authors: ;Andrew Adamczyk

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Pharmaceutical proteins are known to experience shifts in pH throughout the manufacturing pipeline, so that the purified protein of interest may be included within the final formulation. However, the pH changes throughout the manufacturing process can be detrimental to the overall protein stability during both manufacturing and storage. One such degradation mechanism of interest is fragmentation of the peptide bond, a degradation mechanism that is strongly influenced by shifts in pH. For this purpose, we analyzed these pH-dependent mechanisms of peptide bond fragmentation to identify key trends in regards to the reaction behavior of model dipeptides under these pH conditions. The impact of electrostatics was analyzed by modeling each reaction using four dielectrics, which are representative of different sites within a protein, and dielectric-specific databases were built. Through the generation of these databases, we determined which reaction mechanisms and modeled dielectrics could be used to generate statistically significant correlations through which the modeled reactions could be generalized. These results provide a baseline generalization through which statistical and supervised learning methods may be implemented to increase the accuracy of our generated models.

Title: Investigation of ARS-1620, an inhibitor of KRAS-G12C, for its potential to induce MDR1 in LS180 human colon cancer cells

Primary Author: Elizabeth Ledbetter

Additional Authors: Abbott, Kodye L;Satyanarayana Pondugula;Julia Salamat

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: During multidrug chemotherapy, induction of multidrug resistance protein 1 (MDR1) has been shown to contribute to chemoresistance. MDR1 is an efflux pump that plays a critical role in disposition of more than 50% of clinically used drugs. Therefore, during multidrug chemotherapy, drug induction of MDR1 can reduce the therapeutic efficacy of co-administered chemotherapy drugs, leading to chemoresistance. Recently, novel small molecules inhibitors of KRAS-G12C were being developed for the treatment of cancers with the KRAS-G12C mutation. One of such inhibitors, ARS-1620, is being investigated in preclinical trials. It is currently unknown whether ARS-1620 has the potential to induce MDR1. In this study, we investigated whether ARS-1620 can induce MDR1 gene expression and function using qRT-PCR and intracellular Rhodamine 123 accumulation assays, respectively. ARS-1620 induced gene expression and function of MDR1 in LS180 human colon cancer cells. These preliminary results suggest that ARS-1620 may induce chemoresistance via induction of MDR1 when it is used in combination with other chemotherapy drugs transported via MDR1.

Title: Recycling of aerospace-grade glass fiber composites using ionic liquids

Primary Author: Holden Lee

Additional Authors: ;Soledad Peresin;Zahra Naghizadeh Mahani;Suhasini Gururaja;Julkarnyne M Habibur Rahman;Nithinkumar Manoharan

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: In the aerospace industry, glass fiber reinforced plastics (GFRPs) are utilized to create lighter and stronger aircraft with improved fuel efficiency and less maintenance. Aerospace-grade structural GFRPs are comprised of woven glass fibers held together by an epoxy resin. GFRPs are not bio-degradable, and they are often considered to be non-recyclable, which leads them to be disposed of in landfills. Furthermore, retired aircraft are often left parked to decay in remote areas, with owners unaware of the material value present in decommissioned planes. Therefore, this research intends to assess the recyclability of glass fiber reinforced epoxy composites and the replicability of the ionic liquid solvolysis method, and, as a result of the non-volatile/organic nature of ionic liquids, will serve as a model for environmentally friendly thermoset recycling on an industrial scale. In this study, an aerospace-grade glass fiber reinforced epoxy composite was treated with a mixture of ionic liquid and ethylene glycol to determine the efficacy of chemical dissolution-based recycling, as well as the quality and strength of the recovered glass fibers. Ionic liquids 1-butyl-3-methylimidazolium chloride [BMIm][Cl] and 1-butyl-3-methylimidazolium acetate [BMIm][Acet] were used as solvent systems in this research. The dissolution process was performed under four different variables including time and temperature of exposure, ionic liquid formulation, and different ionic liquid to ethylene glycol weight ratios. It was observed that the dissolution process was most effective under exposure to temperatures higher than 150 °C and greater proportions of ionic liquid to ethylene glycol. A decrease in overall mass was observed under a 60:40 weight ratio of [BMIm][Cl] to ethylene glycol. Apart from that, based on the FTIR results, the chemical composition of the solvent system after the completion of the dissolution process has changed, proving the partial dissolution of resin in the proposed solvent system. Optimization of the method has been evaluated based on dissolution yields.

Title: Translating time across the lifespans of humans and non-human primates identifies event variations resulting from evolutionary diversity

Primary Author: Toni Lee

Additional Authors: Madison Bryant;Madi Bryant

Department/Program: Anthropology

College: College of Liberal Arts

Abstract: In aligning the developmental schedules of humans and non-human primates, we identified certain time points representing individual structural and behavioral landmark events. These were of particular interest due to their divergence from trends in developmental schedules in other species of primates. The events that these outlying time points represented were identified, but they were inconsistent with the remainder of the related time points. A dataset composed of 589 time points was developed, spanning various behavioral, structural, and temporal variation transcription changes, both abrupt and gradual, throughout the lifespans of humans and eight other species of primates (both ape and monkey species). The purpose of the data is to align ages across the lifespans of the included species of non-human primates with those of humans. Our observations of variances at certain time points, such as eruptions of deciduous teeth, anterior cranial measurements, corpus callosum development, achievement of adult carpal numbers, and peak birthing years, suggest possible associations with evolutionary preference, ambulatory habits, and dietary heterogeneities. These findings lead us to conclude that evolutionary selectivity and dietary differences are possible contributing factors that enhance those time points as predictors of age translation of non-human primate species into human years.

Title: Increasing sleep by chemogenetic activation of specific neurons in the Nucleus Accumbens in mice.**Primary Author:** Vander LeKites

Additional Authors: ;Natasha Wendy Grabau;Daniel Kroeger;Emma Brousseau

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: Sleep is important for many bodily functions, but the underlying neural circuits regulating sleep/wake states are still poorly understood. Recently, the nucleus accumbens (NAc) was identified as an area containing sleep-active neurons expressing Adenosine 2A receptors (A2AR). Whether activation of A2AR neurons induces restorative sleep or simply increases the quantity of sleep is unknown. For this study we used chemogenetics to specifically activate A2AR neurons in the NAc and analyzed sleep-wake parameters, including rapid eye-movement (REM sleep), non-REM (NREM) sleep and wakefulness. We employed an adeno-associated virus (AAV) to transfect A2AR neurons of the NAc core in A2AR-cre transgenic mice to drive expression of the chemogenetic receptor (hM3Dq) in these neurons. We then activated the hM3Dq receptor with its ligand, Clozapine-N-Oxide (CNO), in varying concentrations (0.1, 0.3, 0.9 and 2.7 mg/kg) and recorded EEG/EMG signals for analysis of the quality and quantity of sleep. CNO administration (2.7 mg/kg) causes an increase in c-Fos expression (c-fos is a marker of recent neuronal activation), in A2AR neurons in the NAc and increases both NREM sleep (105%) as well as REM sleep (278%), as compared to saline administration treatment. Further analysis of sleep features revealed that activation of NAc neurons increased NREM sleep bout length, and NREM sleep bout duration. The increase in REM sleep was mainly driven by an increase in number of bouts. An analysis of the EEG waves during NREM sleep revealed that the induced sleep was of a comparable depth than natural NREM sleep. Overall, our results suggest that chemogenetic stimulation of hM3Dq receptors on A2AR neurons in the NAc with CNO increases both NREM sleep and REM sleep in a dose-dependent manner and that the induced sleep is of a comparable quality than natural sleep. We conclude that activation of A2AR neurons in the NAc can be used as a model system to increase sleep in laboratory mice.

Title: Exploring the genetics of floral development in the sunflower family

Primary Author: Erika Lesperance

Additional Authors: ;Reid Selby;Daniel Jones

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The Asteraceae family, consisting of over 30,000 species, has a distinct floral inflorescence type comprised of many smaller flowers (florets) that mimic a singular large flower, known as a capitulum. This inflorescence is conserved across the large family, but the underlying genetics regulating its development are not yet fully understood. We propose using the cultivated ornamental Bidens cv. “Compact Yellow” (Bidens-CY) as a model system for studying Asteraceae development and evolution. Bidens-CY is highly heterozygous, so before it can be a true model genetic system, we are aiming to bottleneck it to reduce the genetic diversity and variation amongst offspring. While bottlenecking, we noticed that some Bidens-CY progeny have developmental phenotypes of particular interest to our lab, including defects in floral symmetry and corolla fusion, among others. In this study, we are leveraging the genetic diversity of Bidens-CY to identify novel regulators of flower development via a forward genetics approach. The independent lines of Bidens-CY progeny will be outcrossed to two different Bidens cultivars, Sunbeam and Sundrop, allowing us to generate mapping populations. Additionally, we are taking a reverse genetics approach to target and disrupt the transcription factor LEAFY, a floral development regulator, in Bidens-CY using CRISPR-Cas9 gene editing. CRISPR guideRNA sequences targeting LEAFY were designed, cloned, and will be transformed into Bidens-CY via Agrobacterium tumefaciens. Currently, there is no standardized protocol for transforming Bidens, so in vitro transformation methods are being explored with leaf explants and progeny cotyledons for regeneration through tissue culture. This work will help facilitate future genetic manipulations in Bidens and aids in its development as a model system to study genetics in the sunflower family.

Title: Exploring the genetics of floral development in the sunflower family

Primary Author: Erika Lesperance

Additional Authors: ;Reid Selby;Daniel Jones

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The Asteraceae family, consisting of over 30,000 species, has a distinct floral inflorescence type comprised of many smaller flowers (florets) that mimic a singular large flower, known as a capitulum. This inflorescence is conserved across the large family, but the underlying genetics regulating its development are not yet fully understood. We propose using the cultivated ornamental *Bidens* cv. "Compact Yellow" (Bidens-CY) as a model system for studying Asteraceae development and evolution. Bidens-CY is highly heterozygous, so before it can be a true model genetic system, we are aiming to bottleneck it to reduce the genetic diversity and variation amongst offspring. While bottlenecking, we noticed that some Bidens-CY progeny have developmental phenotypes of particular interest to our lab, including defects in floral symmetry and corolla fusion, among others. In this study, we are leveraging the genetic diversity of Bidens-CY to identify novel regulators of flower development via a forward genetics approach. The independent lines of Bidens-CY progeny will be outcrossed to two different *Bidens* cultivars, Sunbeam and Sundrop, allowing us to generate mapping populations. Additionally, we are taking a reverse genetics approach to target and disrupt the transcription factor *LEAFY*, a floral development regulator, in Bidens-CY using CRISPR-Cas9 gene editing. CRISPR guideRNA sequences targeting *LEAFY* were designed, cloned, and will be transformed into Bidens-CY via *Agrobacterium tumefaciens*. Currently, there is no standardized protocol for transforming *Bidens*, so *in vitro* transformation methods are being explored with leaf explants and progeny cotyledons for regeneration through tissue culture. This work will help facilitate future genetic manipulations in *Bidens* and aids in its development as a model system to study genetics in the sunflower family.

Title: Sleep enhancement via focused ultrasound stimulation of the Nucleus accumbens.

Primary Author: Henry Limbo

Additional Authors: ;Daniel Kroeger

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Although researchers have not come to a consensus on the function(s) of sleep, there is strong evidence that sleep is necessary for many physiological and cognitive processes including learning and memory. Previously, sleep enhancement in mice required the use of transgenic mice (expressing the protein cre-recombinase in certain neuronal populations) and the use of invasive techniques such as optogenetics or chemogentics to activate the neurons generating sleep. To facilitate the translational application of this research to humans, we utilized focused ultrasound (fUS) to non-invasively activate neurons in the nucleus accumbens (NAc) which has been shown to be one of the centers involved in sleep modulation. In preliminary experiments with cFos staining, we have shown that the desired structures can be activated will fUS. Our next aim is to determine what specific parameters of fUS will be most effective in stimulating only the desired neuronal populations while leaving neighboring neurons unaffected. We will use both wild-type and transgenic mice in conjunction with calcium imaging to determine the optimal parameters of fUS. We will then use fUS to activate neurons in the NAc to enhance sleep in mice non-invasively. Next, we will assess their performance in the novel object recognition (NOR) test to determine the relationship between sleep enhancement and memory performance. We hypothesize that mice who receive fUS stimulation of the NAc will sleep better and will perform better on the NOR test than unstimulated controls.

Title: Salt transport in crosslinked hydrogel membranes containing zwitterionic sulfobetaine methacrylate and hydrophobic phenyl acrylate

Primary Author: Yi-Hung Lin

Additional Authors: ;

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: A large range of industrial processes, such as oil extraction, metal plating, mining, battery manufacture, etc., create wastewater that contains metal ions. Since the metals in these streams are harmful to the environment and people's health, they must be eliminated before discharge. Membrane separation is a promising unit operation for the removal of harmful species due to their high selectivity and low energy consumption. As a result, membrane separation technologies are now widely used for wastewater treatment. However, the persistent problem of colloidal, organic, and other membrane fouling seriously reduces the functioning of the membrane, reducing its performance and longevity. Zwitterionic polymers—which contain both positive and negative charges but are overall charge neutral—have drawn a lot of interest as hydrophilic, ultra-low fouling materials that can tolerate adsorption by bacteria, cells, and protein. The antifouling properties of these zwitterionic polymer films are believed to be the result of the considerable surface hydration brought on by electrostatically induced hydrogen bonding. Herein, we combine phenyl acrylate (PA), a monomer to improve mechanical properties, and the commercial zwitterionic monomer sulfobetaine methacrylate (SBMA) within crosslinked polymer films using N,N'-methylenebisacrylamide (MBAA) as the crosslinker. The physiochemical characteristics of polymer membranes with different PA/SBMA contents are studied, including water content, dry polymer density, and transport behavior. According to our observations, Young's modulus rises when MBAA or PA content increases. Additionally, decreasing permeabilities to all solutes with increasing SBMA content is caused by decreasing water volume fraction, and these permeabilities are in the following order: K+ > Na+ > Li+ > Ni2+>Ca2+ >Mg2+, most likely because of variations in hydration diameters.

Title: Elucidate the neuroprotective activity of Calebin A: Natural bioactive of Curcuma longa

Primary Author: Keyi Liu

Additional Authors: kalyanam@sabinsa.com;Muralikrishnan Dhanasekaran;Suhrud Pathak;Satyanarayana Pondugula;Surekha kadannagari;Sindhu Ramesh;Jack Deruiter;Timothy Moore

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Calebin-A (hydroxycinnamic acid, novel curcuminoid) is a natural bioactive found in turmeric (Curcuma longa) belonging to the family Zingiberaceae. Calebin-A has been mainly shown to systematically interact with p65 and influence the NF-κB pathway. Due to the above pharmacological mechanism of action, Calebin-A has been therapeutically used in the treatment of cancer and tumor suppression. Yet, there are very few scientific reports on the pharmacodynamic effects of Calebin-A in the brain (central nervous system). To date, only a single report investigated the neuroprotective effect against β-amyloid-induced in vitro neurotoxicity. Thus, there is a significant gap in the neuropharmacological effect of Calebin-A. Hence, this study elucidated the neuro-pharmacodynamic actions of Calebin-A on the dopaminergic and hippocampal neurons. Furthermore, in-silico analyses were performed to validate its neuro-pharmacodynamic properties. Calebin-A was incubated with different doses at two different time points to establish the effect on dopaminergic and hippocampal neuronal viability. Endogenous neurotoxin, hydrogen peroxide was used as a positive control. Statistical analysis was performed using Prism-V software. The current in-silico and in vitro studies established the pharmacokinetic profile and the effect of Calebin-A on dopaminergic and hippocampal neuronal viability.

Title: Effects of developmental exposures to bisphenol-A and bisphenol-S on hepatocellular function in male Long-Evans rats

Primary Author: Keyi Liu

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Satyanarayana Pondugula;Surekha kadannagari;Jack Deruiter;Kodye Abbott;Julia Salamat;Benson Akingbemi

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Bisphenol-S (BPS) is a current substitute for "Bisphenol-A (BPA)" in various commercial products (paper, plastics, protective can coatings) which all age groups are exposed globally. The current literature evidently indicates that a drastic surge in prooxidants, pro-apoptotic, pro-inflammatory biomarkers, in combination with diminished mitochondrial functions, potentially reduce hepatic function leading to morbidity and mortality. Consequently, there are increasing public health concerns that substantial Bisphenol-mediated effects may impact hepatocellular functions. There is various clear alarming evidence of newborns exposed to Bisphenol/its structural congeners postnatally. However, the acute postnatal impact of Bisphenol/its structural congeners and the molecular mechanisms affecting hepatocellular functions are unraveled. Therefore, the current study investigated the acute postnatal effect of Bisphenol/its structural congeners (BPA and BPS) on the general behaviors and biomarkers of hepatocellular functions including oxidative stress, inflammation, apoptosis, and mitochondria function in male Long-Evans rats. BPA and BPS (5 and 20µg/L of drinking water) were administered to 21-day-old-male rats for 14 days. BPS had no results shown significantly affect general behavior observed, apoptosis, inflammation, and mitochondrial function but significantly reduced the reactive oxygen species (ROS) and nitrite content exhibiting hepatoprotective effects. As expected, based on the current scientific literature, BPA induced significant hepatoxicity as seen by significant glutathione depletion. The in silico analysis indicated that BPS is effectively absorbed in the gastrointestinal tract without crossing the blood-brain barrier (whereas BPA crosses BBB) and is not a substrate of p-Glycoprotein and Cytochrome P-450. Thus, the current in vivo findings revealed that acute post-natal exposure to BPS had no significant hepatotoxicity.

Title: Design and construction of a low-cost diamond turning lathe and workflow for ultraprecision manufacturing

Primary Author: Cyrus Lloyd

Additional Authors: ;Nicholas Browning

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: The state of the art in the field of ultraprecision manufacturing is represented by diamond-turning lathes. These machines are capable of producing parts accurate to well under 1 micrometer with surface finishes in the single-digit nanometer Ra range. They are the precision behind everything from mass-produced optics to cutting-edge scientific research, yet limitations in their cost and work-holding methods limit productivity. Common slow manual part mounting and alignment methods make high production difficult on such machines. A low-cost diamond turning lathe that includes a novel work-holding solution was developed to address these areas and bring this capability to the university. Using principles of precision engineering and machine design, a diamond turning lathe capable of sub-micron accuracy and sub-10 nanometer Ra surface finish was designed and built. The X and Z axes consist of custom hydrostatic and aerostatic box ways driven by linear motors and a non-influencing friction drive bar system. Using these engineered machine elements in conjunction with high-precision position feedback sensors, the axes maintained a positional stability and resolution of less than 25 nanometers and a positional accuracy of less than 100 nanometers over the travel of the machine. Concurrently, a kinematic pallet work-holding system was also developed to eliminate the inefficiencies of manual part mounting workflows. This was shown to be repeatable between mountings to within 0.5 micrometers, reducing setup time by 1000% in certain applications. Several test parts were machined from aluminum and copper using a monocrystalline diamond cutting tool. Part quality was inspected via Fizeau interferometry and atomic force microscopy to validate form and finish, respectively. The finished machine expands the university's manufacturing capability with an increase in precision on the order of 10x.

Title: Control and path planning for an unmanned ground vehicle in simulation

Primary Author: Wesley Lowman

Additional Authors: ;

Department/Program: Computer Science

College: College of Engineering

Abstract: The field of robotics continues to have an ever-growing presence in our daily lives. As such growth continues, opportunities for research have opened in a variety of areas of robotics, including artificial intelligence, human-robot interaction, and computer vision. One area of particular importance, which is the focus of this presentation, is robot path planning and control. In robotics, path planning is used to generate a trajectory for a robot to move from one point to another in a 3D-reference coordinate system. Essentially, this means creating a program to help the robot determine the most efficient way to travel from one point to another while accounting for all possible variables and obstacles. Control, on the other hand, ensures that the robot remains on the planned path to get there; it acts as a "real-time" calibration program. With these two ideas, the primary question this research contributes to is: "How can one create the most efficient autonomous route for an unmanned ground vehicle (UGV)?" This presentation will look at the motivations for this project's primary research problem along with the methodologies the student implemented to solve it. The methods implemented to answer include designing UGVs in SolidWorks, configuring them as Unified Robot Descriptions Files (URDFs), configuring the URDFs in RViz, and using Python to design a navigation program that would provide localization, mapping, and path planning. Control was implemented using the ros2_control library. The results of this project provide a dynamic project infrastructure that allows one to simulate robots in a Gazebo environment and use control and path planning to allow a UGV to find and navigate an environment in the most optimal manner possible. From this research, one will be able to understand how to provide viable solutions for optimizing the path planning process.

Title: Mitigating salinity effect on kale (brassica oleracea L. acephala) through split-root application

Primary Author: Dorcas Lukwesa

Additional Authors: ;Daniel Wells

Department/Program: Horticulture

College: College of Agriculture

Abstract: Saline aquaponics is a type of aquaponic system that uses saltwater as a medium for plants and fish production. The system uses elevated water salinity levels which limits the integration of most salt sensitive high value vegetables like kale. The differing water quality requirements between the plants and fish is the major limitation for saline aquaponics progress. Therefore, the current study focused on mitigating the effect of salinity on kale (Brassica oleracea L. acephala) through split-root application. The study was intended for application in saline aquaponics vegetable production. A completely randomized design with four treatments (T1 – 0ppt control), (T2 – 3ppt), (T3 - 6ppt) and (T4 - 9ppt) was set-up. Two growing conditions 'split-root' and 'single-root' were implemented. For the split-root, each test container had two sides of the root environment with side A containing the nutrient solution while side B was filled with city water. The treatment was applied to the nutrient solution under both growing conditions. The study evaluated the relative effect of split-root on growth index and physiological performance of the kale vegetable at different salinity levels. The plants under split-root had a higher growth index relative to their control than single root. There was no significant difference between the control and the rest of the treatments in relation to stomata conductance under split-root, while there was a significant difference between the control and rest of the treatments under single root system. The split-root system was able to mitigate the effect of salinity on kale vegetable which builds the baseline for application in saline aquaponics to grow high value vegetables.

Title: Mitigating salinity effect on Kale (Brassica oleracea L. acephala) through split-root application

Primary Author: Dorcas Lukwesa

Additional Authors: ;Daniel Wells;Emmanuel Ayipio

Department/Program: Horticulture

College: College of Agriculture

Abstract: Saline aquaponics is a type of aquaponic system that uses saltwater as a medium for plants and fish production. The system uses elevated water salinity levels which limits the integration of most salt sensitive high value vegetables like Kale. The differing water quality requirements between the plants and fish is the major limitation for saline aquaponics progress. Therefore, the current study focused on mitigating the effect of salinity on Kale (Brassica oleracea L. acephala) through split-root application. The study was intended to increase salinity threshold of kale for application in saline aquaponics vegetable production. A completely randomized design with four treatments (T1 – 0ppt control), (T2 – 3ppt), (T3 - 6ppt) and (T4 - 9ppt) was set-up. Two growing conditions 'split-root' and 'single-root' were implemented. For the split-root each test container had two sides of the root environment with side A containing the nutrient solution while side B was filled with city water. The study evaluated the relative effect of split-root on growth index and physiological performance of the kale vegetable at different salinity levels. The results showed that split-root had a higher growth index relative to the control than single root. There was no significant difference between the control and the rest of the treatments in relation to stomata conductance under split-root while there was a significant difference between the control and rest of the treatments under single root system. The split-root system was able to mitigate the effect of salinity on kale vegetable which builds the baseline for application in saline aquaponics to grow high value vegetables.

Title: Associations between aspects of anxiety sensitivity and eating disorder symptoms

Primary Author: Rylee Lusich

Additional Authors: K. Jean Forney;Tiffany Brown

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Prior research has found links between anxiety sensitivity (AS; “fear of fear”) and different eating disorder (ED) symptoms. However, there has been limited research exploring how specific aspects of AS (physical, cognitive, and social concerns) are related to specific dimensions of eating pathology. A more nuanced understanding of how AS and ED symptoms are related could aid in informing future interventions. The current study examined which aspects of AS were associated with ED symptoms in undergraduate students (N=382) with elevated eating pathology who completed surveys as part of a larger study across two universities. Participants completed questionnaires including the Anxiety Sensitivity Index-3 (ASI-3) and Eating Pathology Symptoms Inventory (EPSI). Separate regression models were run for each EPSI subscale with covariates (age, BMI, and gender) included in step 1 and ASI subscales in step 2. ASI Social concerns had unique associations with EPSI Body Dissatisfaction ($p<.001$) and Negative Attitudes Towards Obesity ($p=.007$). ASI Cognitive concerns were significantly associated with Binge Eating and Purging ($ps<.001$). ASI Physical concerns were significantly associated with EPSI Excessive Exercise ($p=0.02$) and Negative Attitudes Towards Obesity ($p=0.03$). Results support that different aspects of AS are associated with different ED symptoms. Social concerns were associated with body dissatisfaction and negative attitudes towards obesity, consistent with research linking fears of weight gain with fears of social rejection. Cognitive concerns were associated with binge eating/purging, consistent with links between worry and these symptoms. Physical concerns were negatively related to excessive exercise, consistent with exercise avoidance in individuals with panic symptoms. Future research should explore if different aspects of AS prospectively predict ED symptoms to help inform potential targets for intervention.

Title: Impact of artificial intelligence on the treatment of spinal cord injury

Primary Author: Graham Lynn

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The role of artificial intelligence (AI) in healthcare and healthcare administration has been under increasing focus as providers search for more cost-efficient and effective practices. One class of central nervous system related-injuries that may benefit from AI implementation is spinal cord injury (SCI). AI will play an important role in administrative tasks in healthcare such as chart scribing, billing, provider-provider, and provider-patient communication, possibly lowering the overall cost of SCI treatment. The implementation of AI serves not only to make healthcare more efficient but also may lead to quicker diagnosis, prevention, and treatment, as these patients generally remain disabled while afflicted with SCI. AI has already shown an increase in the accuracy of imaging-based diagnoses. Machine learning and pattern recognition of imaging abnormalities may increase the detection of SCI from imaging. With SCI having symptoms of speech impairment, language processing of these patient-provider interactions may yield highly accurate and useful diagnostic data for physicians, through the cross-referencing of many patient symptoms and reports. AI and machine learning also has a place in the interpretation, meta-analysis, and validity of data encompassing SCI injury. Analysis of gross data by AI may demonstrate pattern identification with an efficiency that current analytical methods can't match. AI will provide immense benefits in drug development and the discovery of SCI treatment. Genetic analysis, protein structure determination, constitutional analysis, predictive modeling, and synthesis planning have already shown promise with the implementation of AI in drug development. These applications may serve a vital role in developing medications that may alleviate secondary symptoms of SCI and possibly restore function. The prevalence of SCI and its effects on many aspects of patient life and health provide support for the need for the implementation of AI in the treatment of SCI.

Title: The sexually dimorphic developmental trajectory of the mouse adrenal gland transcriptome

Primary Author: Ben Maggard

Additional Authors: ;Jeff Huang;Yuan Kang

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: Many studies have shown that the adrenal gland is a sexually dimorphic organ. The objective of this research aims to highlight the differences in the expression of developmental genes that contribute to the sexual dimorphism of the adrenal gland using the mouse (Mus musculus) as the model organism. The specific goal for the Phase 1 of this project aims to discover trends of increasing or decreasing in the expression of genes in the mouse adrenal gland during postnatal developmental stages using RNA-seq. By comparing the RNA-seq data from mouse adrenal glands from postnatal day 0 to postnatal day 49, the data reveals patterns among many genes crucial to the sexually dimorphic development of the mouse adrenal gland. The study also aims to identify candidate genes and pathways that drive the sexual dimorphism and the age-dependent differences. By analyzing the read count data using the R program (R Studio), the study aims to identify differentially expressed genes (DEGs) between males and females at the same developmental stage comparing also the data from different developmental stages. The principal component analysis (PCA) analysis identifies linked trends attributed to the differential expression affecting the sexual dimorphism and the age-dependent differences. The weighted gene co-expression network analysis (WGCNA) identifies clusters (modules) of highly correlated genes between the same sexes at different developmental stages as well as differences between the sexes at similar developmental times. Pathway analyses (GO analysis) then identifies key pathways that are associated with each cluster/DEGs. Interestingly, the most differentially expressed genes across all P7 to P49 are linked to metabolic processes, suggesting genes associated with metabolic processes drive the age-dependent sexual dimorphism. Further analysis of the data will later be conducted using additional coding languages such as Python to further explore the data and for data visualization.

Title: High-resolution spinal cord imaging at 7T using rosette trajectory with compressed sensing.

Primary Author: Sultan Zaman Mahmud

Additional Authors: ;Seyedeh Nasim Adnani;Tom Denney;Adil Bashir

Department/Program: Electrical Engineering

College: College of Engineering

Abstract: MRI is a valuable diagnostic tool to investigate spinal cord (SC) pathology non-invasively. The ability to detect subtle pathological features in SC MRI is limited by spatial resolution, contrast-to-noise ratio (CNR), and physiological motion. SC MRI can benefit from the increased signal-to-noise ratio (SNR) and CNR at ultra-high fields such as 7T. Routine Cartesian MRI is prone to image artifacts caused by physiological motion. Non-Cartesian acquisition techniques such as Rosette can help reduce the artifacts caused by the physiological motion, as the Rosette imaging technique is inherently insensitive to bulk motion. Compressed sensing is a valuable tool to accelerate MR imaging time that can be very useful in clinical applications. Therefore, the goal of this study was to demonstrate the feasibility of high-resolution Rosette imaging of the SC at 7T with the application of compressed sensing (CS).

Title: Functional genetic analysis of Single Nucleotide Polymorphisms in drug metabolism genes

Primary Author: Katie Marlow

Additional Authors: Srikanta Kumar Rath;Amit Mitra;Abigail Weir;Salsabil Ahmed

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The objective of this research is to understand the pharmacogenomic biomarkers underlying variable drug response and differences in drug metabolism genes related to Indian subpopulations that have not yet been explored. Single Nucleotide Polymorphisms (SNPs) are a variation of a nucleotide at a single position in a DNA sequence. Several SNPs are associated with disease and can be used to provide a better understanding of how mutations effect function in the body. One of the causes of individual variation in drug effects is genetic variation of drug metabolism. Mutations in drug metabolizing genes could lead to the development of adverse drug reactions caused by change in efficacy or toxicity of the drug. Having this information will aid professionals in prescribing the best treatment for a beneficial outcome while also avoiding unwanted effects in a particular patient. The Human Genome project was an international scientific project completed in 2003 with a goal of completely mapping and understanding of all the genes of human beings, both physically and functionally. The populations chosen were those in or with ancestry from Europe, East Asia, South Asia, West Africa and the Americas. However, several large populations, including the Indian population, was largely left out of the project. In this study, we identified several novel and reported SNPs in drug metabolism genes within Indian subpopulations with wide diversity in allele frequencies. DNA sequencing and mutational analysis was conducted to find the most damaging mutations. This determined the functionally important SNPs that would be most effective to study for functional analysis using recombinant DNA technology. Next, *in vitro* mutagenesis in cultured cells will be performed to demonstrate the effects of the genetic changes. The results of this research will help in understanding how genetic diversity affects sub-population-specific differences in disease predisposition, drug metabolism, and drug response.

Title: A new perspective for the maternal mortality crisis: The potential impact of home interior design on maternal mental health in the postpartum year

Primary Author: Kelly Martin

Additional Authors: ;Taneshia West Albert;Lindsay Tan

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Public health scholars in the United States (U.S.) continue to request diverse research perspectives to address the alarming and growing problem of maternal mortality. The increasing rate of pregnancy-related deaths in the U.S., which may occur up to one year after giving birth, is characterized by clear disparities in race, ethnicity, and geographic location of residence. Maternal mortality review committees, who reviewed case data extensively, found that: 1) most deaths of mothers in the postpartum year were preventable, and 2) mental health disorders, like postpartum depression, play a frequent role in mortality rates. Preliminary evidence for the impact of the built environment on mental health and well-being outcomes has been established by a growing body of interior design literature, but most studies focus on workplace or clinical healthcare settings. While the home is the physical environment where most mothers complete the healing process after birth and adapt to their motherhood role, a major gap exists in the literature related to how interior design features of the home may play a role in maternal mental health outcomes. This research investigates the potential impact of home interior design features on the mental health and well-being of mothers in the postpartum year. Data collected from a multi-question, online survey instrument administered nationally to 400 women, found preliminary evidence for key interior design features of the home that may influence the development of postpartum depression through the environment’s impact on maternal well-being. Results from this study lay the groundwork for additional research into the possible role of home interior design features in supporting positive maternal mental health outcomes. Additionally, these findings position interior design researchers to provide a diverse perspective to positively affect the maternal mortality crisis in the U.S.

Title: *Thuja occidentalis* and its therapeutic and pharmacological applications

Primary Author: Nick Martin

Additional Authors: Reeta Vijayarani;Muralikrishnan Dhanasekaran;Suhrud Pathak;Sindhu Ramesh;Timothy Moore;Rishi Nadar;Mohammed Almaghrabi

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: The synthetic medications that are now available might not be suitable or adequate for treating and/or preventing diseases in humans and animals. Synthetic drug treatments are also linked to a wide range of adverse effects, hypersensitivity responses, availability, and price. Therefore, innovative techniques that have various pharmacodynamic effects, suitable pharmacokinetic effects, minimal or no toxicity, and cost-effectiveness are urgently needed to enhance human and animal healthcare. Many natural products are currently in great demand because they include beneficial bioactives that have significant pharmacodynamic effects with few or no contraindications compared to synthetic pharmacological agents. *Thuja occidentalis*, the tree of life, or more commonly known as, American cedar and White eastern cedar is grown mainly in European regions and is used as a medicinal plant on account of its therapeutic administration. It belongs to the Cupressaceae family. This study was conducted by reviewing peer-reviewed articles up to February 2023 from the following databases: PubMed and Google Scholar, using suitable keywords for the bioactives and pharmacological applications of *Thuja occidental* in human and animal pathologies. We found that, *Thuja occidentalis* exhibits pharmacological effects through its coumarins, flavonoids, and many essential oils. These effects include anti-inflammatory, antioxidant, antifungal, antibacterial, gastroprotective, antiviral, antipyretic, and anticarcinogenic activity. *Thuja* also carries protective effects against toxicity induced from radiation and regulates glucose and lipid metabolism. This allows *Thuja* to be used as a treatment or preventative measure for various human and animal pathologies.

Title: 3D-printed oral films in addressing pediatric non-adherence to medication

Primary Author: Joy Massey

Additional Authors: ;Chu Zhang;Manjusha Annaji;Nur Mita;Jayachandra Ramapuram;Ishwor Poudel

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Patient non-compliance is a top reason for nonadherence to medication. Specifically, in the pediatric population, medicine nonadherence is expected due to the administration difficulties to traditional oral dosage forms: tablets and capsules. Moreover, palatability concerns and poor aesthetics can deter pediatric patients from adhering to medications. Oral films are a developing oral dosage form that could address these issues. Oral films are ideal for this population because they do not require water with administration and use hydrophilic polymers to disintegrate rapidly upon contact with saliva. Most oral dosage forms go through first-pass metabolism, whereas in contrast, mucoadhesive films adhere to the oral mucosa, or orodispersible can rapidly dissolve in the mouth, facilitating absorption and intake. This dosing form is advantageous because it provides quick systemic absorption like the intramuscular route but is pain-free, like tablets and capsules. A step further, 3D-printed oral films are an upcoming dosage form that could incorporate optimization as a personalized medication. 3D printing also offers unique shapes and colors without harm. Our project focuses on optimizing 3D-printed pediatric drug-loaded oral films using water-soluble polymer. A pneumatic extrusion printing technique was utilized for drug-loaded semisolid feed through a needle/nozzle utilizing air pressure. This technique offers fast fabrication of an oral film. Moreover, pneumatic extrusion techniques are ideal for small batches in a compounding setting. With the nature of pediatrics and individualized medication, this technique would be ideal. Oral films are primarily composed of film-forming polymers. Considering the polymers as a critical component, we investigated polymers like Hydroxypropyl methylcellulose (HPMC), Polyvinylpyrrolidone (PCP), and natural polymers like guar gum (GG) for this project, which are both promising agents in the ODF industry. The fabricated films will be further tested for appearance and release properties in artificial salvia to calculate in vitro release

Title: An inventory of U.S. Universities with GIS certificate opportunities

Primary Author: Jacob Mayberry

Additional Authors: ;Luke Marzen

Department/Program: Geography

College: College of Science and Mathematics

Abstract: Geographic Information Systems (GIS) involves a system that allows users to create, manage, analyze, and map geospatial data tied to locations on the earth. The U.S. Department of Labor has recognized geospatial technology as a high growth field. Over 500,000 professionals in many fields are asked to use GIS in their jobs. The Bureau of Labor Statistics is anticipating growth nearing 20% in the upcoming years. To gain the skills and knowledge in GIS, one can seek higher education and professional certification through academic institutions. In regard to GIS certification, there are numerous ways an individual can receive certification. These programs are found across the United States at many institutions where GIS certificates can be received at the undergraduate and graduate levels, and there are also some two-year institutions who offer certificates. Within the United States there are currently 270 universities that offer GIS certificates at the associate, bachelor, and graduate level. Out of the 270 universities that offer GIS certification, 198 offer certification at the associate and bachelor level. There are 118 universities which offer certification at the graduate level. These universities offer certification for degree-seeking and non-degree seeking students. Only 48 universities offer both undergraduate and post-graduate certifications. Wikle et al (2020) discusses the administration of GIS Certificate programs across the U.S. and this project expands the information about the GIS certificate programs through the creation of an online geospatial database containing all institutions offering certificate programs in GIS. The locations on the map give details on the programs that each university offers. Information provided includes which certificate type is offered, hours in order to gain the certification, contact and application information, number of instructors, and a website link to each institution. The interactive map allows potential students whom are interested in GIS to find institutions across the country that offer the GIS certification.

Title: Functionalized nanocellulose aerogels for oil spills absorption

Primary Author: Emmie Mayson

Additional Authors: Dr. Soledad Peresin;Soledad Peresin;Yufei Nan;Diego Gomez Maldonado

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: In recent years, oils released during industrial accidents and waste management by ships have been catastrophic for marine and aquatic ecosystems. Not only have numerous sea birds and mammals been killed by contact with these spilled oils, but sand on seaside beaches has been heavily contaminated. Various techniques are currently available for selectively removing oil from water. Among the various oil removal techniques, absorbent materials are a popular cleanup method for their ease of access and use as well as low operating costs. However, the most popular open-ocean absorbent materials are not biodegradable and remain in the environment for long periods of time after their use, causing secondary pollution. Therefore, the development of novel absorbent materials with high sorption capacity, environmental friendliness, and chemical inertness is crucial for oil-spill response operations. Cellulose is becoming a popular material for producing biodegradable oil absorption sponges for its abundance and strength of its fibers. Cellulose nano-fibrils (CNF) specifically, nano fibers that are extracted from larger sources of cellulose, are popular for their high specific surface area and strong mechanical properties. The aim of this work is to find suitable replacement for oil spill absorption by comparing the properties and absorption performance of Phenyltrimethoxysilane (PTMOS) functionalized CNF aerogels. These aerogels are produced from 3 chemically modified nanocellulose (6-carboxyl-CNFs, 2,3-aldehyde-CNFs and 6-carboxyl-2,3-aldehyde-CNFs), and unmodified control nanocellulose for comparison. The results showed that the 2,3-aldehyde-CNF aerogels demonstrate suitable structural and chemical stability as well as the capacity to be recycled. Therefore, this aerogel is promising as a sustainable replacement to traditional plastic sponges in oil spill cleanup.

Title: An analysis of the developmental factors suggesting juvenile sexual offender registry reform

Primary Author: Shelby McAlister

Additional Authors: ;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: This presentation outlines a theoretical model for reforming and/or repealing the youth sex offender registry in the United States. Adolescents adjudicated for illegal sexual behavior (AISB) experience considerable developmental stress in many aspects, specifically through the mandated sexual offense registry and public notification standards in many states. Decades of research has documented that youth registries cause unintended developmental stress in individuals, with reports of higher rates of harassment, adult solicitation, sexual assault, and suicide attempts after being released from treatment. Many states have reformed or repealed youth registries in response to this data, but 12 states remain with public youth registries, including Alabama. This topic is important to our understanding of juvenile justice, as it documents evidence of stigmatization and harm for an offender after successful completion of treatment. A criminal justice system must accurately and adequately weigh the risk to public safety when considering continued monitoring of any offender after their debt to society has been fully paid. The intent of this poster is to bring awareness to the drastic effects that sexual offense registries have on incarcerated youth and their families. Developmental theories of criminal trajectories (i.e., adolescent-limited and life-course persistent pathways) will be discussed to highlight the developmental harm caused by youth registry during a vulnerable life transition. Evidence suggests AISB who have successfully completed treatment, and their families, would benefit more from continued mental health care than from continued monitoring. The current literature review will serve as the foundation for a policy proposal for federal youth registry reform. Data will be presented from a 20-year AISB treatment program documenting successful rehabilitation and overall low risk for reoffending by this population, adding further evidence for youth registry reforms.

Title: Temperature adaptation and acclimation in southern pine species and populations

Primary Author: Katelyn McBride

Additional Authors: Michael Aspinwall;Heather Alexander

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Warmer and more variable temperatures have the potential to alter the health, function, and sustainability of southern pine forests, as well as the economic and ecological benefits they provide. Tree responses to warming and temperature variability likely differ among pine species and populations, as each may possess different physiological adaptations and temperature tolerances. Despite a rich history of research on southern pines, our basic understanding of temperature adaptation and genetic variation in temperature acclimation in southern pine species remains limited. To address this, we conducted a common garden experiment with loblolly *Pinus taeda*, longleaf *Pinus palustris*, shortleaf *Pinus echinata*, and slash pine *Pinus elliottii*. Seedlings were selected from three or more geographically distinct populations for each species, allowing us to explore genetic differentiation in temperature adaptation and acclimation between species. We tested the hypothesis that species and populations from cooler and more seasonal climates will generally show a lower photosynthetic temperature optimum, higher basal rates of leaf respiration, and a greater capacity for seasonal temperature acclimation of photosynthesis and respiration in comparison to species and populations from warmer and less seasonal climates. This study's findings regarding the photosynthetic and respiratory responses of southern pine species to temperature variation can inform models of vegetation responses to climate change as well as management decisions aimed at sustaining or improving southern pine forest productivity into the future.

Title: Medicinal mushrooms and the cognitive enhancing effects in potential protection against dementias

Primary Author: Phillip McCain

Additional Authors: ;

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Dementia is a neurodegenerative disease that affects memory and learning. This chronic brain disorder additionally can cause depression and hallucinations. Inflammation and oxidative stress are believed to contribute to the pathogenesis of dementia, as an imbalance of oxidants and antioxidant homeostasis, as well as pro-inflammatory and anti-inflammatory cytokines, cause neural inflammation and an increased rate of reactive oxygen species generation. Natural mushrooms, enriched with antioxidants, medicinal, and anti-inflammatory properties, are gaining popularity as agents to provide beneficial neural effects, such as protecting neuronal excitotoxicity, hindering oxidative stress, and promoting the human immune response. Mushrooms such as *Hericium erinaceus* and *Coriolus versicolor* have been determined to enhance cognitive function and reduce progression of two specific types of neurodegenerative diseases - Alzheimer's and Parkinson's disease. The bioactive compounds in these mushrooms include erinacines, polysaccharopeptides, terpenoids, and polyphenols. Erinacine A, one of the main bioactive components, effectively reduces neurodegeneration and dementia and has no known adverse side effects. The mycelia can be supplemented in a diet and are safe for oral consumption over an extended amount of time. This presentation summarizes current scientific information on the health properties of *H. erinaceus* and *C. versicolor* to contribute to prophylactic and therapeutic findings regarding neural protection against dementia.

Title: Self-folding of liquid crystal elastomer composite films

Primary Author: Greg McCallum

Additional Authors: ;Yi-Hung Lin;Russell Mailen;Bryan Beckingham

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: In this work, we seek to fabricate self-folding liquid crystal elastomer (LCE) composite films. Liquid crystal elastomers (LCEs) are a class of smart, multifunctional materials and can be imparted with enhanced, anisotropic mechanical properties as a result of alignment of crystalline domains. This enables programmable, reversible actuation in response to temperature changes. The envisioned composite films comprise domains of active, monodomain LCEs to drive reversible self-folding, which are adhered to passive, thin films that serve as a framework to guide the self-folding response. LCEs will be synthesized using a two-stage thiol-acrylate Michael addition and photopolymerization (TAMAP) reaction. The first-stage consists of a room temperature cure to form polydomain films, and the second-stage photopolymerization forms aligned liquid crystal monodomains. Crystalline order decreases with increasing temperature, and long-range order is lost above the nematic to isotropic transition temperature, TNI. Composite films will be molded to a folded state prior to the second stage cure such that heating above TNI produces a reversible unfolding. We characterize the self-folding behavior of these materials using a series of single-fold and multiple, intersecting fold geometries. We envision application of these composite films as actuators in soft robotics and morphing surfaces.

Title: Recruitment and retention in a pediatric wellness initiative, Nourish Wellness

Primary Author: Kendall McCallum

Additional Authors: ;

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Minority individuals–particularly children–are disproportionately confronted with an increased risk for obesity, diabetes, and other chronic illnesses. The healthcare system plays a critical role in treating and managing chronic disease. However, healthcare reach and access remain limited. Nourish Wellness is a clinical community initiative for youth and their families seeking to implement and evaluate a flexible, clinical-community pediatric wellness initiative in a community-based clinical setting with various aims. Nourish Wellness aims to partner alongside adolescents and their families, with the outcome that the children's health routines, patterns, and habits can be positively influenced in the long run. For this specific study, the objective is to describe participant recruitment and retention for a one-year clinical community-based pediatric wellness initiative, Nourish Wellness. The participant's and caregivers' characteristics will be utilized to describe those who enrolled with Nourish Wellness and what the engagement looked like over the initial six months. Those with eligibility for the program included individuals ages five to sixteen years who have conditions or are at risk for conditions related to obesity, hypertension, and type two diabetes. Convenience sampling was done by primary care physicians, school nurses, and school counselors for up to forty patients. Anthropometric and clinical measures have been conducted for both the patients as well the caregivers. Validated questions based on a brief interview checklist have provided the quality of life, demographics, and past/current medical history of each participant and caregiver. Statistical analysis is currently underway to determine the characteristics of those originally engaged in the program as well as the maintained engagement of participants. Findings will be presented and conclusions offered to inform the continued success of Nourish Wellness.

Title: Predicting COVID-19 hospitalizations: A systematic review of prevailing AI/ML/DL model characteristics

Primary Author: Nick McCormick

Additional Authors: ;

Department/Program: HORP

College: School of Pharmacy

Abstract: The utilization of Artificial Intelligence (AI) models through Machine Learning (ML) and Deep Learning (DL) can predict patient hospitalization due COVID-19, with the optimization of ML and DL being of great importance for future real-world application. Common methods of ML and DL, e.g, Linear Discriminant Analysis (LDA), Linear Regression (LR), Decision Trees (DT), XGBOOST (XGB), Support Vector Machine (SVM), etc., vary in both their implementation feasibility on a given dataset and their prediction accuracy. Through the review of literature, published instances of ML utilization and their associated prediction accuracy of patient hospitalization, measured as reported AUC-ROC, denotes Random Forest, XGBOOST, and LR as yielding the highest accuracies. DL methods still yield applicable and accurate predictions of patient hospitalization with Neural Networking being the most utilized and accurate. Alongside ML and DL methods, a primary effect on prediction accuracy derives from the factors that are implemented in the models. Variations in available predictive factors can be great from one dataset to another, however, commonalities still arose across publications emphasizing pertinent factors of COVID-19 that are most suitable when generating a predictive model. Commonly utilized predictive factors by authors fall into two camps: 1) factors that are available in most Electronic Health Record (EHR) databases without additional in-patient testing, such as age, sex, respiratory rate, heart rate, and disease comorbidities and 2) factors that require additional salvatory and/or blood laboratory testing, such as hemoglobin, AST, ALT, and LDH. Factors that require additional laboratory testing are more resource intensive and are less commonly provided for patients prior to entering an in-patient, hospital setting, but significantly increase predictive accuracy. These results inform which AI models may be most advisable for future, real world health care settings and serve as an exemplar for use in predicting patient hospitalizations due to illnesses analogous to COVID-19.

Title: Population-based estimates for factors associated with individualized A1C targets among adults with diabetes

Primary Author: Cassidi McDaniel

Additional Authors: Wei-Hsuan Lo-Ciganic;Kimberly Garza;Jan Kavookjian;Brent Fox;C. Edward Chou

Department/Program: HORP

College: School of Pharmacy

Abstract: This study aimed to investigate factors associated with individualized A1C targets recommended by the American Diabetes Association. The study applied a serial cross-sectional design among a nationally representative sample of non-pregnant adults (≥20 years old) with A1C labs and self-reported diabetes using the 2015 - March 2020 (pre-pandemic) National Health and Nutrition Examination Survey (NHANES) data. The primary endpoint, A1C lab values, was dichotomized into meeting vs. not meeting individualized A1C targets that were determined based on age and the number of chronic conditions as reported in other literature. Multivariable logistic regression with stepwise selection was applied to determine associations between meeting individualized A1C targets and various factors (e.g., medication use, patient factors, clinical factors, behaviors, etc.). Among 2,042 adults with diabetes (mean age 60.63 (SE=0.50), 55.26% (95%CI=51.39-59.09) male, and 64.49% (95%CI=59.19-69.53) non-Hispanic White/other race), 63.08% (95%CI=59.13-66.90) met individualized A1C targets. Factors associated with lower odds of meeting individualized A1C targets included male vs. female gender (adjusted odds ratios [aOR]=0.69, 95%CI=0.54-0.88), non-White race (Hispanic: aOR=0.34, 95%CI=0.18-0.65; non-Hispanic Black: aOR=0.63, 95%CI=0.44-0.90; non-Hispanic Asian: aOR=0.50, 95%CI=0.25-0.98 vs. non-Hispanic White/other), widowed/divorced/separated vs. married/living with a partner (aOR=0.67, 95%CI=0.50-0.89), insulin use vs. no use (aOR=0.17, 95%CI=0.11-0.27), sulfonylurea use vs. no use (aOR=0.35, 95%CI=0.24-0.51), and no insurance for prescription drug cost covered vs. covered (aOR=0.16, 95%CI=0.04-0.62), etc. Nationally representative survey data analyses suggest that two-thirds of adults with diabetes met individualized A1C targets, with 37% exceeding these. This study identified factors associated with individualized A1C targets that may inform person-centered strategies for diabetes management.

Title: Parental attachment and parenting styles in incarcerated youth

Primary Author: Maddy Mcdaniel

Additional Authors: ;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: A lack of sufficient early childhood attachment in sex offenders has been theorized as a possible mechanism by which problematic sexual behavior develops, often leading to pursuits of intimacy in an unhealthy manner. Initial trials to explore attachment styles in sexual offending populations found high levels of insecure attachment, although not significantly more than in non-sexual offender populations. Some studies have found a neglectful parenting style (low in discipline, monitoring, structure, cohesion, and authoritarian beliefs) was associated with more severe types of criminal offending behavior, particularly for those with multiple offenses. In contrast, high levels of positive parenting, adequate discipline, structure, and cohesion were less likely to be involved in any offending groups. Task-oriented families (high levels of structure but low levels of warmth and beliefs about the family), which may be similar to the authoritarian parenting style, appeared more likely to be involved in serious offending. While developmental theories suggest that there are many factors contributing to antisocial behaviors, including economic, social, and individual factors, but a connection between patterns of family function and offending behavior is still clear. The current study investigated parenting styles in a sample ($n = 511$) of incarcerated youth. The sample included male youth in court-mandated treatment for serious delinquent behavior, including illegal sexual behavior. A series of one-way ANOVAs were used to compare the groups on maternal and paternal parenting styles. The groups differed significantly on maternal indifference ($p < .001$), maternal abuse ($p = .04$), and paternal indifference ($p = .01$). The group living with other biological relatives expressed the highest amount of maternal indifference. Those with adoptive parents reported the highest rates of maternal abuse, which may be reflecting the circumstances necessitating custodial change.

Title: Açai extracts and botanical supplements: Potential CYP induction-based botanical-drug interactions

Primary Author: Kelli McDonald

Additional Authors: ;Angela Calderon;Satyanarayana Pondugula;Julia Salamat;Kabre Heck;Catherine Dennis;Christin Keeton;Meredith Almy

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: <<Euterpe oleracea>> Mart., commonly known as açaí, has recently gained popularity and is among the top 40 botanicals currently used in the US. Each year, more açaí food products and botanical supplements are being produced. As with many trending botanicals, the safety of these food products/botanicals have not been fully studied. With their increased use, it is important to elucidate their potential for botanical-drug interactions and toxicity. In this study, we have obtained certified açaí fruit, as well as two over-the-counter açaí botanical supplements (Natrol and Nature's Way). We extracted the açaí fruit with water (AQ), ethanol (ET), methanol (ME), and acidic methanol (AC). Furthermore, the 2 açaí botanical supplements were extracted in methanol (ME) and acidic methanol (AC). The lyophilized extract powders were then optimized for solubility and found to be a 15% acetonitrile:85% water solvent mixture. Utilizing the hepatocyte sandwich technique, primary human hepatocytes were treated with human relevant dose concentrations (standardized to cyanidin 3-glucoside concentrations) of the individual açaí extracts (0.01439 – 0.00017 mg/mL). CYP (CYP3A4, CYP2B6, CYP1A2) levels were analyzed via RT-PCR to determine if the açaí extracts induced CYP transcription. Our initial findings show that the acidified methanol extract of the Natrol açaí botanical supplement does produce induction of CYP1A2. This effect could result in the increased metabolism of some drugs, such as clozapine, which would result in lower efficacy. Our next round of treatment will be performed using a higher concentration of açaí (50x greater), comparable to current food products and supplements. This study highlights the importance of a rigorous experimental design to assess the potential for botanical-drug interactions with açaí supplements.

Title: Different resistance exercise paradigms similarly affect methylation status and mRNA expression patterns of myostatin-related genes in skeletal muscle

Primary Author: Mason Mcintosh

Additional Authors: Dr. Adam Philip Sharples;Casey Sexton;Joshua Godwin;Bradley Ruple;Max Michel;Daniel Plotkin;Christopher Vann;Michael Roberts

Department/Program: Kinesiology

College: College of Education

Abstract: Many resistance exercise (RE) studies have used bioinformatics platforms to identify gene expression changes; however, these platforms seldom provide in-depth information on genes mechanistically linked to skeletal muscle hypertrophy. Thus, we sought to perform a secondary analysis on previously collected data involving two different bouts of RE. Previously trained college-aged males (n=11, training experience: 4±3 years) performed two RE bouts. The higher-load bout (80fail) consisted of 4 sets of back squats and leg extensions to failure using 80% of their one-repetition maximum. The lower-load bout (30fail) consisted of this same paradigm using 30% of their one-repetition maximum. Vastus lateralis muscle biopsies were collected before (PRE), 3 hours (3h), and 6 hours (6h) after each exercise bout and were separated by a one-week washout. Muscle mRNA was analyzed for genome-wide mRNA expression patterns using the Clariom S mRNA array. Based on a literature search, the mRNA expression profile of gene candidates mechanistically associated with skeletal muscle hypertrophy (58 genes) was interrogated between 30fail and 80fail. Select targets were further interrogated for associated protein expression and phospho-signaling events. ~57% of the gene targets displayed a significant time effect from PRE to 3h (15↑ and 18↓, $p<0.01$) and ~26% showed a significant time effect from PRE to 6h (8↑ and 9↓, $p<0.01$). There were increases in phospho (Thr389)/pan p70S6K ($p=0.001$; PRE to 3h) and follistatin protein levels ($p=0.021$; PRE to 6h) regardless of the bout. No significant time effects or interactions were observed for phospho (Ser2448)/pan mTOR, phospho (Thr389)/pan AKT, phospho (Ser235/236)/pan rpS6, or myostatin protein levels. To conclude, performing lighter load and heavier load RE to failure elicits similar responses in genes mechanistically associated with skeletal muscle hypertrophy.

Title: Investigating the use of bacteriophage to control Salmonella enterica in recirculating water systems for vegetable production

Primary Author: Vania Paula Mickos

Additional Authors: ;Steven Kitchens;Stuart Price;Daniel Wells;Camila Rodrigues;Mark Liles

Department/Program: Horticulture

College: College of Agriculture

Abstract: Foodborne pathogens frequently contaminate vegetables. Concerns about food safety in Controlled Environment Agriculture (CEA) systems have grown in recent years. As a result of the rise of bacteria with antibiotic resistance, new strategies for controlling foodborne pathogens are required. The use of biological controls, such as bacteriophages, is one example of an alternate strategy that may be used to regulate and avoid the presence of microbial contamination in food. This study investigates the use of a phage cocktail to manage Salmonella enterica in water recirculation systems. Three previously identified and characterized phages (S7, S10, and S13) that target S. Newport and S. Typhimurium were obtained from the Auburn University Veterinary School and utilized in this research. A plaque assay was performed to determine the three phage titers in S. Newport and S. Typhimurium cells. Using the three tested phages at different temperatures (30, 25, and 20 °C) and concentrations (10, 1, 0.1, 0.01, and 0.001), a phage cocktail was prepared against Salmonella Newport and Salmonella Typhimurium (1.5 x 108 CFU/mL). Bacterial concentration was determined by absorbance reader at OD595 at 30-minute intervals per 6 hours and after 24- and 48-hour incubation. The phage cocktail reduced S. Newport and S. Typhimurium growth by 2 - to 3-fold at all phage concentrations, and temperatures when compared to the control ($p<0.05$). This indicates that bacteriophage cocktails might be a promising method for controlling Salmonella enterica in water systems for CEA.

Title: Genetic analysis of the Mulchatna caribou herd from southwest Alaska

Primary Author: Andrea Miranda Paez

Additional Authors: Renae Sattler;Janna Willoughby

Department/Program: Wildlife Ecology and Management

College: School of Forestry

Abstract: Indigenous people in Alaska and elsewhere have relied on caribou (*Rangifer tarandus*) for generations for various cultural practices and as a critical food resource. However, caribou herds range-wide have declined over the last two decades putting these activities at risk. In a collaborative effort with the Alaska Department of Fish and Game, we are working to identify genetic causes of reduced reproduction in the Mulchatna caribou herd, an essential resource for many people who live in Southwest Alaska. We are specifically interested in understanding how the genetic characteristics of the caribou population has changed over time and how these changes may be altering herd fitness. Blood samples from 136 individuals from the Mulchatna herd, including representatives from East, West, and Central groups, were sequenced using reduced representation sequencing. Using the resulting 20,000+ variable sites across the genome (SNPs), we quantified inbreeding coefficients in the Mulchatna herd (East, West, and Central) and identified ancestry groups. We found only a single genetic cluster, suggesting that individuals from the East, West, and Central are equally related to each other and that these groups interbreed. These results may be due to low philopatry or the short time period since anthropogenic barriers have restricted movements. Because we did not detect differences between herd groups and yet differences in fitness between these groups exists, this suggests that low genetic diversity may be of limited effect on fitness in the Mulchatna caribou or that genetic diversity interacts with other stressors. In the future, we will mine our data for additional insights to aid in the management and conservation of this critical resource in Alaska.

Title: PLGA-based in situ forming implant loaded with Capsaicin: An injectable delivery system for the treatment of obesity

Primary Author: Nur Mita

Additional Authors: ;Haley Kim;Manjusha Annaji;Jayachandra Ramapuram;Ishwor Poudel;Oladiran Fasina

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Capsaicin, a TRPV-1 receptor agonist, is an anti-obesity drug that enhances metabolism, energy expenditure, and thermogenesis to counter HFD-induced obesity. However, its low solubility in an aqueous environment, short half-life and bioavailability, and the adverse side effects of oral administration hampered the clinical development of capsaicin. In-situ forming implant (ISFI), an injectable-implant drug delivery system, can overcome those problems. The research aimed to develop an optimum capsaicin-loaded Poly Lactic-co-Glycolic Acid (PLGA-ISFI) for treating obesity. Capsaicin-loaded ISFIs were formulated by dispersing capsaicin into Poly Lactic-co-Glycolic Acid Dimethyl Sulfoxide (PLGA-DMSO) solution, with different liquid lipids as the drug release retarders, i.e., Kolliphor® RH 40, Labrasol®, and Maisine®, then characterized for their visual appearances, viscosities and solidifying times. In vitro release study was carried out using Sample and Separate method, whereas the samples were collected at 0, 2, 4, 8, and 12h, 2 to 7 days, then weekly for up to 4 months, and analyzed using the High- Performance Liquid Chromatography (HPLC) method. Their initial burst release and kinetics models were compared, then characterized the selected formulation by its morphological features and thermal analysis by differential scanning calorimetry (DSC). The injectability parameters in various syringe and needle dimensions were predicted based on the ISFI rheological behavior. A stability study was performed for six months at room temperature. The result showed that CM75 (7.5% capsaicin-loaded ISFI with Maisine®) was the selected formulation with the specification of transparent yellowish, has spontaneous solidifying time, a viscosity of 134.97 ± 0.12 mPa.s at 20 rpm, and following Newtonian fluid behavior. The predicted injection forces in 19 – 30 Gauges were within the acceptable values. Capsaicin was sustained released from ISFI entirely in 4 months following the Korsmeyer-Peppas model with a very minimum initial burst release of 7.97% ± 1.29 %. The assay showed a stable ISFI formulation with a recovery of 96.35 ± 0.58%.

Title: Rural-urban disparities in service utilization and support provision by type-2 diabetes family members

Primary Author: Hannah Montgomery

Additional Authors: ;Allie Keller;Kate Bouchillon;Joshua Novak

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: Previous research has demonstrated greater disparities between those in rural and urban locations regarding diabetes outcomes, however, little work has been done on differences of family members on diabetes involvement. The present study sought to examine the rural-urban differences in service utilization (e.g., diabetes self-management attendance, therapy attendance, and satisfaction with information and frequency of resource access) and support provision (e.g., active engagement, protective buffering, and overprotection) by 446 family members of persons with type 2 diabetes. A series of ANOVAs were performed with Tukey's post hoc test to determine differences between rural, suburban, and urban/metro. Results revealed significant differences between rural and urban as well as between suburban and urban in both positive and negative types of support and service utilization. These findings highlight that families involved in interventions could be an important and fruitful avenue for reducing geographically based health disparities in diabetes outcomes.

Title: Role of tra gene in sex dimorphic immune gene expression in Drosophila melanogaster

Primary Author: Adrian Moolman

Additional Authors: ;Md Mursalin Khan;Rita Graze

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract:

Sex differences in immune function have been observed in many organisms, including in Drosophila. A better understanding of sex dimorphism in the innate immune response of Drosophila will contribute to an overall understanding of the evolution of sex differences in immunity, as well as an understanding of variation in immune function, physiology, and lifespan. The canonical sex-determination pathway is the key regulator of sex dimorphism. Perturbation of core sex determination pathway genes will determine if there is a regulatory role of the sex determination genes on sex dimorphism of the immune response. To understand the role of one of the conserved sex-determining gene *transformer (tra*), we generated *tra* null and *tra* over-expressed *D. melanogaster* from transgenic lines. We used *tra* knockdown flies to observe the effect of the absence and overexpression of the *tra* protein on immune response against gram-negative bacterial *Providencia rettgeri* (PRET). The survival analysis, bacterial load determination, and bacterial load upon death (BLUD) were performed in *D. melanogaster* to examine the effect of the *tra* gene on immunity. The survival data of the *tra* -null and overexpression demonstrated the significant impact of tra on survival. The *tra* null Pseudomales showed a lower survival rate than males and females. Likewise, the *tra*-overexpressed Pseudofemales exhibited a higher survival rate compared to males and females upon PRET infection. Moreover, the bacterial load and BLUD provided an indication of the important role of the *tra* gene on immunity. Overall, the data demonstrated the regulatory role of *tra* on sex dimorphic immune gene expression in flies. For further investigation, the samples of the *tra* -null and overexpression were sent for RNA sequencing.

Title: Identifying single shift quality (SSQ) measures in the case of nursing students

Primary Author: Kelly Moore

Additional Authors: ;Haneen Ali;Yasin Fatemi;Astin Cole

Department/Program: Health Services Administration

College: College of Liberal Arts

Abstract: As a result of recent workforce shifts, the mental health of frontline healthcare workers affects patient outcomes now more than ever. The Single Shift Quality (SSQ) project seeks to answer the question: what interactions, events, or environments have the authority to define a shift as “good” or “bad” in a future nurse’s eyes? Through research and data collection, the capability exists to prevent medical errors before they occur, block catalysts of burnout among healthcare workers, and create a more sustainable future for healthcare organizations. This project determines specific factors that significantly influence these nursing students’ perceptions of their abilities, workloads, and stress. We first determine a suitable instrument for data collection, then conduct nursing student interviews to identify key determinants of shift quality. Data is then synthesized to identify and evaluate the factors contributing to stress. This research aims to (1) assess the degree to which nursing students can predict a single shift’s potential level of stress through the comparison of the student’s predicted perceived stressors at the start of the shift with their observed and experienced stressors at the time they clock out; and (2) analyze and pinpoint the factors contributing to perceived SSQ from a student nurse’s perspective by identifying changes in indicators from discernable stressors both before and after the shift. Ultimately, this project seeks to positively impact nursing workflow, improve patient safety, and reengineer shortcomings stemming from inadequate processes in healthcare.

Title: The effects of anxiety training on performance under pressure: Investigating the psychological mechanisms

Primary Author: Daniel Morris

Additional Authors: ;Juliana Otoni Parma;Kaila Green;Georgia Kamburis;Dustyn Lewis;Amanda Young;Matthew Miller;Daniel Cabral

Department/Program: Kinesiology

College: College of Education

Abstract: Research has shown that training a motor skill under pressure (anxiety training [AT]) can help prevent deterioration of that skill when individuals subsequently perform under pressure. The current work aims to investigate the effect of AT on subsequent motor performance during low-, mild- and high-pressure post-tests and the mechanisms behind the potential benefits of AT to performance under pressure. Participants were randomly assigned to one of two groups: (1) The AT group practiced 300 golf putts under mild levels of anxiety (i.e., They were recorded and had the chance to win money based on their performance); (2) The control group practiced 300 putts but with no pressure. One week later, participants performed low- (no pressure), mild- (same as the AT practice), and high-pressure (chance to win more money and a person watching them live) post-tests. Participants completed questionnaires related to mental effort, perceived challenge/threat, and movement reinvestment after each condition. These are potential candidates to explain the benefits of AT. Participants also completed an anxiety questionnaire after each condition in order to ensure the pressure manipulation was successful. Results revealed that the pressure manipulation was successful, as anxiety levels increased across post-tests. The AT group maintained performance from one post-test to the other, whereas the control group reduced performance from low- to mild- to high-pressure post-tests. Additionally, participants in the AT group showed similar movement reinvestment scores across post-tests, whereas participants in the control groups showed increases in reinvestment from one post-test to the other. Furthermore, both groups showed systematic increases in mental effort across post-tests. In conclusion, training under mild levels of anxiety prevented post-test performance decrements under mild and high levels of anxiety. Movement reinvestment seems to be a potential mechanism to explain the AT advantage.

Title: Implementing camp-based education to increase childhood asthma knowledge

Primary Author: Taylor Kate Murphy

Additional Authors: Linda Gibson-Young;Linda Gibson-Young

Department/Program: Nursing

College: School of Nursing

Abstract: Childhood asthma is the most common chronic childhood condition in the United States, affecting 8.6% of children. Despite its prevalence, asthma is a critically misunderstood disease and requires exploration with social determinants of health. Findings have examined the relationship of socioeconomic status, health literacy, and asthma knowledge with home management of childhood asthma. Our study examines how community interventions are addressing such variables with asthma control. Asthma Camp Eagle is a 4-day, 3-night camp in Alexander City, AL designed to educate children 7-12 years of age with asthma. This study explores relationships with SES, knowledge, and literacy in children and families attending camp over the past 4 years. We implemented a camp intervention for children 7-12 years of age currently living with asthma over a 4-year period. Data examined between parent-child dyads and individually for outcomes. Results: We had 40 unique campers and 20 returning campers. The ages of campers (6-12 years, mean 8.4 years), 2.2 years since diagnosis of asthma, mild to severe severity of asthma(67% of children moderate persistent, 14% mild persistent, 19% severe persistent), and child perception vs. parent dyads (matched and no relationship between outcomes). Data are being explored at a detailed level. In conclusion, asthma outcomes continue to decline in children living with moderate to severe persistent asthma. Community interventions need to do a better job with data collection and exploration. Camps connected with Auburn University offer opportunities to engage with children and parents impacted by asthma.

Title: Extracellular vesicles derived from mesenchymal stem cells modulate immune responses in feline leukocytes

Primary Author: Matt Murray

Additional Authors: ;Nikolia Darzenta;Maria Naskou;Olivia Moore;Anna Cochran

Department/Program: Pathobiology

College: School of Veterinary Medicine

Abstract: Mesenchymal stem cells (MSCs) have been proposed as a therapeutic tool to alter inflammation through exertion of a bioactive trophic effect. Specifically, MSCs' anti-inflammatory properties are traced to their secretome, containing a soluble component and encapsulated Extracellular Vesicles (EVs). The therapeutic potential of MSC-derived EVs (MSC-EVs) has been assessed in many disease models including Alzheimer's disease (AD), Traumatic Brain Injury (TBI), graft-versus-host disease and others. EVs are isolated from MSCs via serial centrifugations and ultrafiltration, but their anti-inflammatory properties are dependent on the cell culture conditions they are exposed to. Recent studies have shown that exposure of the parent cells to an inflammatory and hypoxic environment can improve the potency and immunomodulatory abilities of MSC-EVs. The aim of this study was to compare EVs isolated from Umbilical Cord derived MSCs (UC-MSCs) under different cell culture conditions and to evaluate their anti-inflammatory effects when exposed to stimulated feline peripheral blood leukocytes. UC-MSCs were exposed to serum free media (SF), inflammatory environment (IF), or media supplement with 5% fetal bovine serum (FBS) after reaching confluency. Through a centrifugation and ultrafiltration process, the different EVs were isolated and analyzed through electron microscopy and size characterization. The anti-inflammatory properties of the different isolates of EVs were evaluated after exposure to stimulated peripheral leukocytes derived from cats. mRNA expression levels via qPCR were performed for the pro-inflammatory cytokine interleukin 6 (IL-6). Our data showed a statistically significant downregulation of mRNA expression of IL-6 in LPS stimulated leukocytes after the addition of UC-MSCs isolated from IF conditions. This data supports that priming of MSCs with inflammatory mediators can lead to the production of MSC-EVs with greater anti-inflammatory properties.

Title: The bionomics and control interventions of Anopheles stephensi: A meta-analysis

Primary Author: Tabeth Mwema

Additional Authors: Mekala Sandaram;Janna Willoughby;Sarah Zohdy

Department/Program: Wildlife Ecology and Management

College: School of Forestry

Abstract: *Anopheles stephensi* is an Asian malaria mosquito that has recently invaded Africa. Due to its diversity in feeding behavior and ecology, for example, its preference for feeding earlier in the evening, this mosquito can cause major public health concerns because these behaviors help this species evade our vector control activities. Since *An. stephensi* is a new species to Africa, little is known about this mosquito in the context of African ecosystems. To fill this research gap, we need to understand how to best accomplish vector surveillance in these ecosystems and also understand An. stephensi bionomics to determine which control interventions are suitable. To accomplish this, we used a meta-analytical framework to quantify *An. stephensi* sampling method effectiveness using data from all the relevant literature on An. stephensi behavior and biology (searchers performed in PubMed, Web of Science, and Google Scholar). A total of 3209 peer-reviewed studies were searched, and only 72 studies had quantitative data for extraction. Of the 11 methods analyzed to determine which ones collect more mosquitoes, pyrethrum spray catch, and dipping were the most effective at collecting adult mosquitoes and larvae, respectively. Additionally, there was preference for breeding in vegetation and foothill ponds and differences in the effectiveness of the different classes of insecticides. Biopesticides such as *Beauveria bassiana* can be used to control larvae. However, there were no differences in the biting and resting behaviors indoors and outdoors. These preliminary results show that control interventions should be focused on targeting both indoor and outdoor biting, otherwise residual malaria transmission is likely to persist.

Title: Philanthropic innovations: An assessment of the literature

Primary Author: Reagan Myers

Additional Authors: ;Peter Weber

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Philanthropic Foundations are private, non-profit organizations that exist for the purpose of distributing grants to charitable organizations. Foundations are credited to be sources of innovation because they are independent from market considerations and political expectations, so they can make risky social investments, connect institutions, empower capable organizations or individuals, and respond to gaps in service. Scholars note that too often foundations tend to pursue the status quo rather than social change. Identifying innovative funding models is particularly relevant as the Covid pandemic limited fundraising efforts of non-profit, moving the question of how to maximize impact of philanthropic dollars to the foreground. This study then systematically reviews existing literature to identify how scholars have analyzed innovations in philanthropy. We searched three academic databases for empirical, peer-reviewed articles focused on philanthropic innovations at the organizational level. Using various key words, we identified 2,048 articles. After removing duplicates and hand-screening abstracts, 41 articles were included. Most exclusions were made because a search term is used in a completely different context. Given the rigidity of the search criteria, we then expanded the search to include the citation and references of our initial corpus, adding another 38 articles. The preliminary analysis of 79 included articles shows venture philanthropy, participatory philanthropy, and impact investments as common forms on innovations within organized philanthropy. Among academic articles, we find a high reliance on case studies, whereas the analysis of references in our initial corpus led to the inclusion of a noteworthy number of practice-oriented publications (grey literature). This study highlights gaps in the extant literature, as most scholarship focuses on foundations funding innovations rather than developing innovative funding practices and is therefore of interest to scholars and practitioners.

Title: Elucidate the neuroprotective effects of curcuma longa against hyperglycemia combined with hypoarousal-induced clinical cns anomalies

Primary Author: Rishi Nadar

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Satyanarayana Pondugula;Sindhu Ramesh;Timothy Moore;Rishi Nadar;Manoj Govindarajulu

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Patients with hyperglycemia often display significant hyperarousal-related clinical anomalies such as fear, panic, nervousness, pain, seizures, and cognitive deficiencies. Consequently, hyperarousal in patients with inadequate metabolic outcomes (hyperglycemic conditions) is usually treated with drugs that block sodium/calcium channels, augment inhibitory (gamma-aminobutyric acid [GABA]) neurotransmission, and reduce excitatory (glutamatergic) neurotransmission. The perilous synergistically collective clinical-pathological conditions of hyperglycemia combined with hypoarousal may result in severe learning disabilities and cognitive impairment. Unfortunately, no studies have investigated the neuroprotective effects of synthetic drugs and/or natural bioactives against hypoarousal and hyperglycemia-induced cognitive impairment. *Curcuma longa* is a natural bioactive that has been used for centuries around the world and has exhibited numerous pharmacodynamic effects with minimal adverse effects. Hence, the current study elucidated the behavioral and biochemical effects of *Curcuma longa* against hyperglycemia and hyperarousal-induced neurotoxicity.

Title: A meta-analysis of mycotherapy in the current and future human and animal healthcare

Primary Author: Rishi Nadar

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Satyanarayana Pondugula;Sindhu Ramesh;Timothy Moore;Rishi Nadar;Manoj Govindarajulu

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: The existing synthetic drugs may not be appropriate and/or sufficient for diagnosing, preventing, and treating human and animal pathologies. Additionally, numerous adverse effects, hypersensitivity reactions, availability, and affordability are associated with synthetic drug therapies. Therefore, there is an impending necessity for novel approaches with multiple pharmacodynamic effects, appropriate pharmacokinetic effects, with minimal/no toxicity, and cost-effectiveness to significantly improve human and animal healthcare immediately. "Complementary" (remedies used in concert with traditional/conventional remedies) and "Alternative" (non-traditional/conventional approach) therapeutic interventions are currently considered as the future healthcare tactics to prevent and cure various pathological conditions. Mushrooms have been used for centuries globally as food and medicine. However, there is a lacuna in the literature on the role of mushrooms in the diagnosis, prevention, and treatment of various human and animal pathologies. This study was conducted by manually searching published articles up to February 2023 from the following databases: PubMed and Google Scholar, using appropriate search terms for the role of mycotherapies in human and animal pathologies. We also searched for relevant clinical websites and content using CDC and Lexi-Comp. We manually searched references of selected articles and books for additional information. Mycotherapy (the use of mushrooms) can be a novel, immense complementary, and alternative approach to drastically improve current and future healthcare.

Title: Adaptation of a microfluidic device for use in scalable cell encapsulation

Primary Author: Ravi Nataraj

Additional Authors: ;Mohammadjafar Hashemi;Elizabeth Lipke;Yuan Tian;Ferdous Finklea

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: To combat degenerative conditions like cardiovascular disease, billions of cells such as cardiomyocytes are required for cell therapy. Stem cells (SCs) are optimal candidates for use in scalable cell production but current 2-D monolayer or 3-D bioreactor expansion approaches are limited by surface area or size/shape uniformity, respectively, impacting SC differentiation and yield. Previously, our lab has established a novel microfluidic platform capable of producing functional engineered cardiac tissues (ECTs) from the direct differentiation of human induced pluripotent SCs within poly(ethylene glycol)-fibrinogen microspheres (MS). An expensive, high-intensity visible halide lamp has been used for rapid photocrosslinking of the hydrogel but issues such as light output consistency, heat regulation, batch-to-batch variability, adjustability of photoinitiator type, and user-friendliness limit scalability. Here, we describe cost-effective and scalable improvements to our platform to support clinically relevant production of ECTs. Using an iterative design approach, the light source was redesigned using two aluminum plates each mounted with a three-watt LED module. Encapsulated MS achieved comparable levels of crosslinking as the original halide lamp without added maintenance or heat production. Additionally, plates with UV or visible light LED modules can be interchanged to allow for robust crosslinking with different photoinitiators such as LAP and Eosin Y. As proof of concept, HT29 colorectal cancer cells were encapsulated using both our original and optimized microfluidic platform and cell viability was compared using live/dead staining. Preliminary results indicate fewer dead cells in MS produced by optimized platform but further validation is required. Overall, by improving function and utility while preserving its reliability, our platform has high potential for clinically relevant production of ECTs and long-term commercial scalability.

Title: Southern U.S. pine germination response to increased soil temperature and decreased soil moisture

Primary Author: Rachel Nation

Additional Authors: John Willis;Heather Alexander

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Temperature and moisture are important factors influencing seed germination and establishment. Warming climatic conditions and increases in management by prescribed fire could lead to both increases in soil temperature and decreases in soil moisture. These changes may impede seed germination. Longleaf pine (*Pinus palustris* Mill.), shortleaf pine (*P. echinata* Mill.), slash pine (*P. elliottii* Engelm.), and loblolly pine (*P. taeda* L.) are southern U.S. pine species with different seed traits and environmental tolerances. The impacts of shifting environmental conditions on the seed germination of these species are not known. Specifically, how seeds of these species respond to variations in soil temperature and soil moisture has not been determined. To evaluate these impacts, we conducted a 60-day greenhouse germination trial where southern pine seeds were exposed to the following soil temperature and soil moisture treatments: 1) ambient soil temperature and high soil moisture, 2) ambient soil temperature and low soil moisture, 3) increased soil temperature and high soil moisture, and 4) increased soil temperature and low soil moisture. All species except longleaf pine had lower percent germination in the increased soil temperature and low soil moisture treatment compared to the control treatment. Slash pine had the highest percent germination across all treatments. Our results better inform land managers regarding species selection and regeneration efforts in the face of shifting environmental conditions due to prescribed fire and climate change.

Title: Adagrasib, a recently FDA approved KRAS-G12C inhbitor, downregulates drug-induced MDR1 activity in LS180 human colon cancer cells

Primary Author: Artie Nayak

Additional Authors: Kodye L. Abbott;Satyanarayana Pondugula;Elizabeth Ledbetter;Chuanling Xu

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: During multidrug chemotherapy, induction of multidrug resistance protein 1 (MDR1) has been shown to contribute to chemoresistance. MDR1 is an efflux pump that plays a critical role in disposition of more than 50% of clinically used drugs. Therefore, during multidrug chemotherapy, drug induction of MDR1 can reduce the therapeutic efficacy of co-administered chemotherapy drugs, leading to chemoresistance. A clinical anticancer drug, which can effectively downregulate drug-induced MDR1, would be beneficial to overcome such chemoresistance. In that regard, we tested whether Adagrasib, a recently FDA approved KRAS-G12C inhibitor for the treatment of non-small cell lung cancer with the KRAS-G12C mutation, can downregulate the drug-induced MDR1. Using intracellular Rhodamine 123 accumulation assays, we show that Adagrasib suppresses the drug-induced MDR1 function in LS180 human colon cancer cells. These preliminary results suggest that Adagrasib, as part of a "cancer drug cocktail" may help overcome chemoresistance by suppressing drug induced-MDR1.

Title: Atomistic mechanism of MXenes degradation: insights from first principles

Primary Author: Valentina Nesterova

Additional Authors: ;Vladislav Korostelev;Konstantin Klyukin

Department/Program: Materials Engineering

College: College of Engineering

Abstract: Understanding the degradation mechanism at the molecular level is increasingly needed for a variety of clean energy applications, including supercapacitors, batteries, and catalysts. MXenes, a large class of 2D transition metal carbides and nitrides, demonstrate outstanding electrochemical performances. However, the stability of MXenes remains a concern because of their fast degradation in water or air under ambient conditions. The mechanism responsible for the oxidative degradation of MXenes remains elusive, limiting the development of degradation mitigation strategies. In this work, we used ab initio molecular dynamics (AIMD) simulations to resolve the atomistic mechanism of oxidative degradation of 2D titanium carbide layers (e.g., $Ti_3C_2T_x$ and Ti_2CT_x) and elucidate the role of surface chemistry (T_x = O, OH, F, Cl) on their stability. Enhanced free-energy sampling AIMD simulations were performed to evaluate the energy landscape of Ti dissolution for various surface chemistries. To establish structure-stability relationships across different MXenes chemistries and structures, we correlated dissolution barriers to the dynamical, electronic, and electrostatic traits of the MXene surfaces.

Title: Evaluation of subsurface gypsum-rich rock in the context of geological carbon sequestration

Primary Author: Jamie Newsome

Additional Authors: ;Lauren Beckingham

Department/Program: Civil Engineering

College: College of Engineering

Abstract: Geological carbon sequestration is a promising means of reducing atmospheric carbon dioxide emissions by capturing CO2 gas and storing it long term in subsurface porous rock. Generally, the goal of carbon sequestration is to sequester CO2 in an aqueous, solid, or pure gas form so it cannot re-enter the atmosphere. In this study, a gypsum-rich rock sample was taken from a potential injection site in Cassville, Georgia to determine the viability of this site for carbon sequestration. Before injection, it is paramount to have an accurate prediction of the geochemical processes that will occur with the addition of supercritical CO2 to the formation. The reactive modeling software Crunchflow was used to model several dynamic processes. Specifically, the initial acidification of the brine present in this sample and the reactions between CO2 and gypsum: dissolution and precipitation of both gypsum and calcite were modeled. These dissolution reactions are highly dynamic and the goal of the models is to provide an accurate prediction of the rate, extent, and impact of geochemical the reactions in the formation. Images of the sample were taken using a scanning electron microscope (SEM) with a backscatter electron (BSE) detector. These images were used to calculate the porosity of the sample and mineral accessibility as well as create a segmented mineral map. This data was used to inform the reactive transport model. The results of this model provide predictions of changes in this formation including porosity, permeability, mineral precipitation and dissolution. This project is supported by the Southeast Regional CO2 Utilization and Storage Partnership (SECARB-USA), funded by the U.S. Department of Energy.

Title: Effects of different soybean protein sources on growth performance, intestinal histology, and physiological gene expression of Litopenaeus vannamei

Primary Author: Khanh Nguyen

Additional Authors: ;Adela Nicole Araujo;Allen Davis;Trenton Corby;Leila Strebel;Melanie Rhodes;Timothy Bruce

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: This study aimed to evaluate the impacts of different soybean meal protein sources, which were the products of fermented, fractionated, and expeller-extruded processes, on the growth performance, feed utilization efficiency, intestinal histology, and physiological gene expression in white shrimp. The trial was conducted in a green water recirculation system with the stocking density at 30 shrimp tank-1, at an initial weight of 0.42 ± 0.01 g (Mean ± Standard Deviation) over an 8-week period. A total of nine experimental diets were evaluated. This included a diet containing primarily animal-based proteins (17.7% fishmeal and 17.7% poultry meal) and no soybean meal, along with a basal diet containing 48% soybean meal and 6% fishmeal. The SBM was then replaced (50% and 100%) on an isonitrogenous basis with BrightDay, Soycomil PE, and Hamlet HP 300. Additionally, one diet contained 100% replacement using an expeller-extruded soybean meal. All growth metrics in the trial, with the exception of survival rate ($p>0.05$), showed significant differences among treatments ($p<0.001$). Furthermore, we observed trends concerning feeding utilization efficiency with fermented BrightDay products having significantly higher phosphorus retention ($p<0.001$). Protein retention, however, showed no discernible differences other than for the fractionated Soycomil PE product with 100% replacement. The histology and gene expression analysis are under investigation for enteritis and physiological gene expression. Results indicate that high inclusion levels do not guarantee a good development performance for shrimp, despite the fact that fractionated and expeller-extruded can be used as a protein source in shrimp diets. At the same time, fermented soybean meal, especially at 50% replacement, is a viable protein source and can be considered a feasible animal-based diet alternative. Therefore, additional studies on various plant-based protein sources are required to improve the dietary matrix and diversify the source of the components for improved animal development performance.

Title: Near Infrared spectroscopy as a valuable tool for assessing wood rot decay

Primary Author: Laura Michelle Nieto Arciniegas

Additional Authors: ;Brian Via;Christian Rivera Caicedo;Lori Eckhardt;Iris Vega Erramuspe

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Near-infrared spectroscopy (NIRS) is an analytical non-destructive tool sensitive to wood rot decay within as little as two weeks. The change in the NIR spectra is attributable to changes in the chemical composition of wood, principally associated with lignin and carbohydrate decay. The present study aims to estimate the severity of wood rot-decay using NIRS coupled with a chemometric model. Wood decay experiments were performed under controlled conditions. The lignin and carbohydrate contents of the wood samples were assessed using traditional wet chemistry analysis. The chemometric model correlated the results from wet chemistry analysis (primary method) with the results from NIRS analysis (secondary method) and can be used to estimate the wood rot-decay severity of unknown samples. Hence, this method may be beneficial in rapidly determining the integrity of downed timber in the field and thus may help landowners reduce the window of time and sell their timber without integrity loss.

Title: Exploring the experiences of black graduate students at predominantly white institutions: A systematic review

Primary Author: Makeda Nurradin

Additional Authors: ;

Department/Program: Curriculum and Teaching

College: College of Education

Abstract: Black students face ongoing struggles in higher education, particularly at Predominantly White Institutions (PWIs). Despite some progress, Black students continue to face significant barriers to success in these environments. It is important to explore and understand the experiences of Black graduate students at PWIs, to gain a more comprehensive understanding of the challenges faced and how to support their success. A systematic review was conducted to synthesize the existing literature on the experiences of Black graduate students at PWIs. The focus was on academic, social, and institutional challenges and the strategies used to navigate and succeed in these environments. A comprehensive search was conducted using Education Resources Information Center (ERIC), and a total of 31 studies were included in the review. Black graduate students at PWIs face a range of challenges, including microaggressions, discrimination, lack of belonging and community, and limited opportunities for mentorship and networking. However, despite these challenges, Black graduate students reported using various strategies to navigate and succeed in these environments, including seeking support from peers and mentors, engaging in community-building activities, and advocating for themselves and their needs. This systematic review highlights the need for further research on the experiences of Black graduate students at PWIs, including the development and implementation of supportive programs and policies aimed at promoting our success and well-being. The findings also have important implications for institutions of higher education, as they suggest the need to address systemic barriers and create more inclusive and supportive environments for Black graduate students.

Title: Application of biomimicry to 21st century energy challenges: The reduction of oxygen to water using a bioinspired Fe (II) electrocatalyst

Primary Author: Segun Obisesan

Additional Authors: ;Chris Goldsmith;Byron Farnum

Department/Program: Chemistry

College: College of Science and Mathematics

Abstract: The need for more sustainable electrocatalysts for the oxygen reduction reaction (ORR) has motivated us to explore complexes containing first-row transition metals, which are more abundant and much less expensive than the platinum normally used for this application in commercial fuel cell devices. Although iron, manganese, copper, and cobalt complexes with a variety of ligand scaffolds have been able to electrocatalytically reduce dioxygen, few of these contain electron-proton transfer mediating groups that may improve both the efficiency and selectivity of the ORR. Here, we report the synthesis and characterization of an iron (II) complex bearing a pendent quinol group. This complex mimics the active site of cytochrome c oxidase, a large trans membrane protein responsible for powering cellular activities via the reduction of oxygen to water. This bioinspired electrocatalyst is highly effective functioning at high turnover frequency's and possessing greater selectivity for H2O.

Title: An improved in vitro 3T3-L1 adipocyte model of inflammation and insulin resistance

Primary Author: Ifeoluwa Odeniyi

Additional Authors: Benjamin Anbiah;Michael Greene;Elizabeth Lipke;Bulbul Ahmed;Grace Hester;Iman Hassani

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Obesity is a significant public health concern characterized by chronic inflammation in adipose tissue and an increased risk of insulin resistance (IR). New in vitro models of adipose tissue inflammation in which adipocytes are viable yet maintain the inflammatory state are needed. Here, we examined the treatment time with TNF-α in the presence of hypoxia to reduce cell death while maintaining inflammation and IR in 3T3-L1 adipocytes. To develop the IR model, adipocytes were treated with 20 ng/ml TNF-α (12h or 24h) and incubated in a hypoxic chamber with 1% O2/5% CO2. To develop a long-term IR phenotype, 2.5mM glucose/10% FBS were added 24 h post-treatment. Viability and markers of IR and inflammation were assessed using Live/Dead staining and RT-qPCR, respectively. Treatment for 12 h with TNF-α in the presence of hypoxia resulted in a significant increase ($P < 0.05$) in the percentage of live cells by 1.85-fold compared to 24 h treated cells. However, IR and inflammation were maintained in the 12 h treated adipocytes; the expression of the insulin sensitive (IS) genes adiponectin (0.08 ± 0.1-fold) and solute carrier family 2 member 4 (SCLA2A4, aka GLUT4) (0.07 ± 0.1-fold) were significantly decreased ($P < 0.05$), while the expression of the inflammatory genes C-C Motif Chemokine Ligand 2 (CCL2) (228 ± 11-fold) and Interleukin 6 (21 ± 4-fold) were significantly increased ($P < 0.05$). In the long-term culture model, no significant differences were found in the viability of the 12 h TNF-α/24 h hypoxia treated cells across the different time points. At 24 h, the IS genes adiponectin and GLUT4 decreased by 0.03 ± 0.0 and 0.02 ± 0.0-fold, respectively, and remained downregulated at 48 and 72 h. CCL2 expression increased by 109.2 ± 9.6-fold at 24 h ($p < 0.001$). The fold increase decreased to 13.05 ± 3.82 after 72 h; however, CCL2 expression was not statistically different after 48 h. Our new adipocyte model can be used to further examine obesity-linked IR and inflammation.

Title: Apolipoprotein E4 role in Alzheimer’s disease

Primary Author: Julia Odum

Additional Authors: ;Junwei Wang;Amal Khalil Kaddoumi

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Alzheimer’s Disease (AD) is a neurodegenerative condition characterized by the build-up of amyloid-β plaques and loss of cognitive ability. It can have an onset as early as 30 years old and can also be late-onset after 65 years of age. Key characteristics of the disease are accumulations of amyloid-β plaques, neurofibrillary tangles, and degeneration of the blood-brain barrier (BBB), which increases inflammation in the brain. A review of the literature on this topic indicates that the apolipoprotein 4 allele (ApoE4) is a risk factor for AD and its progression. ApoE gene is expressed largely in microglia and astrocytes. It has three isoforms that are researched in association with AD and each has different effects on the progression of the disease. The ApoE protein binds to cholesterol and lipids, playing a role in their transport and metabolism. It also plays a role in the maintenance of the cytoskeleton and the overall health of neurons. When ApoE4 is expressed, the integrity of the BBB decreases and plaques may build up because of the less efficient transport of amyloid-β protein. ApoE4 is associated with an earlier onset of the disease because the breakdown of the BBB decreases the protection of the brain and increases the presence of neurotoxins and amyloid plaques. Degradation pathways in the brain are activated, which leads to a decrease in tight junction proteins in the BBB, allowing for neurotoxin leakage. Weakening of the BBB also allows for worsened bleeding and infection in AD cases accompanied by cerebral amyloid angiopathy. With the breakdown of the BBB, homeostasis is interrupted and the brain is subject to inflammation and a decline in cognitive function. In conclusion, the ApoE4 allele is a strong risk factor for AD.

Title: Investigating the mechanism of luciferase catalyzed bioluminescence in the dinoflagellate species Noctiluca scintillans

Primary Author: Sean O'Hare

Additional Authors: ;Steven Mansoorabadi

Department/Program: Chemistry-Biochemistry

College: College of Science and Mathematics

Abstract: Noctiluca scintillans is a species of bioluminescent dinoflagellates that is widely distributed across the world’s oceans. The unique light emission of this species is the result of the oxidation of luciferin by the luciferase enzyme, NS-LCF. This enzyme is of great interest to the scientific community because of its potential application as a reporter enzyme in medical imaging. Bioluminescence imaging offers a less invasive and more sensitive alternative to traditional fluorescence imaging methods, making it a promising area of study. Furthermore, the study of NS-LCF may also provide evolutionary insights into other dinoflagellate luciferases. Despite the potential of this enzyme though, the mechanism behind its action remains unclear. In this research project, our objective is to elucidate this. To achieve this, we are currently working on expressing NS-LCF in E. coli cells. Once expression is successful, techniques such as affinity chromatography and fast protein liquid chromatography will be used to purify the enzyme. The purified enzyme will then be subjected to structural analysis through crystallization and the active site residues will be determined through mutational analysis. Additionally, the enzyme’s pH dependence will be studied using fluorescence spectroscopy. Through these investigations, we hope to gain an understanding of the enzyme’s mechanism of action, laying the foundation for further research into the enzyme’s potential use as a reporter enzyme.

Title: Liquid chromatography and paper spray coupled with ion mobility mass spectrometry for bacteria strain discrimination

Primary Author: Orobola Olajide

Additional Authors: ;Jingyi Zheng;Yuyan Yi;Ahmed Hamid

Department/Program: Chemistry-Biochemistry

College: College of Science and Mathematics

Abstract: Determining bacterial identity at the strain level is critical for public health to enable proper medical treatment and reduce antibiotic resistance. Herein, we used liquid chromatography, ion mobility, and tandem MS (LC-IM-MS/MS) to distinguish E. coli strains. Numerical multivariate statistics (principal component analysis, followed by linear discriminant analysis) allowed strain-level discrimination with a prediction rate of 96.1% and 100% utilizing the negative and positive ion information of LC-IM-MS/MS, respectively. The tandem MS and LC separation proved effective in discriminating diagnostic lipid isomers in negative mode, while IM separation was more effective in resolving lipid conformational biomarkers in positive ion mode. Because of the clinical importance of early detection for rapid medical intervention, a faster technique, paper spray (PS)-IM-MS/MS, was used to discriminate the E. coli strains with a prediction rate of 62.46% and 73.54% in negative and positive ion modes, respectively. The strategy of numerical data fusion of negative and positive ion data increased the classification rates of PS-IM-MS/MS to 80.54%. Lipid isomers and conformers were detected, which served as strain-indicating biomarkers. The two complementary multidimensional techniques revealed biochemical differences between the E. coli strains confirmed by comparative genomic analysis. The results suggest that PS-IM-MS/MS is a rapid, highly selective, and sensitive method for discriminating bacterial strains in environmental and food samples.

Title: Effect of eggshell translucency and color intensity on egg quality parameters, moisture loss, and chick weight

Primary Author: Leticia Orellana Galindo

Additional Authors: ;Matthew Bailey;Ken Macklin;James Krehling;Luis Rolando Munoz Romero;Cesar Escobar Lobo;Marcela Quino;Vianca Maite Tashiguano Encalada

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Previous research has correlated the effect of egg quality with hatchability and chick weight. This study aimed to evaluate the effect of translucency and color on egg quality parameters, moisture loss and chick weight of broiler eggs. A total of 4320 eggs from Ross 708 broiler breeder hens (35 to 65 weeks old) were collected for this study. Eggs were selected according to its eggshell translucency level (1-3) and color (dark and light). For translucency classification, a 3-point subjective scoring system was used based on the amount and coverage of clear spots or mottling in the eggshell. Eggshell color was evaluated using an electronic colorimeter while egg thickness using a noninvasive ultrasound gauge. Data for this experiment were analyzed using the GLIMMIX procedure of SAS (V 9.4) and Tukey's HSD test was performed to separate means. A significant difference was considered when $P \leq 0.05$. Results show that low translucent eggs hatched 1.44 g heavier chicks than high translucent eggs. Moisture loss percent at hatch ($P<0.0001$), in contradiction to the above, was greater in high translucent eggs (9.5%) than in low translucent eggs (8.9%). Eggshell thickness ($P<0.0001$) was found to be thicker in high translucent eggs (468.6 µm) compared to low translucent eggs (432.2 µm). The color of the eggshell was found to affect chick weight ($P=0.0128$), dark-colored eggs produced chicks that were 0.55 g heavier than light-colored eggs. Moisture loss ($P<0.0001$) was higher in light-colored eggs (9.9%) than in dark-colored eggs (8.8%). In conclusion, low translucent and dark-colored eggs had better egg quality and chick weight. The largest reduction was found for moisture loss and eggshell thickness when eggs are highly translucent or light-colored.

Title: Small business digitization before, during, and after the COVID-19 pandemic

Primary Author: Audrey Osborne

Additional Authors: ;Atiya Avery

Department/Program: Informational Systems Management

College: College of Business

Abstract: Organizations are still seeking to understand the implications of the COVID-19 pandemic as businesses enter a new normal and reflect on the lessons learned. The COVID-19 pandemic spun the supply chain into disarray for small businesses. Because of this, many of these businesses were forced to engage in the digital transformation of their supply chains in real-time to further their survival. In this research in progress, we conduct a systematic literature review to better understand, through existing research, the evolution of the digitization of the supply chain information systems for small businesses before, during, and after the COVID-19 pandemic. We also examine the literature for evidence that the COVID-19 pandemic played a role in accelerating the digitization of small business supply chain information systems. We discuss the implications of our mixed results and the next steps for the project.

Title: Plant-inspired mechano-sensing soft robots

Primary Author: Tofayel Ahammad Ovee

Additional Authors: ;Jean-Francois Louf

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Modern society relies on robotic automation to accomplish menial, hazardous, and sophisticated tasks. A growing subfield of robotics uses soft materials to accomplish these tasks. While promising, soft robotics lacks a key feature: mechanosensitivity. To address this challenge, we designed a smart skin transmitting information solely using poroelasticity in a fashion reminiscent of plant mechanoperception. More specifically, we designed a PDMS pad with hollow channels filled with a liquid, that we implemented on a homemade 3D-printed arm and connected to a pressure sensor. We could then access experimentally the strain applied by the robotic arm and the associated pressure response, and use these inputs in combination with contact mechanics theory to extract an effective Young's modulus. Moreover, we later on replaced the pressure sensor with an ionic hydrogel to transform the pressure signal into an ionic response compatible with biological tissues. As a result, our approach shows promise in the design of mechanosensitive soft robots and prosthetics to impart mechanosensing abilities to a wide public, from amputees to automatic devices handling soft objects or interacting with human.

Title: Induction of oxidative stress in 3T3 L1 differentiated adipocyte cells

Primary Author: Adebowale Samuel OYERINDE

Additional Authors: Vaithinathan Selvaraju;Geetha Thangiah

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Obesity causes mitochondrial dysfunction and reactive oxygen species (ROS) production. In physiologic settings, ROS governs proliferation, differentiation, apoptosis, and immune response through multiple cellular signaling pathways. When their production exceeds the cellular antioxidant defense, it results in oxidative stress (OS) which causes ROS-mediated damage to nucleic acids, proteins, and lipids. We hypothesize that pro-oxidants such as H2O2 beyond cellular antioxidants can create ROS and cause OS in obese people. This study aimed to treat 3T3 L-1 differentiated adipocytes (DA)-obese models with varied H2O2 concentrations to induce OS. Mouse embryonic fibroblast-adipose-model cell line 3T3-L1 MBX clone was used for this study. After attaining confluence in Dulbecco's Modified Eagle's Medium (DMEM), cells were differentiated with adipogenic differentiation media. The cells were treated with insulin media on the third day for two days, then kept in a growth medium for five days, at which point over 95% of the cells became mature adipocytes with lipid-filled droplets. OS was induced in DA cells by treating them with a new medium containing varying doses of H2O2 (0µM, 100µM, 300µM, and 500µM) for 12 and 24 hours. A one-way analysis of variance at a 5% significant level was employed for various experiments with these cells. Oil red O staining affirmed 3T3-L1 DA. 500µM H2O2 leads to significant OS in DA cells without altering the cell morphology. 12 and 24-hour treatment with 300µM and 500µMH2O2 caused significant loss of cells viability, inhibition of cell growth, and increase in lipid peroxidation. These results demonstrated that OS caused a significant apoptotic effect in 3T3-L1 DA cells treated with 500µMH2O2 in both 12 and 24 hours. 300µM and 500µMH2O2 significantly induced OS in 3T3-L1 DA. OS influences metabolic enzyme activity, transcription factor, and gene expression that can lead to type 2 diabetes and other obesity-related diseases.

Title: Plant variability impact on soybean yield in Alabama

Primary Author: Maria Leticia Pacheco da Silva

Additional Authors: ;Murilo Trimer Morata;Eros Francisco

Department/Program:

College: College of Agriculture

Abstract: Several studies have demonstrated that nonuniform spatial distribution of plants along the sowing row, mainly caused by distribution failures during the sowing or low seed quality, results in biomass variability and reduced grain yield. However, there is lack of information of longitudinal distribution of seeds along the fields and its impact on grain yield. Hence, the objective of this project was to evaluate how variability among plants in the same sowing row can impact soybean grain yield. We conducted a statewide assessment of plant variability in commercial soybean fields across Alabama state, totaling 51 sites. For each site, 10 consecutive plants in a row were collected at 3 different points across the field. The general parameters measured were plant population, plant variability, and grain yield. For the plant variability parameter, plant height, number of pods, and number of lateral branches were measured for each individual plant collected. Later, plants were passed in a single plant thresher to collect the seeds and grain yield was estimated for each point. The results showed that, within the field, variability (represented by the standard deviation) in plant population was between 0 to 38,419 plants/acre (93,308 plants/acre in average), grain yield ranging from 0.5 to 29 bushels/acre (39.8 bushels/acre in average), and plant height between 3.1 to 13.8 cm (72.64 cm in average). Additionally, a quadratic positive correlation between yield and seed weight per plant was found and a linear positive correlation between yield and plant height or pod number. Furthermore, pod number was influenced by the plant height and number of branches.

Title: Immune Responses of Nile Tilapia (Oreochromis Niloticus) Raised in Biofloc when Supplemented with Probiotics

Primary Author: S M Uthpala Medhini Kumari Padeniya

Additional Authors: ;Allen Davis;Timothy Bruce

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: Biofloc technology is a rearing technique that encompasses water quality by manipulating carbon and nitrogen and their inherent mixture of organic matter and microbes. Biofloc systems have several advantages, which include improved biosecurity, and increased health and survival of rearing organisms. Further integration of biofloc systems such as addition of probiotics to manipulate the microbial community could be useful. In the present study, two probiotics (AP193 and BiOWiSH FeedBuilder Syn 3) topcoated in commercial Optimal Aquafeed and the commercial feed as the control were evaluated on Nile tilapia reared in biofloc. Nine individual circular tanks were stocked with 120 juveniles (71.4 ±4.4 g) and conducted the trial for 16 weeks. At the end of the feed trial, the fish were challenged with *Streptococcus iniae* (ARS-98-60, 6.6 x 108 CFU/mL, via intraperitoneal injection). At 10 days post-infection, cumulative percent mortality (CPM) differed across the treatment groups. CPM of fish that did not receive probiotics was significantly higher than AP193-fed fish (p=0.009) and Syn 3-fed fish (p=0.003). Serum lysozyme activity analyzed pre- and post- challenge showed no difference between the treatment groups. However, there was a significant difference between the two time periods (p= 0.0001). The gene expression of *il8* of the spleen of fish received Syn 3 and that of *tnfα* gene of the spleen of fish received AP193 were significantly higher than that of the control. CPM data and up-regulation of these pro-inflammatory cytokines suggests that the probiotic addition may enhance disease resistance and increase immune responses against S. *iniae*.

Title: Introducing computer science and arts for all (CSA4ALL): Developing an inclusive curriculum and portal for K5 children

Primary Author: Prashamsa Pandey

Additional Authors: ;Fatemeh Jamshidi;Daniela Marghitu

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: The difficulty of acquiring computer programming skills is a plausible cause for the elevated attrition rates in Computer Science (CS). Music and robotics integrated with computer programming are approaches to engage students in CS by prioritizing personal expression, creativity, and aesthetics. This paper conducts a systematic review of using music and robotics to teach CS concepts to elementary school students. The authors aim to identify the existing problem in the literature to make CS more interactive, accessible, and engaging for students to improve their motivation in enhancing CS concepts and develop creative interpersonal skills. This paper also identifies a mixed-methods study to determine ways to promote CS among elementary school students. The mixed methods describe an adaptation of Blockly, Xylophone, and Dash robots for use in an introductory elementary school-level programming course that will be implemented in an open-access camp at Auburn University where American grades 3-5 will participate in pre-, post-, and follow-up surveys while attending the CS camp. The authors want to demonstrate how music and robotics programming can contribute to STEM education regarding technology and engineering integration and include existing research studies resulting from the search and review processes. These studies were synthesized according to some common characteristics, including their use of educational robotics, preliminary results, subjects, and potential contributions to STEM education. A few educational implications of educational robotics are also discussed as possible contributions to technology and engineering education. As a result of this systematic review, using robotics and music in early childhood STEM education is a promising tool and application for integrating technology and engineering. The study concludes with a summary of the findings on the effectiveness of this approach.

Title: A novel technique to determine the evolution of pad cratering failure under multiple-reflows at resin-Copper interfaces

Primary Author: Aathi Raja Ram Pandurangan

Additional Authors: ;Pradeep Lall;Padmanava Choudhury

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Pad cratering is a mechanically induced fracture in the resin between the copper foil and the outermost layer of fiberglass of a printed circuit board (PCB). It may be within the resin or at the resin-to-copper or fiberglass interfaces. The propensity for cratering depends on reflow conditions and mechanical loading in the PCB after reflow during operation and handling. These fractures, which often develop due to the application of high mechanical stresses, pose a severe reliability risk for the industry. Pad cratering impacts the production yield as well as long-term reliability. The properties of the bulk resin and resin/copper interfaces evolve during reflow, which further influences the propensity towards pad cratering. A study on resin/copper interface strength with the evolution of bulk resin properties is new. In this study, 10 different bulk resin materials are studied under various reflow conditions. The change in bulk resin properties is computed and used in determining the interfacial fracture strength of resin/copper interfaces. Samples of resin/copper interfaces are subjected to various reflow conditions and tested under dynamic four-point bend loading. The change in failure modes and crack propagation are recorded during the experiment. Interfacial fracture toughness and steady-state energy release rate have been recorded and compared for each testing condition. The evolution of bulk resin properties and resin/copper interfaces has been studied to determine its effect on pad cratering. This study would help recommend resin to copper interface combination, which provides better reliability against pad cratering.

Title: Soil erosion estimation and best management practices implementation in conventional and biomass clearcut harvests

Primary Author: Manisha Parajuli

Additional Authors: Mitchell Dana; Daniel, Marrisa Jo;Tom Gallagher;Richard Cristan;Timothy Mcdonald;Arjun Rijal

Department/Program: Environmental Science

College: School of Forestry

Abstract: The utilization of forest residues for energy production through biomass harvesting may increase and reduce the amount of soil-retained biomass, potentially leading to soil erosion. This study aimed to compare erosion rates and the implementation of Best Management Practices (BMPs) between 12 operational harvests located in the Coastal Plains of Alabama, Florida, and Georgia. The clear-cut areas were divided into six operational categories, including harvest areas, roads, skid trails, SMZs, decks, and stream crossings. The Universal Soil Loss Equation Forest method was applied to estimate the potential erosion in each category. BMP audits were performed based on each state's guidelines. The results showed that the mean erosion rate from conventional harvesting sites was slightly higher, at 0.41 tons/acre/year, compared to the biomass sites, at 0.40 tons/acre/year. The erosion rate varied depending on the operational category and BMP implementation status, with higher rates from skid trails in both conventional and biomass sites (conventional: 0.724 tons/acre/year, biomass: 0.68 tons/acre/year). However, a two-sample t-test showed that the erosion rates were not significantly different between the two harvest types (p-value=0.99). The overall BMP implementation rate was 96% for biomass sites and 94% for conventional sites. It is important to ensure that proper BMPs are implemented at all harvest sites, regardless of the type of harvest.

Title: Methanol-carboxylate co-transport in sulfonated PEGDA membranes with PEGPEA as a blocking group

Primary Author: Pravin Parasakthi Aravindhan

Additional Authors: Jung Min Kim;Bryan Beckingham

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Artificial photosynthesis devices reduce CO2 to useable chemicals to help reduce the effects of climate change. However, these devices lack the selectivity to produce a single product, producing a mixture of alcohols (methanol), carboxylates (formate, acetate), and various other products. The membranes in these devices must prevent the crossover of these products for maximum efficiency without compromising ionic conductivity. Unfortunately, ion exchange membranes cannot mitigate the crossover of these products. Thus, fundamental studies on membrane structure and the resultant transport-physiochemical property relationships are essential. Previously, our group observed increased acetate permeabilities on co-permeation with fast-moving methanol and found that including phenyl group-containing poly(ethylene glycol) phenyl ether acrylate or PEGPEA can reduce this undesirable transport. To further extend this investigation, we prepare a series of cation exchange membranes (CEMs) with poly(ethylene glycol) diacrylate or PEGDA as a crosslinker, 3-sulfopropyl methacrylate potassium or SPMAK as a sulfonated comonomer, and PEGPEA as an uncharged comonomer. Secondly, we varied the membrane composition with different SPMAK-PEGPEA ratios and two different PEGDA chain lengths. Permeability to methanol and carboxylates are carried out individually and in their co-transport. Sorption-desorption (solubilities) experiments for carboxylates are also performed. Permeabilities vary as methanol > formate > acetate ≈ propionate, and solubilities vary as propionate > formate > acetate. Both permeabilities and solubilities decrease with decreasing PEGDA chain length. In the future, we will perform sorption desorption to methanol individually and its co-transport with carboxylates to elucidate the solute transport. We will also study physiochemical properties to help explain the transport behavior in these dense polymer membranes.

Title: Female first and senior authorship in critical care publishing

Primary Author: Anna Lauren Partee

Additional Authors: ;Ginny Snipes;Sandi Perry;Marilyn Bulloch

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The number of females working in healthcare is growing. According to the U.S. Bureau of Labor Statistics, women made up 77% of healthcare practitioners in 2021. However, publishing does not reflect this statistic. The objective of this study was to evaluate female first and senior authorship in critical care and intensive care medicine journals. Scimago Institutions Rankings (SJR), an online rank system, was utilized to identify the top 5 critical care journals by impact factor as of 2019. The Table of Contents for each journal was evaluated for every issue published in 2021. Articles excluded were corrections to existing articles, letters to the editor, meeting abstracts, or those not in English. Articles that met study criteria were evaluated to determine if the first or last author was female and if the authors had received funding for their scholarship. The credentials and departmental listing were noted for these authors. Data was analyzed using descriptive statistics. There were 1400 articles that were evaluated; Of these, 32% of articles had female first authors and 19% had female last authors, and 9% had both. The most common type of article was editorials (32%) followed by original research (30.8%); followed by correspondence (14.6%); followed by review articles (13.9%); followed by imaging (3.1%); followed by patient education (2.0%); followed by guidelines (0.7%). Of the articles with female first or last authors, 26% declared funding. The most common credentials of senior authors were MD (68.3%), followed by PhD (20.4%). While women make up approximately 77% of healthcare practitioners, 42% of articles published in the top 5 critical care journals were female first or senior authors. The majority of articles published by women were editorials. It is unclear why the amount of female authorship is disproportionally low. Further evaluation is needed to determine the low rates and how to increase female authorship in the medical literature.

Title: Exploring the therapeutic potential of a new psychoactive substance engineered [1-(3,4-Methylenedioxybenzyl)-Piperazine] for Parkinson's disease

Primary Author: Ishan Patel

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The background for this research 1-(3,4-methylenedioxybenzyl)-piperazine (MDBP), a piperazine designer drug, has been misused extensively over the last several years. MDBP screening and measurement methods are now well-documented in the current MDBP literature. Another area in which MDBP has been researched is in myocytes, hepatocytes, and Caenorhabditis elegans. However, relatively few in silico, in vitro, and in vivo investigations have explored the pharmacodynamic characteristics and dopaminergic neuropharmacological profile of MDBP. The specific aim is to investigate the pharmacodynamic properties and in vitro dopaminergic neuropharmacological effects of MDBP. These are the materials and methods used. N27 dopaminergic neuronal cells have been used in the current research to illustrate the influence of MDBP on dopaminergic neuronal viability, ROS and RNSgeneration, hydrogen peroxide, nitrite, Lipid peroxide production, glutathione, NADH content, and the activities of specific enzymes such as mitochondrial Complex-I, Complex-IV, cyclooxygenase, interleukin converting enzyme, caspases (3,8,9), monoamine oxidase and tyrosine hydroxylase. These parameters allow the evaluation of the influence of MDBP on oxidative stress, mitochondrial function, inflammation, apoptosis. The results are as follows. Dopaminergic neuronal viability was not impaired by MDBP. MDBP showed no significant influence on tyrosine hydroxylase activity. Surprisingly, it suppressed the activity of monoamine oxidase considerably. Likewise, MDBP exhibited no negative impact on the mitochondrial function and had no significant influence on the markers of apoptosis and inflammation. Due to the preceding factors, MDBP could have no or mild dopaminergic neurotoxic consequences. With more reliable data from in vivo research, MDBP might be a therapeutic or preventative treatment for a wide range of human and animal disorders.

Title: Enhancing healthcare and drug development in cerebral disorders through artificial intelligence

Primary Author: Ishan Patel

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Cerebral disorders (CDs) have affected humans and animals throughout history. These conditions can range from relatively minor issues, like migraines, to more serious pathological conditions such as stroke, dementia, and Parkinson's disease. Despite advances in medical treatment, many CDs remain poorly understood, and current treatments can be limited in their efficacy. The application of artificial intelligence (AI) to therapeutic, preventive, and diagnostic approaches has the potential to be substantial. The advances in AI have provided unprecedented opportunities to dramatically improve present and future healthcare. AI is being used to diagnose, reduce morbidity and mortality, and health costs, as well as integration into the drug discovery and development sector to develop innovative prophylactic or therapeutic agents. AI also has a promising role in individualized, decision-based therapies and in the early diagnosis of CD. AI is used to develop predictive models and algorithms that can identify pathologies with greater accuracy, detect early onsets, and provide personalized treatments with improved healthcare. AI-driven medical imaging solutions, such as computer-aided diagnostics and image segmentation, can enable faster and more accurate diagnosis while reducing the risk of human error and healthcare costs. AI-driven decision support systems can provide tailored medical advice based on patients' genomics and toxicological data to help clinicians make better clinical healthcare decisions. Thus, AI has the potential to revolutionize healthcare, making it more efficient, cost-effective, and accessible in the treatment of CDs. AI-based healthcare is still not yet well established, and future developments not only promise to improve patient outcomes, but also medical bureaucracy in CDs.

Title: Artificial Intelligence: The future of individualized and effective therapeutic or preventive approach for psychosis

Primary Author: Krish Patel

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Every year, the incidence and prevalence of mental diseases rise. There has been a spike in drug usage, loneliness, and suicidal thoughts because of the Covid 19 epidemic. Psychosis is a common, debilitating symptom of many psychiatric, neurodevelopmental, neurological, and medical diseases. It is a significant area for research in neurologic and psychiatric practice. The implementation of artificial Intelligence (AI) into the medical field has become more prevalent as healthcare providers look to maximize their efficiency in their practices, as well as in discovery and development of the drug. Not only does this save time for the physicians, but it also helps organize the electronic data of patients, such as their genomics and allergic conditions, leading to more individualization that can help reduce morbidity and mortality along with improving the therapeutic efficacy. Moreover, it can ease the process and aid researchers in discovering or developing novel pharmacological agents and therapeutic, diagnostic, or preventive approaches. AI can help traverse the gap between the two and interpret a multitude of data simultaneously in real-time. From subjective interpretations to reading MRI scans, AI can convert raw data into significant readings instantaneously. AI has been coupled with machine learning to develop discriminatory factors to create a learning algorithm that continuously becomes more efficient, which helps in the early detection and prevention of patients with Psychosis. AI also supports the accurate differentiation of other illnesses that have symptoms similar to Psychosis, such as dementia and Alzheimer's. Currently, through prognostic analysis of neural signatures, AI and machine learning are advancing the therapy for Psychosis, especially with suicidal thoughts. Ultimately, the physician-patient interaction, drug discovery and precise drug dosing will become progressively cost-effective and methodical as AI and machine learning evolve.

Title: Genome-wide DNA methylation analyses that contribute to racial disparities in childhood obesity

Primary Author: Priyadarshni Patel

Additional Authors: ;Geetha Thangiah;Xu Wang;Ramesh Jeganathan

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Children who are overweight or obese are a direct result of long-term positive energy balance, which has its proximal causes in the complex interactions between a person's genetic makeup, life choices, an environment that promotes obesity, and social factors. Despite research indicating that childhood obesity is heritable, the drastic increase in the prevalence of obesity in children over the past few decades cannot be fully accounted for by changes in the genome brought on by evolution, indicating that the childhood obesity epidemic is likely driven by gene-environment interactions. The term "epigenetics," which describes mitotically inheritable changes in gene function that cannot be accounted for by changes in the DNA sequence, refers to one of the primary molecular mechanisms driving the interaction between genes and the environment. Here, we identified differentially methylated areas using the Illumina MethylationEPIC BeadChip Array. Between normal weight (NW) and overweight/obese (OW/OB) children, there were 3138 target IDs in total that were differently methylated ($p < 0.05$). These targets were linked to 2313 genes. In this study, OW/OB children had 792 target IDs that were hypermethylated and 2347 that were hypomethylated compared to NW participants. A total of 1240 target IDs representing 739 genes were significantly differentially methylated for the racial groups' European American (EA) and African American (AA). Compared to EA participants, AA participants had 643 target IDs that were hypermethylated and 597 that were hypomethylated. We discovered unique genes that were differentially methylated between children of NW and OW/OB and between EA and AA ethnicity, which further opens the door to a more thorough examination of the top hits and the overlapping genes.

Title: Investigating the neuroprotective mechanisms of Tetrahydrocurcumin: a key curcumin metabolite.

Primary Author: Suhrud Pathak

Additional Authors: Nagabhushanam Kalyanam;Muralikrishnan Dhanasekaran;Satyanarayana Pondugula;Keyi Liu;Surekha kadannagari;Sindhu Ramesh;Jack Deruiter;Timothy Moore

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Curcumin is one of the most valuable natural bioactive owing to its prolific beneficial pharmacodynamic activities. However, curcumin's extremely limited bioavailability has long been a barrier to its prophylactic and therapeutic applications in animal and human healthcare. Notably, various metabolites of curcumin have become a relatively recent research topic of scientific interest and extensive research has been accomplished to enhance curcumin usage. Furthermore, escalating scientific information shows that curcuminoid metabolites have biological activity comparable to or better than curcumin or its precursors. However, there are very few studies on the effects of Tetrahydrocurcumin, a key curcumin metabolite, on the dopaminergic and hippocampal neurons. Hence, this study investigated the neuroprotective effects of Tetrahydrocurcumin. *In silico* and *in vitro* studies were performed to elucidate the neuroprotective effects of Tetrahydrocurcumin. HT-22, the hippocampal cells, and N27, the dopaminergic neuronal cells, were used to establish the impact of Tetrahydrocurcumin on hippocampal and dopaminergic neuronal viability. Statistical analysis was accomplished using Prism-V software. Elucidating the *in silico* properties and neuroprotective mechanisms of Tetrahydrocurcumin can promote its prophylactic and therapeutic use in the treatment of various neurological diseases.

Title: Determine the in vivo protective effects of "Capsaicin" against High-Fat Diet-induced toxicity in control and TRPV1 knockout mice

Primary Author: Suhrud Pathak

Additional Authors: Padmamalini Baskaran;Muralikrishnan Dhanasekaran;Jayachandra Ramapuram

Department/Program: Pharmacy

College: School of Pharmacy

Abstract:

Obesity is a chief cause of metabolic dysfunction and leads to type 2 diabetes, fatty liver diseases, hypertension, and cardiovascular complications. Obesity leads to insulin resistance. Hyperglycemia and hyperlipidemia cause an increase in reactive oxygen species (ROS) due to enhanced substrate-mediated cellular metabolism, the release of proinflammatory cytokines, and lipid peroxidation. The pathophysiology of non-alcoholic fatty liver disease (NAFLD) and its progression are influenced primarily by oxidative stress. Emerging evidence suggests that mitochondrial dysfunction leads to oxidative stress in NAFLD. Recent research suggests that activation of transient receptor potential vanilloid subfamily 1 (TRPV1; also known as capsaicin receptor) counters obesity and NAFLD. However, the mechanism underlying this remains unclear. This research addresses this knowledge gap. We used wild-type (WT) and TRPV1-/- mouse models to evaluate the effect of dietary capsaicin in countering High Fat Diet (HFD) induced NAFLD. These mice received a normal chow diet (NCD) or HFD (± capsaicin) for 32 weeks. We isolated the liver tissue from these mice and performed *in vitro* experiments. Morphological/histological analysis showed that capsaicin ameliorated fatty liver in WT but not in TRPV1-/- mice. HFD feeding increased reactive oxygen species, lipid peroxidation, and caspase 3 activity while capsaicin feeding countered these in the liver isolated from WT but not in TRPV1-/- mice. Our results indicate that dietary capsaicin reduces lipid peroxidation and redox stress in the liver. We hypothesize that capsaicin-induced TRPV1 activation antagonizes HFD-mediated oxidative stress in NAFLD. Further studies to analyze the role of TRPV1 in preventing NAFLD are in progress.

Title: Listening to the voice of the rural Alabama community through needs assessment

Primary Author: Margaret Ann Payne

Additional Authors: ;Linda Gibson-Young

Department/Program: Nursing

College: School of Nursing

Abstract: Our team has developed a model to address social determinant of health outcomes and significant health disparities across rural Alabama in partnership with Pharmacy, Nursing, Human Sciences, and the Alabama Cooperative Extension System. After reviewing community capacity and health needs across the region, the Auburn University team elected to partner with Chambers County as the pilot site for this model. Data from the community are clear and emphasize high percentages with COVID-19, obesity (38% in Chambers County in 2018), hypertension (40%), or diabetes (16%) in this region. In the Chambers County City of LaFayette, the nearest emergency medical treatment facility is 24 miles away. In 2020, 12% of residents in Chambers County were uninsured, with a primary-care healthcare provider to patient ratio of 2,410:1(University of Wisconsin Population Health Institute, 2022). This rural health initiative is focused on increasing access and education to populations on health-related content. We started with community engagement efforts to identify the needs of the community. We designed a 16-item needs-assessment and administered to community throughout a 15-month time frame. Community members that attended local events were approached to complete the assessment via pen and paper or electronic submission. The team gathered all data and reviewed it together. We analyzed 58 unique entries, and the needs assessment data was entered into MS Excel. Through these results we explored demographics and analyzed community needs. We only had one electronic survey, as 57 participants completed via pen and paper. To address the needs of the community most adequately, it is critical to communicate directly with residents who would likely use the facility on an ongoing basis. We assessed top choice for healthcare as chronic pain (15%), aging issues (13%), diabetes (13%), and obesity (13%). Through this communication, residents relayed the need of improvement in hours of service and asked for extended hours. The nearest urgent care to Lafayette is 20 minutes away by car, and the nearest

Title: Fabrication of self-standing bio-based films containing hemicelluloses and pectin

Primary Author: Evie Pearson

Additional Authors: ;Fatimatu Bello;Soledad Peresin

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: The usage of plastics, especially single-use plastics, is an issue of continually growing concern due to its longevity in the environment and unsustainable disposal methods. The continued utilization and disposal of these materials are contributing to growing concerns regarding the environment, wildlife, and human health. Because of these issues, it is imperative to seek replacements for traditional synthetic plastics. Replacing plastics such as synthetic films with alternatives containing renewable, biodegradable, and non-toxic polymers such as hemicelluloses and pectin are of great economic and environmental interest. Hemicelluloses and pectin are naturally occurring polysaccharides that can be sourced from plant cells. These materials are promising for making films due to their ability to form gels and their barrier properties. For this research, pectin derived from soybean hulls and apples were used to form films along with hemicelluloses derived from tara gum to develop bio-composite films at varying ratios. A small amount of glycerol was used as a plasticizer. The effects of the source and isolation of the pectin on tara gum-containing films will be discussed. Chemical structure and hydrophobicity of these bio-based films were determined using Fourier transform infra-red spectroscopy (FTIR) and contact angle, respectively. The moisture content and solubility of the films were also investigated. Films such as these have potential to begin the process of phasing out petroleum-based films, particularly within the food packaging industry.

Title: Test efficacy of orexin 2 receptor (ox2r) agonist on memory, anxiety, and depression in narcoleptic orexin knock-out (ox-ko) mice

Primary Author: Julia Peterson

Additional Authors: ;Vander LeKites;Natasha Wendy Grabau;Henry Limbo;Daniel Kroeger

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Narcolepsy is a sleeping disorder resulting from the loss of orexin signaling in the brain due to orexin neurons in the lateral hypothalamus dying. Narcolepsy patients typically exhibit the following primary symptoms: severe sleepiness during the day, fragmented sleep during the night, hypnagogic hallucinations, and cataplexy. The secondary symptoms include memory impairments, anxiety, and depression. Current therapies utilize stimulants or antidepressants to enhance wakefulness to address the primary symptoms, but symptoms rarely fully resolve. Orexin knock-out (OX-KO) mice are exemplary because they lack the gene that encodes the protein prepro-orexin, resulting in a loss of orexin signaling and symptoms of narcolepsy. Previous research utilizing OK-KO mice demonstrated that an orexin agonist targeting the orexin 2 receptor (OX2R) could be used as an effective treatment for the primary symptoms of narcolepsy. The current study was designed to test whether this OX2R agonist can also alleviate the secondary symptoms of narcolepsy (memory/anxiety/depression) in OX-KO mice. We are implanting two groups of OX-KO mice (and two groups of wild-type control mice) with EEG/EMG leads (to monitor sleep/wake states) and allow for a two-week acclimation period, after which one group of each genotype will receive the OX2R agonist treatment while the others receive a vehicle treatment. One hour after administration, we will assess their performance in the novel object recognition test (memory), open field test (anxiety), and forced swim test (depression). We hypothesize that the OX-KO mice treated with the agonist will perform at comparable levels to wild-type mice (either vehicle or agonist treated) in the object recognition test and show similar levels of anxiety and depression, but that vehicle-treated OX-KO mice will perform poorly compared to the other three groups, confirming that OX2R agonist treatment can alleviate the primary as well as secondary symptoms of Narcolepsy.

Title: Surrogate modeling of the relative entropy for inverse design

Primary Author: Levi Petix

Additional Authors: ;Mohammadreza Fakhraei Ghazvini;Michael Howard;Christopher Kieslich

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Relative entropy minimization—a statistical-mechanics approach for finding molecular interactions that produce target structural ensembles—is a promising route to achieving robust inverse design of soft materials. For a given set of parameters describing a molecular interaction, the gradient of the relative entropy is evaluated by performing a molecular simulation, then the parameters are updated using gradient-descent methods. Small descent steps are often needed for numerical stability, incurring considerable computational expense because a simulation must be performed at each step. Gradient-descent methods may also fail to find the true optimal parameters (global minimum of the relative entropy) because they can converge to suboptimal local minima depending on the initial value of the parameters being adjusted. Here, we investigate the use of a surrogate model to reconstruct the relative entropy using sparse sampling of its gradient. We approximate the relative entropy with Chebyshev polynomial interpolation on Smolyak sparse grids, giving a function that is inexpensive to evaluate and is amenable to standard optimization techniques. We then identify approximate locations of minima in the relative entropy that we can use as starting points for standard relative-entropy minimization protocols based on gradient descent. By identifying these good initial values, our work increases the robustness and computational efficiency of the relative entropy minimization protocol.

Title: The effects of pre-drying on the thermal degradation of ethylene-vinyl alcohol

Primary Author: Julia Pettersen

Additional Authors: ;Daniel Meadows;Tanmay Rahman

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: As of 2022, only 9% of plastic waste is recycled while plastic consumption is growing continuously. A large contribution to that waste is the use of multilayer plastics for packaging. Ethylene-vinyl alcohol (EVOH) is a polymer popularly used in multilayer packaging for its strong barrier properties that lengthen the shelf life of products. However, it begins to degrade at a temperature very close to its melting point. This makes it very difficult to recycle EVOH as well as separate it from other layers in the packaging. EVOH is also very moisture sensitive, which results in a loss of its barrier properties if brought into contact with water. Trace amounts of water in EVOH could be contributing to the degradation that occurs when heated. To measure the effects that moisture has on the thermal degradation of EVOH, dried samples and non-dried samples are extruded at temperatures above melting point. Then, FTIR (Fourier-transform infrared spectroscopy) , DSC (differential scanning calorimeters), and CIELAB color characterization are performed on the samples. FTIR is used to look at the changes in functional groups. DSC measures the melting and crystallization points in order to assess the behavior. CIELAB color characterization quantifies the differences in color. With the comparison of quantitative measurements of degradation, we can determine whether pre-drying EVOH lessens the thermal degradation that transpires. If this is the case, pre-drying can be implemented in further EVOH research dedicated to minimizing degradation during processing.

Title: Multi-dose misoprostol pharmacokinetics and its effect on the fecal microbiome in healthy, adult horses

Primary Author: Rachel Pfeifle

Additional Authors: Aaron Ericsson;Kara Lascola;Erin Groover;Anne Wooldridge;Dawn Boothe;Tamara Sierra Rodriguez

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: Misoprostol, a synthetic prostaglandin E1 analogue, is administered to treat glandular gastric ulcers in horses and may possess anti-inflammatory properties. However, misoprostol's multi-dose pharmacokinetics and effect on the fecal microbiome in horses require investigation. Our objective was to compare the pharmacokinetics between repeated doses and to characterize changes in the fecal microbiome after oral and rectal multi-dose misoprostol administration in six healthy university-owned geldings. In a randomized, cross-over study, misoprostol (5 mcg/kg) was administered orally or rectally every 8 hours for 10 doses, or not administered (control), with a 21-day washout between treatments. Concentration-versus-time data for dose 1 and dose 10 were subject to non-compartmental analysis. For microbiota analysis using 16sRNA amplicon sequencing, manure was collected at -7 days, immediately prior to dose 1, then 6 hours, 7 days, and 14 days after dose 10, with time-matched points in controls. Repeated dosing related differences in pharmacokinetic parameters were not detected for either administration route. Area under the concentration-versus-time curve was greater ($p < 0.04$) after oral versus rectal administration. Relative bioavailability of rectal administration was 4-86% that of oral administration. Microbial composition, richness, and β-diversity differed among subjects ($p < 0.001$ all) while only composition differed between treatments ($p \leq 0.01$). Richness was decreased 6 hours after dose 10 and at the control-matched timepoint ($p = 0.0109$) in all subjects. No other differences for timepoints, treatments, or their interactions were observed. Overall, differences in systemic exposure were associated with route of administration, but were not detected after repeated administration of misoprostol. Differences in microbiota parameters were primarily associated with inter-individual variation and management rather than misoprostol administration.

Title: Modelling water imbibition of hydrogel coated seeds

Primary Author: Tori Phillips

Additional Authors: Jean-François Louf;Jean-Francois Louf

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Plant species that grow naturally in semi-arid environments have developed various survival strategies to capture water. One of them is to produce mucilage: a hydrogel seed coat that absorbs soil moisture and helps to maintain hydration in case of drought events. Inspired by these mucilage producing seeds, hydrogel coatings have been developed to improve drought resistance in other seed species. Some field tests showed encouraging results with, for example, increased growth by 16% in wheatgrass, 50% in cucumber, 77% in corn, and 100% in pea shrub. However, other tests showed conflicting results as the seed coatings reduced germination rates, especially with thin seed coats (hydrogel mass < 50% of seed mass). Unfortunately, the reason behind the dichotomy of these germination rates is unknown. In order to investigate the effect of a hydrogel seed coat on water transport, we designed artificial seeds made of clay and coated them with an alginate hydrogel. We then measured the associated imbibition rate, and examined how the variation of permeability in flow direction, in this spherical geometry, affects the dynamics of water moving into the clay core. By combining Darcy's law and polymer physics, we aim to develop an analytical model capturing water motion in hydrogel coated seeds.

Title: Designing universal hotel standard practices for all disabilities

Primary Author: Madeline Pick

Additional Authors: ;Anna Ruth Gatlin

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Around 61 million adults in the United States live with some disability: a physical or mental debilitation that restricts someone from participating in common daily activities. The assumption that a disability has an outward appearance means that many legitimate, non-visible disabilities go unnoticed. Since the Americans with Disabilities Act (ADA) provides design guidelines for the physically disabled, people with invisible disabilities are often forced to comply with a world designed for the non-disabled. Travel, at its core, is navigating a world designed for non-disabled people, leaving disabled travelers and their loved ones, who may still desire to experience the world, with many barriers, and restrictions to navigate. Due to the lack of resources and accommodations for people living with disabilities within the hospitality and travel industry, many travel less or not at all. The sad reality is that people navigating the world with disabilities cannot experience the same world as non-disabled tourists. There are statistically significant differences between the travel patterns of people with disabilities and people without a disability. Only 21% of people with a disability stay overnight during a trip due to extreme discomfort and lack of safety. Evidence-based design interventions, including but not limited to intentional room layout and space planning, reducing sharp corners, and emergency services buttons, may lower the threshold of barriers for travelers with disabilities. The purpose of this research poster is to establish a guideline for designing a standard double-queen hotel room that supports people with visible and invisible disabilities. This poster will feature the guideline, grounded in relevant literature, and original images of selected features that are transferable to standard hotel rooms.

Title: Breaking the barrier: A systematic review of the challenges faced by black women in the technology industry

Primary Author: Chelsea Pierre

Additional Authors: ;Makeda Nurradin

Department/Program: Informational Systems Management

College: College of Business

Abstract: The technology industry continues to face a major challenge in breaking down barriers for Black women, despite ongoing efforts to promote diversity and inclusion. The under representation of Black women in technology is a complex issue shaped by systemic barriers, biases, and limited access to opportunities. To gain a better understanding of the challenges faced by Black women in the technology industry and how to support their success, a systematic review of existing literature is essential. The review examines the various barriers to entry and advancement, including discrimination, lack of representation, inadequate mentorship and networking opportunities, and the need to reconcile multiple identities through Education Resources Information Center (ERIC) with 29 relevant articles. The inclusion criteria for studies were those that focus on Black women in the technology industry and that provide original data or insights on the challenges they face and the strategies they use to overcome these challenges. The review also highlights the strategies and interventions utilized by Black women to overcome these barriers and succeed in the technology industry. The findings of this systematic review provide valuable insights into the experiences of Black women in the technology industry, inform future research and practice, and underline the need for continued efforts to address the systemic barriers and biases that hinder Black women's progress and success in the technology industry.

Title: Should baseball be adjusted to better suit younger players' physical characteristics?

Primary Author: Matthew Poczatek

Additional Authors: ;

Department/Program: Kinesiology

College: College of Education

Abstract: Scaling of equipment is commonplace across various sports and has been shown to enhance skill acquisition and aid the development of better motor patterns. In baseball, bat size, field size, and protective equipment are modified to meet the needs of younger players, except for the size of the baseball itself. Further, hand anthropometry for each playing level has not been considered. Therefore, the purpose of this study was to investigate the differences in the hand size of males from 6 years old to adult (18+), to determine a suitably sized baseball for each playing age group (per the USSSA's guidelines). PubMed, Google Scholar, and EBSCO Host databases were searched from 2002-2022 for studies including terms related to hand size. 56 studies were found, with 9 meeting the inclusion criteria by reporting both hand length and hand width. Mean hand size values for each age were calculated from 3833 data points, before being grouped into the playing age groups: 7-8y, 9-10y, 11-12y, 13-14y, and 15-17. Mean hand size for each age group was established and the difference in hand size (HS, length □ width) and ball coverage (BC, hand size □ ball surface area) compared to an adult. Relative to the adult group, HS was: 41.2% smaller (with 40.5% less BC) for 7-8 yrs; 31% smaller (with 30.5% less BC) for 9-10 yrs; 19.9% (with 19.5% less BC) for 11-12 yrs; 7.2% (with 7.1% less BC) for 13-14 yrs; and 3% (with 2.9% less BC) for 15-17 yrs. These findings demonstrate that hand size differs considerably between adult and age-group players. Consequently, younger players appear to be using a ball that is too large. The premise of scaling the baseball according to players' hand anthropometry may benefit youth athletes overhand throwing motion in order to more closely mimic their senior counterparts and potentially reduce overuse injuries. Future work should identify how scaling a baseball influences throwing technique and determine if a scaled ball improves throwing pattern.

Title: Investigation Into Low-Defect Molybdenum Produced by Continuous and Pulsed Laser

Primary Author: Ernest Porterfield

Additional Authors: ;Bart Prorok

Department/Program: Materials Engineering

College: College of Engineering

Abstract: Refractory metals have piqued the interest of many researchers as the solution to many high-temperature applications. These metals, however, tend to be difficult to manufacture and machine. The solution: additive manufacturing. Additive manufacturing has become well known for its ability to create complex or even personalized creations, but despite its advantages, many materials are not widely used. One such material is Molybdenum. Recent studies using laser powder bed fusion have printed crack-free Molybdenum with an achieved density greater than 90%. These results were obtained by using a heated print bed in conjunction with continuous laser. By modifying the laser parameters of a pulsed laser, it is hypothesized that the need for a heated print bed can be overcome in part due to improved input energy control. The information learned from Molybdenum can be applied to its alloy TZM or other refractory metals.

Title: Formulation of bio-based resins for the fabrication of engineered wood composites (EWC)

Primary Author: Lorena Alexandra Portilla Villarreal

Additional Authors: ;Abiodun Oluseun Alawode;Manish Sakhakarmy;Sushil Adhikari;Brian Via;Iris Vega Erramuspe;Archana Bansode;Maria Auad

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Phenolic-formaldehyde (PF) resins are synthetic polymers formed through the condensation reaction between phenol and formaldehyde. They are commonly used in the wood composite industry due their characteristics, among them, dimensional and thermal stability, chemical and fire resistance, high hydrophobicity. However, the growth of the wood resin and composite manufacturing sector has also brought challenges, as concerns over the impact of PF on human health and the environment. Phenol and formaldehyde are the main components of PF resins, both chemicals have been designated as hazardous pollutants that can seriously affect human health at high concentrations or long exposure times. Also, these chemicals are derived from the non-renewable petroleum resources. Hence, developing new resins is crucial to fully or partially replace chemical components with bio-based materials is crucial. This work describes the production of wood panels using biobased resin (replacing 50% of phenol) and commercial PF resin, with the intention of analyzing and comparing their performance. The panels were characterized using standard methods, including thermogravimetric analysis, differential scanning calorimetry (DSC), dynamic thermal analysis, elemental analysis, Fourier transform infrared (FT-IR) spectroscopy. According to the results, the wood panels made with biobased resin and PF resin showed excellent mechanical properties (modulus of elasticity and rupture modulus) and dimensional stability (internal adhesion), in addition, the boards with biobased resin showed more uniformity and consistency. The preliminary results of the present work evidenced the potential of naturals for the partial replacement of phenol in synthetic resins.

Title: Different extrusion-based approaches in 3D-printing of oro-dispersible films: Newer possibilities in personalized drug delivery

Primary Author: Ishwor Poudel

Additional Authors: ;Chu Zhang;Manjusha Annaji;Nur Mita;Jayachandra Ramapuram;Joy Massey;Oladiran Fasina;James Scherer;Andrew Manush;Lucy Chae

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Orodispersible films (ODFs) are emerging as versatile thin-layer dosage forms that are designed to disintegrate rapidly upon encountering oral saliva. The primary reasons for the popularity of this innovative formulation are improved patient acceptability and adherence, dosing flexibility, and convenience. ODFs are attractive to patients affected by dysphagia and with no water access. ODF blends the dose accuracy of solid dosage forms and ease of administration of liquid dosage forms and offers dynamicity of patient-centric precision dosage forms. We have investigated the feasibility of various extrusion-based 3D printing technologies to fabricate fast-dissolving ODFs and compared the variations in the process parameters, ease of fabrication, and characterization properties of final dosage forms. The variation in the printing parameters, drying time, drying temperature, and nature of needle/nozzle, were variables utilized to compare the reproducibility and uniformity of the ODFs prepared from three extrusion-based printing technologies (Pneumatic extrusion, syringe-based extrusion(needle/nozzle) and thermoplastic extrusion). Feed materials for extrusion were selected based on rheological characterization, printability, and reproducibility. Sumatriptan succinate was utilized as a model drug for investigation. An optimized ODF formulation composition involving was kept common and utilized for comparison. The ODFs obtained from pneumatic and syringe-based extrusion printhead consistently created bulk batches with little to no variation. Syringe-based extrusion showed high precision, whereas pneumatic extrusion showed quick fabrication. Thermoplastic-based extrusion evaded the need for initial hydrogel feed preparation but faced challenges of uniform mixing of multiple components together. Consecutive utilization of three technologies was possible to create multi-layered ODFs, which opens up possibilities of multi-ODFs in a single film. Sandwiching drug-admixed layers between taste-masking layers was able to address the palatability challenges associated with ODFs.

Title: Impact of new product entry on the price trends of existing disease-modifying antirheumatic drugs

Primary Author: Nabin Poudel

Additional Authors: Dr. Jeffrey R. Curtis;Kimberly Garza;Jingjing Qian;Surachat Ngorsuraches;Peng Zeng

Department/Program: HORP

College: School of Pharmacy

Abstract: The objective of this study was to determine the impact of new disease-modifying antirheumatic (DMARD) entry on the price trend of existing brand-name DMARDs. Average Wholesale Prices from September 1998 to June 2021 for conventional synthetic DMARDs (csDMARDs), biologic DMARDs (boDMARDs), and targeted synthetic DMARDs (tsDMARDs) for rheumatoid arthritis (RA) were obtained from IBM Micromedex®-REDBOOK®. The maintenance dose of each DMARD was used to calculate the monthly estimates of the average annual acquisition cost. The price trend of each DMARD was estimated based on the change in the monthly estimates of the annual acquisition cost over time. A segmented regression analysis with interrupted time series (ITS) was constructed to determine the impact of within-class entry of new DMARD (i.e., new molecule or dosage form) on the price trends of existing brand-name DMARDs. Thirteen DMARDs were included in the analysis. The prices of csDMARDs increased by 5.4% to 6.2% per annum, except for the Otrexup® whose price decreased by 0.4% per annum. The prices for brand-name boDMARDs and tsDMARDs increased from 0.6% to 7.7% per annum. ITS results showed that the prices of existing csDMARDs were not significantly affected by the entry of a new csDMARD. The effects of new boDMARD entries on the prices of existing boDMARDs varied. Only the entry of Simponi® significantly increased the average price (intercept) by \$25.9 ($p=0.027$) and the monthly change (slope) by \$4.6 ($p<0.001$) of the price of Remicade®. While most of the entries of new tsDMARDs did not significantly affect the price trends of existing tsDMARDs, the average price (intercept) of Olumiant® significantly dropped by \$33.9 ($p=0.021$) after the entry of Rinvoq®. Generally, the prices of brand-name csDMARDs, boDMARDs, and tsDMARDs for RA treatments had increased. New DMARD entries had varying effects on the price trends of existing DMARDs.

Title: Characterization of a viral suppressor of RNA silencing encoded by CLRDV-AL

Primary Author: Bailee Price

Additional Authors: ;Sung-Hwan Kang;Mary Akinyuwa

Department/Program:

College: College of Agriculture

Abstract: A new cotton leafroll dwarf virus (CLRDV) strain has been isolated from Alabama and the rest of the United States Cotton Belt. CLRDV strains that were prevalent and caused severe yield loss in the cotton industry in African and South American countries had noteworthy differences between their viral suppressors of RNA silencing (VSR). VSRs are virus-encoded proteins to counterattack the antiviral mechanism employed by their hosts, which degrades viral RNA molecules. In order to understand the pathogenicity of the Alabama strain of CLRDV (CLRDV-AL), our project aimed to characterize a CLRDV-AL encoded VSR, P0 protein, by expressing various recombinant P0 proteins via *Agrobacterium*-mediated infiltration to examine them for silencing suppression potency, intracellular localization, and self-interaction. Sequence alignment comparing CLRDV-AL to the previously isolated strains from South American countries indeed showed some mutations within the domain known for VSR function. To verify the P0 protein's ability to suppress the RNA silencing, P0 was concurrently expressed next to the VSRs from other viruses along with a green fluorescent protein (GFP) in *Nicotiana benthamiana* 16c plants, a transgenic line that constitutively expresses GFP. This assay demonstrated that P0 protein of CLRDV-AL is not a potent silencing suppressor compared to other VSRs such as P19 and HC-Pro known for their strong silencing suppression. The self-interaction of P0 proteins examined using the yeast-two-hybrid method implied no homo-dimerization of CLRDV-AL P0 proteins. The intracellular localization of P0 investigated by expressing GFP-tagged P0 proteins in the plant cells and monitoring them using a fluorescence microscope revealed the possibility of P0 protein being a membrane-bound protein. Our study showed that VSR encoded by CLRDV-AL has interesting characteristics that differ from other well-known strong VSRs. More studies may be needed to identify the cause of such differences further.

Title: Rootstock effect on yield, fruit quality and labor input of ‘Cresthaven’ peach trained to a perpendicular V system

Primary Author: Jarrett Price

Additional Authors: ;Bernardo Chaves-Cordoba;Melba Salazar-Gutierrez;Edgar Vinson;Elina Coneva;Sushan Ru

Department/Program: Horticulture

College: College of Agriculture

Abstract: In Alabama, peach production is the largest fruit crop industry. Armillaria root rot (ARR) disease threatens the industry, as it causes over $8 million in annual crop loss in the southeastern U.S. With increasing costs associated with production and disease pressure, producers need a reliable technology to sustain production. Newly released, size controlling, ARR resistant interspecific rootstock, MP-29, is currently the only commercially available ARR resistant rootstock and needs to be tested in Alabama conditions. An experimental orchard was planted at the Chilton Research and Extension Center, AL in 2017 to determine rootstock effect on total yield, yield efficiency, fruit quality and possible labor reduction of ‘Cresthaven’ peach grafted to size-controlling, semi-dwarf rootstocks in a high-density orchard trained to a perpendicular-V, two-dimensional system. Rootstocks included are Guardian and Lovell (Controls), MP-29, Rootpac -20, Rootpac-40, Controller 6, Controller 7, and Controller 8. The experiment is a RCBD consisting of 5 replications with 4 trees per replication. Current results indicate that ‘Cresthaven’ trees on Guardian produced the highest total yield of 13.7 kg/tree in 2022. MP-29 grafted trees had similar yield (10.6 kg/tree). MP-29 trees had the highest yield efficiency, 0.23 kg/cm2, in 2022, almost twice as efficient as standard Guardian rootstock (0.12 kg/cm2). Trees on Controller 6 produced the largest fruit, with a mean weight of 278 g. MP-29 fruit averaged 232 g, similar to fruit size of Guardian trees (236 g). MP-29 grafted trees took 45% less time to harvest when compared to trees grafted to Guardian. No rootstock effect was found on fruit quality characteristics of ‘Cresthaven’ peach. Current results indicate MP-29 is a promising, highly efficient and ARR resistant rootstock for sustainable peach production in Alabama. Further research will be conducted to better understand the rootstock effect on peach tree vigor and productivity.

Title: Investigating invisible labor practices in TTRPG Actual Play

Primary Author: Olivia Price

Additional Authors: ;Emily Friedman;Charles Bringardner

Department/Program: English

College: College of Liberal Arts

Abstract: Online streaming and multimedia filming of Tabletop Role-Playing Game (TTRPG) Actual Play has become immensely popular in recent years. The invisible labor practices in designing, producing, and distributing these shows is mostly obscured from viewers, despite these processes being integral to the form. As TTRPG Actual Play joins the entertainment industry in television and film deals, the invisible labor conducted behind the scenes has become exponentially more relevant. This study mainly consists of information obtained through interviews and site visits with industry professionals. These practitioners offered insight on their labor processes, material necessities, noticed trends, and expectations for the future of Actual Play. A bibliography of resources has been started through the collection of academic articles, peer-reviewed works, social media interactions, and other mediums through which the Actual Play community communicates. This study has found that the labor frameworks in use are largely informal and reminiscent of those in theater, television, and film settings. Industry professionals who produce Actual Plays are often members of these other entertainment communities, which fuse closer together as the industries progress. New frameworks for invisible labor continue to form and be revealed as the Actual Play production community develops, further encroaching into television and film. Lifting the veil that separates the viewer from the labor has illuminated the economic and academic potential of this field in terms of production frameworks, entertainment, live performance, and viewership. This study will serve as the basis for future investigations of invisible labor in Actual Play, providing a vocabulary and expectations for continued exploration.

Title: Global supply chain management - Walmart case study.

Authors: Quyen Huynh

Department: International Business

College/School: College of Business, Auburn University at Montgomery.

Abstract:
For 25 years, Walmart has been the best supply chain among other retailers. Besides Walmart's most effective cost leadership strategy, the paper explores, lists and compares global supply chain management characteristics such as customer orientation, competitor orientation, logistics management, supply management and operation management between Walmart and its competitors in the hypermarket and super centers industry. We seek to identify key factors of success. The paper aims to prospect factors and the flows that make Walmart’s SCM different and efficient, even though Walmart was instituted much later than its competitors in this retail industry.

Title: Nanocellulose-based film for greaseproof food packaging application

Primary Author: Summia Rahman

Additional Authors: ;Yucheng Peng

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: The common uses of plastic for food packaging are advantageous in many cases because of its easy processability, low cost, and excellent resistance to water, oil, and grease penetration. The per- and poly-fluoroalkyl substances (PFASs) treated paper using the conventional paper manufacturing process has also achieved similar functionalities to prevent oil, water, and grease passages through the article. However, due to the health and environmental concerns of the two packaging systems mentioned above, food packaging industries are now open to more options. A sustainable, cost-effective, and health-promoting paper-based food packaging system that can restrict oil, water, and grease from passing through is highly desirable to fulfill the increasing demand for convenience food products. Cellulose nanomaterials, such as cellulose nanofibrils (CNFs) and cellulose nanocrystals (CNCs), are ideal alternatives. CNFs have excellent mechanical strength and gas barrier properties, but have high hydrophilicity because of their amorphous structure and surface hydroxyl groups which decrease their properties whenever in contact with moisture or high humidity. On the other hand, CNCs are less chemically reactive to water due to their crystalline structure, but films prepared with only CNCs are very brittle. This research will study grease resistance ability, mechanical properties, and physical properties of films prepared with CNF/CNC blend suspension at different ratios. Next, in this study, polyethylene oxide (PEO), which is widely known for coating applications as well as a biocompatible and nontoxic polymer will be added. The research goal is to prepare standalone grease resistance film and/or coating material with CNFs and CNCs followed by adding PEO for food packaging applications. The properties of the films will be characterized by mechanical property tests, contact angle analysis, grease resistance test, pore size distribution, and FTIR analysis.

Title: Assessment of the thermal-oxidative stability of Nylon 6/66 copolymer used as a barrier in multilayer food packaging

Primary Author: Tanmay Rahman

Additional Authors: ;Daniel Meadows;Virginia Davis

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: The widespread use of Nylon, a versatile, durable, and strong polymer, has led to a growing global market estimated to be worth USD 32.6 billion in 2022. The market is expected to expand at an annual rate of 6.2% from 2022 to 2030, driven by increasing demand across various industries such as automotive, food packaging, electrical and electronics, fashion, and textiles. Nylon 6/66 is commonly coextruded with other polyolefins and tied into layers to produce multilayer food packaging. Like most thermoplastics, Nylon 6/66 can be re-extruded both in the manufacturing plant and post-consumer use. This study focuses on the evaluation of the thermal and rheological behavior of virgin and extruded polymers. Time resolved Rheology was utilized to get information about the dominant mechanism of thermal oxidative degradation. The virgin polymers were extruded at different temperatures for a certain time period and screw speed in a twin screw extruder. Fourier Transform Infrared Spectroscopy (FTIR) was conducted on the virgin and extruded polymers to get information about the presence of functional groups and their relative concentrations. Thermogravimetric analysis (TGA) was performed in both nitrogen and air environments to get insights into the thermal stability of the polymers. A differential scanning calorimetry (DSC) study was carried out using a heat-cool-heat cycle to examine the melting behavior and crystallinity. Viscosity and flow behavior were analyzed using a rheometer within the viscoelastic region. The results obtained from this provide a comprehensive overview of the stability of Nylon 6/66 copolymer under different extrusion conditions. This also depicted a comparative analysis of the sensitivity of the methods to changes. This study serves as a foundation for further research to assess the feasibility of processing recycled polymer.

Title: In-vitro assessment of botanical extracts for cytochrome P450 enzyme inhibition using LC-MS-Q-TOF.

Primary Author: Zarna Atul Raichura

Additional Authors: Amala Soumyanath;Angela Calderon;Kabre Heck

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: The World Health Organization (WHO) data and literature shows that, more than 70-80% world's population uses complementary and alternative medicine (CAM) for their health care needs. This indicates that there is an exceptional growth in consumption of botanical dietary supplements because of increase in awareness about its therapeutic importance. Thus, making it crucial to understand the safety profile of these botanical supplements with respect to absorption, distribution, metabolism, and excretion, including their potential for pharmacokinetic botanical-drug or botanical-botanical interactions. Metabolism based drug-drug interactions, involving inhibition of cytochrome P450 (CYP450) enzymes by co-administered drugs has gained significant attention due to prevalence of polypharmacy. Therefore, this study aims to determine any potential CYP450 inhibition by ashwagandha and açaí botanicals, using a recently developed in-house CYP450 cocktail enzyme assay and a liquid chromatography-mass spectrometry method for efficient detection of metabolites. The CYP450 cocktail enzyme assay involves analyzing 10 FDA approved CYP450 isoforms simultaneously. For preliminary screening of ashwagandha extracts, enzymes CYP1A2, CYP2A6, CYP2B6, CYP2C8, CYP2E1, CYP2C9, and CYP2D6 showed ≤ 50% enzyme activity, whereas CYP3A4 and CYP3A5 ≥ 50% enzyme activity at a concentration range of 1.318-2.462µg/ml of withaferin A and 0.544-1.816 µg/ml of withanolide A. Whereas for açaí, only CYP2C9 showed ≤ 50% enzyme activity when treated with acidic methanol extract of açaí formulation at a human equivalent concentration of 2.321ng/ml of cyanidine-3-glucoside. This reflects that both botanical extracts showed potential of CYP450 inhibition. Based on the above results, IC50 values will be calculated for those specific extracts and its respective enzyme who showed ≤50% activity.

Title: Nutrients, sediments, and water loss from one-inch rainfall in conventionally tilled soils receiving two manure types and four application rates.

Primary Author: Chhabi Raj

Additional Authors: Tibor Horvath;Bernardo Chaves-Cordoba;Rishi Prasad;Debolina Chakraborty

Department/Program: Agriculture

College: College of Agriculture

Abstract: Farmers apply manure in conventionally tilled fields to enhance the soil's organic matter and provide nutrients for crops. Manure from different animals has unique nutrient concentrations and alters the soil properties differently. The time of rainfall affects the concentration of the nutrients in runoff. We hypothesize that runoff volume, sediment, and nutrient load will differ between manure type and application rate on conventionally tilled soil during runoff generation. Hence, a rainfall simulation experiment was performed in a conventionally tilled soil to evaluate how manure types (poultry and swine), and application rates (poultry litter: 1-, 2-, 3-, and 4-ton acre-1: liquid manure: 5000, 10,000, 15,000, 20,000 gallons acre-1) affect runoff volume, dissolved reactive phosphorus (DRP), inorganic nitrogen (NO3-N + NH4-N), and sediments. A secondary objective was to evaluate the short-term (1, 2, and 3 weeks after manure application) and long-term (2 months) effect of rainfall on nutrient and sediment losses. The soil samples were collected in pans (21×12×2.5, in^3) from a conventionally tilled field in Town Creek, Alabama. These pans were placed under a calibrated rainfall simulator to collect the surface runoff water samples to simulate one acre-inch rainfall. The water samples were analyzed for sediments and nutrients using standard protocols. It was observed that manure type, application rate, and time of rain significantly affected sediment, water soluble phosphorus, and inorganic nitrogen loads. There was no effect of manure type and application rate on runoff volume. Time of rainfall affected runoff volume, sediment, water soluble phosphorus, and inorganic nitrogen loads. The amount of sediment loss was not equal in swine manure treatments and poultry litter treatments. The application of swine manure was better than poultry litter in terms of decreasing inorganic nitrogen and water-soluble phosphorous loads for both the short and long term.

Title: Forecasting neurotoxicity of designer drugs through computational modeling

Primary Author: Teja Ramapuram

Additional Authors: ;Randall Clark;Muralikrishnan Dhanasekaran;Sindhu Ramesh;Jack Deruiter;Timothy Moore;Mohammed Almaghrabi;Forrest Smith;mansour alturki;Mohammed Majrashi

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: In this study, the pharmacological activity and neurotoxicity of various drugs were predicted using computational modeling. The focus was on designer drugs with low toxicity, which have the potential to treat peripheral impairments, endocrine disorders, and neurological diseases. To evaluate their effects, novel substances of abuse were tested both computationally (using the Qikprop method) and in vitro for cell viability. Seven derivatives of 3-Trifluoromethylphenyl-piperazine (TFMPP) were studied, including 2-TFMPP, 3-TFMPP, 4-TFMPP, 2-TFMBzPP, 3-TFMBzPP, 4-TFMBzPP, and BZP. Based on several pharmacokinetic parameters, such as Lipinski's rule of five, Jorgensen's rule of three, QPlogBB, and QPPCaco, the TFMPP derivatives were found to be highly absorbable after oral administration and able to cross the blood-brain barrier. The neurotoxicity of a drug or chemical was also evaluated using PISA* and FOSA* values, which are derived from SASA*. The TFMPP derivatives showed lower cLogp, HBD, and HBA values, and exhibited significantly higher neurotoxicity compared to the TFMBzPP derivatives.

Title: Sentiment analysis for low-resource African languages (Hausa and Igbo)

Primary Author: Nilanjana Raychawdhary

Additional Authors: ;

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: One of the most extensively researched applications in natural language processing or NLP is sentiment analysis, yet most of the research focuses on languages with a lot of data. Igbo and Hausa are the two most widely spoken languages in Nigeria, and each language's annotated tweets contain a sizeable portion of tweets that have been code-mixed. The majority of African languages lack the curated datasets needed to create sophisticated AI applications. Research is required to determine both the feasibility of current NLP methodologies and the creation of novel techniques in order to optimize the application of such datasets. This paper outlines our efforts to develop a sentiment analysis (for positive and negative as well as neutral) system for tweets from African (Hausa, Igbo) languages. With the help of sentiment analysis, we can computationally analyze and discover opinions and sentiments in a text or document. We worked on the first comprehensive collection of human-annotated SemEval-2023 Task 12 Twitter dataset for the most widely used languages in Nigeria, including Hausa and Igbo. Here we trained the modern pre-trained language model AfriBERTa -large on the SemEval-2023 Task 12 Twitter dataset to create sentiment classification. The results specifically show that training these datasets on the AfriBERTa-large model produced the performance on our sentiment analysis test, with an F1 score of 81 % for both Hausa and Igbo languages.

Title: Emotional dysregulation and suicidality in adolescents adjudicated for sexual offenses

Primary Author: Maddie Rein

Additional Authors: ;Cameron Tice;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Suicide is very important risk factor for incarcerated youth, given the high rates of trauma often experienced. Suicidal ideation, the presence and magnitude of thoughts related to suicide, is highly correlated with future attempts in youth. Ideation is also correlated with emotional dysregulation, or one's ability to recognize and understand emotional states and respond in an adaptive way. One measure of emotional dysregulation is hyper-responsiveness, or an overreaction to emotionally triggering stimuli. In youth and adult populations, emotional dysregulation was positively correlated in both presence of and severity with suicidal ideation The current study sought to establish a link between suicidal ideation and self-reported emotional dysregulation in a sample (n=165) of AISB at a court-mandated residential treatment facility. The Trauma Symptom Checklist for Children (TSCC) and the Millon Adolescent Clinical Inventory (MACI) were used in a linear regression analysis. Thoughts and behaviors related to suicide were measured using the suicidal ideation scale. While the body of literature investigating the correlation between ideation and emotional dysregulation in residential youth populations specifically is limited, the results generally supported previous findings. The overall model was significant. There was a significant positive association between suicidal ideation and hyper-responsivity and a significant negative association between suicidal ideation and under-responsivity. This suggests multiple pathways between emotional dysregulation and suicidal thoughts, where some may express outwardly with externalizing symptoms and some inwardly with blunted responses. These findings can guide intervention and treatment practices for youth both within and outside of treatment populations.

Title: Assessing the impact of integrating algae into biofloc aquaponics on the system performance under coupled and decoupled operations

Primary Author: Shima Rezaei

Additional Authors: ;

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Over 23 million American households live in food deserts. Food deserts have been a major problem in urban areas, which disparately affect racial minorities and people living in impoverished neighborhoods. Aquaponics can be a sustainable remedy for this situation as it can be operated by local people to produce their own fresh fish and vegetables. These days, aquaponics has drawn considerable attention among other agricultural systems, as it can produce fish and vegetables at the same time. In addition, it can recover nutrients from the aquaculture wastewater for growing plants. As a result, less water, energy, and fertilizer would be consumed compared to traditional aquaculture and agricultural systems. While attractive in theory, lack of technical knowledge in stability and ease-of-use of systems as well as low-quality products are the main obstacles for novice users to operate aquaponics. To address these issues, our first objective is to understand how different designs of aquaponics will impact the system's reliability and user-friendliness. Coupled and decoupled operations, two main designs of aquaponics with different arrangements of water recirculation between the aquaculture and hydroponics bed, will be assessed in this study. Four regional high schools in Alabama are involved in this project to investigate the effect of different design decisions on aquaponics performance operated by inexpert users. The second objective is to apply algal biofloc technology in the fish tank to improve the process and product quality since algae are capable of helping nitrifiers and enhancing the release of the nutrients that can be used by plants. Moreover, it potentially improves the fish flavor profile and nutritional value of products. Four different treatments will be evaluated in this research;1) Coupled bacteria biofloc, 2) Coupled algal biofloc, 3) Decoupled bacteria biofloc, 4) Decoupled algal biofloc. Currently, 16 aquaponics are running in the regional high schools and 12 aquaponics are running in E.W.Shell Fisheries Center at Auburn University.

Title: Mitochondrial respiratory function varies between migratory and non-migratory White-crowned Sparrows

Primary Author: Emma Rhodes

Additional Authors: Kang Nian Yap;Wendy Hood;Paulo Henrique Caldeira Mesquita;Andreas Kavazis;Geoffrey Hill

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The energetics of migration and the role mitochondria play remain an enigma. We studied mitochondrial function of two subspecies of White-crowned Sparrow (*Zonotrichia leucophrys*), migratory *Z. l. gambeli* and non-migratory *Z. l. nutalli* in California. Collection occurred during three different time points: pre-migration, mid-fall migration, and winter. We hypothesized that mitochondrial adaptation plays a significant role in bird migration. We predicted that migratory birds would have higher maximum mitochondrial respiration, respiratory control ratio (RCR), mitochondrial density, and complex enzymatic activity compared to the non-migratory group. Through differential centrifugation, we isolated mitochondria from the pectoralis muscle and polarographically tested mitochondrial oxygen consumption. For the mid-migration timepoint, our results show that for both Complex I and II respiration, *Z. l. gambelii* has significantly higher maximum respiration compared to that of *Z. l. nutalli* and migrant RCR values were higher for complex I respiration but not complex II respiration. Migrants overall had significantly higher mitochondrial density than residents. For complex enzymatic activity, we found no patterns with the residents. Among migrants, complex II and III activity were significantly lower for the mid-migration timepoint compared to the spring and winter timepoint. We observed mixed seasonal effects for the migrant subspecies, indicating that subspecies difference could be due to both fixed and plastic traits. Our study supports the hypothesis that mitochondria may play a crucial role in migration.

Title: Effort of preservation method on nutritive value of kudzu forage

Primary Author: Diva Rigney

Additional Authors: ;Abbigail Hines;Courtney Heaton;Brandon Smith

Department/Program: Agriculture

College: College of Agriculture

Abstract: Kudzu (*Pueraria montana* [Lour.] Merr.) is labeled by the USDA as an invasive plant species responsible for a significant economic loss in forage productivity and infrastructure damage. Early research on kudzu as a pasture crop found that it has a high nutritive value and nitrogen-fixation ability. Research on kudzu was abandoned for years, but recent efforts in sustainable agriculture have renewed interest in the potential in the use of kudzu. Therefore, the purpose of this study was to compare the effect of preservation methods on nutritive value and digestibility of kudzu forage. A plot of land in Auburn, Alabama was utilized for the harvest of kudzu. The plot was subdivided into two parts; half of the biomass was collected fresh, and the remaining half was allowed to sun-cure as part of the haying process. Samples were collected from each and assayed for NDF, ADF, ADL, and CP. Samples were also subjected to batch culture in vitro digestibility. Data were analyzed using SAS v. 9.4. There was no effect of preservation ($P \geq 0.39$) on NDF, ADF, ADL, or CP concentrations in kudzu forage. Sun-cured kudzu had greater ($P < 0.01$) IVTD (64.3%) and IVTDOM (63.0%) and tended to have greater ($P = 0.06$) IVNDFD (35.6%) than fresh material (59.4, 57.8, and 31.3%, respectively). With the observed increases in digestibility, results are interpreted to mean that traditional preservation techniques may be beneficial in enhancing the feed value of kudzu for ruminant livestock species.

Title: Formaldehyde paper-based analytical device (PAD) for a cost-effective detection of formaldehyde in the air

Primary Author: Christian Rivera Caicedo

Additional Authors: ;Laura Michelle Nieto Arciniegas;Brian Via;Iris Vega Erramuspe

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: The engineered wood composite (EWC) industry is one of the most thriving sectors in the forest industry. EWCs are produced on a large scale using wood particles and resins. Depending on the application, the wood particles may vary in type, size, and shape. Furthermore, the chemical composition of the resin varies depending on its application. Phenol–formaldehyde (PF) resins continue to dominate the resin industry because of their excellent performance. However, PF resin manufacturing faces substantial challenges, including the strong demand for partial or total replacement of synthetic compounds and strict regulations limiting volatile organic compound (VOC) emissions. Formaldehyde is a crucial precursor for the fabrication of PF resins. The chemical compound, with a boiling point of −21°C, is found ubiquitously in air and is listed as a hazardous VOC because of its negative impact on human health and the environment at high concentration levels or during long-term exposure to low concentrations. The present work describes the development of a paper-based formaldehyde sensor prototype for measuring the concentration of formaldehyde in air. The sensor was developed using natural polymers, cellulose fibers, and color probes and was validated using the ASTM D6007-14 standard technique and an electronic formaldehyde sensor. The outcomes of our work may provide an easy and quick alternative to monitoring formaldehyde emissions, following the current legislation.

Title: Assessing nutrition knowledge, diet quality, and physical activity in student veterans

Primary Author: Laura Robinson

Additional Authors: Casey Colin;Michael Greene;Drew Fruge;Krissy Smith

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Military veterans are at greater risk for chronic medical conditions, many of which are associated with greater body mass index (BMI). Detrimental changes to diet and physical activity levels after separation from military service may contribute to this disparity which may be mitigated by nutrition education during service. We conducted a survey in student veterans attending two southeastern US universities to determine current nutrition knowledge and hypothesized that nutrition education during service would be associated with better current diet quality (DQ), physical activity (PA), and BMI. Food group knowledge, and nutrient knowledge, DQ as measured by Healthy Eating Index, and PA reported in Metabolic Equivalent physical activity minutes per week (METmin) were assessed using previously validated questionnaires. Height and weight were self-reported to calculate BMI. Differences in these variables between nutrition education groups were assessed using Mann-Whitney U tests. Change in DQ, PA, and BMI were assessed with Wilcoxin Signed Rank tests. Sixty-three out of 82 responses were valid. Respondents were 60.3% male, 81.0% white, 42.9% and 17.5% served in the Army and Air Force, respectively, and 30.2% received nutrition education while in the military. Veterans receiving nutrition education while serving did not have higher food group knowledge, nutrition knowledge, current DQ, METmin or BMI than their counterparts. As a whole, respondents reported decreased METmin ($p<0.001$), increased BMI ($p=0.01$), and no change in DQ. Effective lifestyle interventions are needed to improve diet quality and PA in veterans in order to prevent chronic disease and improve quality of life.

Title: The effect of nerve growth factor on the gut microbiome and gut-brain axis in an obese, type II diabetic mellitus, and Alzheimer's disease mouse model

Primary Author: Megan Robinson

Additional Authors: ;Ramesh Jeganathan

Department/Program: Nutrition, Dietetics, and Hospitality

College: College of Human Sciences

Abstract: Within the United States, obesity and Type 2 Diabetes Mellitus (T2DM) are at epidemic levels. In Alabama, the rates for both obesity and T2DM are even higher than the national average. Obesity and T2DM increase the risk for the development of other chronic diseases through the dysregulation of all organ systems within the body, including the digestive and nervous systems. Notably, sustained hyperglycemic states, such as in obesity and T2DM, have been linked to the development of cognitive decline and dementia. Alzheimer's Disease, a form of dementia, is connected with increased systemic inflammation and gut microbiome dysbiosis. Over 13 weeks in a high-fat/high-sugar diet murine model, the effect of a neuro-regenerative treatment, Neuronal Growth Factor (NGF), on the gut microbiome was investigated. Fecal samples were analyzed from 36 mice using 16s rRNA sequencing techniques. Diet and diabetes status exerted a greater effect on gut microbiome homeostasis than NGF treatment when compared to controls. The current investigation is being performed on gut-brain barrier function through analysis of key junction protein expression within the small intestine. Further investigation into the interrelationships of diet, metabolism, and nervous system health is warranted.

Title: Development of a novel bead reactor for aquaculture wastewater treatment

Primary Author: Marisa Rodriguez McGehee

Additional Authors: Luz E. de-Bashan;David Blersch

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Tertiary treatment can be used to prevent eutrophication in streams or lakes where wastewater may be disposed of and to allow the possibility of reuse of treated wastewater. This project builds on previously published research which established the process of making and testing alginate macrobeads containing co-immobilized bacteria (*Azospirillum brasilense*) and microalgae (*Chlorella sorokiniana*). These macrobeads were found to successfully remove nitrogen and phosphorus from synthetic and municipal wastewater when the system was treated as a batch reactor. However, the effectiveness of the bead reactor at removing nitrogen and phosphorus from other wastewater types, and using other reactor designs, has not been tested. The aim of this research is to optimize a general reactor design to increase nutrient removal from aquacultural wastewaters. This involves designing the system as an activated sludge process where the macrobeads are recycled back into the system. The design of the system as an activated sludge process is predicted to increase nutrient removal and lower cost through a lower requirement of macrobeads. Results from preliminary trials at the benchtop scale are presented, and considerations for scale up are considered. In the future, the reactor design will be repeatedly optimized to suit treatment of specific agricultural wastewaters

Title: Assessment of early-stage thermal manipulation on broiler chicken muscle satellite cell population densities at transfer and at hatchGer

Primary Author: Wesley Rogers

Additional Authors: Charles W. Starkey;Brittany Wall;Jessica Starkey;Jeremiah Davis;Martha Sabine Rueda Lastres

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Multi-stage hatching egg incubators are challenging to manage and still common throughout the US broiler industry. It is difficult to satisfy all embryonic temperature requirements in systems where late-stage embryos must be kept from overheating while ensuring early-stage embryos are not at sub-optimal temperatures. The objective was to assess the effect of thermal manipulation (TM) during early-stage incubation (ESI) on muscle SC heterogeneity in broiler chicks at transfer and at hatch. Broiler breeder eggs (n = 2,160) were incubated at 37.5 °C from embryonic day (ED) 0 to 3. On ED4, COLD incubator setpoints decreased to 36.4 °C, HOT incubator setpoints increased to 38.6 °C, and control incubators remained 37.5 °C (n = 2 incubators per treatment). On ED11 all incubators were set to 37.5 °C until ED18 when eggs were transferred to hatchers. At transfer (ED18) and at hatch (ED21), pectoralis major (PM) and biceps femoris (BF) muscle samples were collected from 6 chicks per treatment. Samples were immunofluorescence stained to facilitate taxonomy of SC populations expressing the myogenic regulatory factors and common SC markers, MyoD, MRF4, and Myf5, by fluorescence microscopy. Data were analyzed as a 1-way ANOVA with the GLIMMIX procedure of SAS. Means were separated at $P \leq 0.05$ with the PDIFF option. Tendencies were declared when $0.0501 \leq P \leq 0.10$. Chicks from COLD incubators had the greatest density of MyoD+:Myf5+ SC in their BF ($P = 0.0261$) and tended to have a greater density of MyoD+:MRF4+ SC in their PM muscle ($P = 0.0562$) compared with chicks from the HOT incubators. On ED21, chicks from the hot incubators had the greatest density of MyoD+:MRF4+:Myf5+ SC in their PM muscle ($P = 0.0406$). Temperature gradients as small as 1.1 °C during ESI altered PM and BF SC populations in chicks at transfer and at hatch, underscoring the importance of careful hatchery management, and warranting investigation into whether these perinatal changes result in altered meat yields.

Title: SGLT2i prescribing opportunities in patients with diabetes and chronic kidney disease in relation to 2022 KDIGO and ADA guidelines

Primary Author: Jordan Rogers

Additional Authors: ;Pamela Stamm;Langley Matthews

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Chronic kidney disease (CKD) is characterized by a gradual loss of kidney function over time. CKD affects >10% of the general population worldwide. These patients are often diagnosed with other medical conditions, such as diabetes, that promotes additional kidney damage. With CKD progression, fluid and waste products accumulate causing other complications such as high blood pressure and anemia. Sodium-glucose cotransporter 2 inhibitors (SGLT2i) favorably affect renal outcomes in patients with predominantly stage 3 or 4 CKD. SGLT2i slow the progression of kidney disease and lower the risk of kidney failure by reducing glomerular hypertension, mediated through tubuloglomerular feedback. According to the Kidney Disease Improving Global Outcomes (KDIGO) 2022 Guidelines for Diabetes Management in CKD, SGLT2i are recommended for patients with type 2 diabetes (T2DM) and CKD with an estimated glomerular filtration rate ≥ 20 mL/min per 1.73 m^2 regardless of glycemia. As a result of the change in KDIGO guidelines, we will evaluate prescribing opportunities of SGLT2i among patients with current diabetes and CKD diagnoses, predominately CKD stage 3a, 3b, and 4, and identify the patterns of SGLT2i prescribing among this population, as well as identify candidates that may benefit from the initiation of an agent among this class for future clinical intervention. A chart review of patients diagnosed with T2DM and CKD (stages 3a, 3b, and 4) confirmed by review of estimated glomerular filtration rate (eGFR) and albumin to creatinine ratio will be conducted. A standardized data collection tool will be used to identify those patients who are potential candidates for SGLT2i. Descriptive statistics will be used to describe the results.

Title: Texture profile analysis of dehydrated pet treats manufactured from broiler wingtips and different inclusions of hydrocolloids

Primary Author: Jorge Romero Garcia

Additional Authors: Charles Starkey;Jessica Starkey;Justin Dunavant;John Wesly;Tristan Reyes;Madison Wagoner

Department/Program: Poultry Science

College: College of Agriculture

Abstract: The objective of this experiment was to evaluate texture profile analysis (TPA) of dehydrated pet treats generated from ground wing tips (WT) containing 4 concentrations of a hydrocolloid. Ground pressure cooked WT were mixed with encapsulated calcium lactate (ECL) + sodium alginate (SA) = ALGIN, based on manufacturers recommendations for four 6,800 g batches to create the following treatments: 0x (control), 0.5x (34.02 g SA + 28.92 g ECL), 1x (68.04 g SA + 57.83 g ECL), and 2x (136.08 g SA + 115.67 g ECL). Mixtures were extruded into 63.5-mm-diameter casings, and stored at 4 °C overnight. Chubs were frozen at -20 °C for 3 h before slicing into 5-mm-thick slices that were dehydrated using a convection oven at 93 °C for 2.5 h. TPA was analyzed using a texture analyzer (Stable Micro Systems, TA-HDplusC), with a TA-40 probe evaluating hardness, springiness, cohesiveness, adhesiveness, chewiness, and resilience. Data were analyzed using the GLIMMIX procedure of SAS ver. 9.4. Treatment means were separated using the PDIFF option and declared different at $P \leq 0.05$. There were no differences in hardness between treatments ($P=0.4036$). Treats with 0x and 0.5x ALGIN were similarly adhesive ($P=0.1968$) but treats with 1x and 2x ALGIN couldn't be analyzed due to no adhesiveness to the probe. Treats containing 0x and 0.5x ALGIN were similarly resilient, but less resilient than treats containing 1x and 2x, which were also similar ($P \leq 0.0001$). Treatments containing 0x and 0.5x were less cohesive when compared with 1x and 2x ALGIN treats ($P \leq 0.0001$). Springiness increased from 0x to 1x ALGIN ($P \leq 0.0001$), but were different between 1x and 2x. Finally, chewiness values for 1x and 2x ALGIN treats were greater than 0x treats, while chewiness values for 0.5x concentration were intermediate and similar to the rest ($P=0.0077$). Different ALGIN concentrations can alter pet treat texture profiles. This experiment did not consider consumer preferences, which need to be evaluated in the future.

Title: Effects of accented speech on listening effort and speech perception in college students

Primary Author: Sophia Rosene

Additional Authors: ;Sridhar Krishnamurti

Department/Program: Communication Disorders

College: College of Liberal Arts

Abstract: As the United States is becoming more multicultural and diverse, Americans are becoming more exposed to foreign accents. Hearing a foreign accent can increase a listener's cognitive load and result in an increased pupillary dilation. We were able to use pupillometry to measure pupil dilation in college-age students whose native language was English as they listened to audio recordings. These recordings contained sentences spoken by native speakers of English (unaccented speech) and non-native speakers of English (accented speech). The participants wore micro-medical VNG eye goggles as they completed pupillometry listening tasks, and changes in pupil dilation allowed us to objectively measure whether more listening effort was required when listening to an accented talker versus an unaccented talker. We found that there were greater changes in pupil dilation when listening to an accented speaker than to an unaccented speaker, which means that listening to accented speech results in greater cognitive load and requires more listening effort. Acoustic analysis of the audio recordings using spectrograms showed that the accented speakers paused more frequently and had more mispronunciations than the unaccented speakers, which resulted in differences in speech timing and distortions of the spectrograms. However, pitch and loudness were not significantly different between the two types of speakers. We can reasonably and objectively say that listening to accented speech in your native language requires more listening effort and places more demands on the listener than listening to unaccented speech. With these findings, we can better understand ourselves and the ways we react to degraded speech and stressful listening situations.

Title: An evaluation and characterization of the pharmacokinetics and pharmacodynamics related to the consumption of cannabis

Primary Author: Lily Royston

Additional Authors: Suhrud Pathak;Muralikrishnan Dhanasekaran;Suhrud Pathak;Timothy Moore

Department/Program: Pharmacy

College: College of Science and Mathematics

Abstract: Cannabis usage has accumulated a lot of interest as a possible therapeutic target for cancer and cancer-related ailments. It has been linked to many different neurological problems. Two primary physiological functions of cannabinoids in our bodies that are subjects of interest as a possible cancer treatment include cancer chemotherapy-induced nausea and vomiting management and appetite stimulation. Our goal in systematically reviewing 792 articles was to characterize possible therapeutic cannabis medication interactions as well as to categorize the cannabis safety profile since pharmacokinetic and pharmacodynamic interactions might occur when taken with other drugs. When cannabis is administered, the half-life of cannabidiol was reported to vary among the different methods of administration. Cannabis is found to have a wide range of effects in the body, specifically in the cardiovascular, respiratory, and neurological organ systems. Pharmacodynamic activity on specific brain receptors caused impairments of psychomotor performance related to the dosage received with consequences for driving a vehicle, piloting an airplane, and academic performance. Other components of cannabis smoke convey respiratory and cardiovascular health risks analogous to those of tobacco smoke. Prescription medication interactions and drug-to-drug reactions to cannabis have been documented, according to newly released research. Cannabis is often well-tolerated, however, bidirectional effects by enzyme metabolizing medications cannot be excluded. Cannabis users' reactions to different drugs should be carefully scrutinized to guarantee their well-being. This is particularly true for elderly people with various medical problems. Prior to legalizing the use of cannabis for medicinal purposes, more research and standardization must take place. If a more balanced approach is taken, the usage of cannabis could be much more beneficial.

Title: Development and validation of a broiler feeder pan spillage protocol to determine feed spillage of broilers using commercial feeders

Primary Author: Martha Sabine Rueda Lastres

Additional Authors: Joseph L. Purswell;Jessica Starkey;Jeremiah Davis;John Linhoss;Bethany Baker;Carson Edge;Jesse Campbell

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Feed constitutes between 70-80% of total costs in commercial poultry production. As of today, it is unknown how much feed is spilled by broilers during a grow out. Several factors including feed form and quality, bird age, feeder height and design, can influence the amount of feed being spilled. The purpose of this study is to validate a protocol where; as spilled feed is being captured, its adherence to feces and litter can be minimized and recovery of spilled feed can be more accurate. Two trials were conducted at the National Poultry Technology Center (NPTC) to simulate feed spillage at 2 bird ages, 14 and 42-d of age. Experimental design was a 3 × 3 factorial, with 3 percentages of feed spillage (1, 5 and 10%) and 3 different screen approaches (no secondary screen and secondary screen with opening sizes of 0.635 cm or 0.772 cm. A total of 36 capture units were evenly distributed in a 4.1 × 17.1 m concrete floor area. A capture unit consisted of a 68.6 × 69.8 cm black recycled plastic edging lumber grade g frame, surrounding a 58.4 × 58.4 × 5 cm 16-gauge carbon solid steel catch tray (bottom) that fits into a 59.7 × 59.7 × 7 cm 16-gauge carbon solid steel gridded platform (top), and a broiler feeder pan on center of gridded platform. Treatments with secondary screen had a 57.1 × 57.8 × 3.8 cm wood frame and a galvanized steel hardware cloth with opening sizes of either 0.635 or 0.772 cm, between the top and bottom steel structures. To estimate recovery rates, fixed amounts of feed, wood shavings and stone-ground mustard (as a substitute for bird feces) were weighed and evenly distributed on surface of capture units. Distribution of materials was done 4 times during a 12-hour period. After every distribution, the top platform was swept to assist material to fall through and avoid agglomeration at the surface of it. Feed, simulated feces, and wood shavings collected were separated from each other and weighed individually to calculate recovery rates.

Title: Differential strain dynamics under host and environmental stressors: A pathway to better understanding pathogen presence and fitness

Primary Author: Ivory Russell

Additional Authors: ;Amanpreet Kaur;Neha Potnis;Ranlin Liu

Department/Program:

College: College of Agriculture

Abstract: Co-occurrence of pathogenic species is routinely encountered in agricultural plants, yet factors driving coinfection dynamics and their influence on overall disease outcomes and pathogen prevalence are poorly understood. In Xanthomonas perforans (Xp), pathogenicity across strains is variable and by studying the contribution of host genotype, agricultural practices, and abiotic environment towards coinfection dynamics, insight into the within-host diversity may be uncovered. Two parallel approaches are employed, one of coinfecting Xp within field treatments exposing them to or lacking in environmental and/or host stressors and another where leaf material from tomato farm fields around the southeast is sampled for Xp. Metagenomic analysis obtains spatio-temporal dynamics of pathogen genotypes and could provide insight into maintenance of pathogen variation in different field conditions while further dissecting a possible influence of factors such as environment and host independently and synergistically on the pathogen. While Xp abundance and variation may correlate with climactic factors, analysis of the field trial results show significant differences across strain relative abundance and mutations and interestingly, these relationships are not static, yet may change by condition. These data uncover intraspecific differences in growth of Xp under variable environmental and/or host stressors and suggest that the mere pathogen presence may be a surface-level observation; as, if present, understanding intraspecific variation in factors that may play a role in pathogen fitness may shed light on differential treatment. Regarding intraspecific variation within the elements of a classic disease pyramid, these data suggest that the epidemiology of disease may evolve from a standard of treating or managing pathogen presence to a more focused plan and narrowed strategy starting with recording or predicting presence of strains based off any extrinsic factors involved.

Title: Cultural similarities and differences in functioning and disability among people with hearing loss: Lesson from a HEAR-COMMAND tool

Primary Author: McKenzie Russell

Additional Authors: ;Razan Al Fakir;Kathleen Lea

Department/Program: Communication Disorders

College: College of Liberal Arts

Abstract: The number of individuals with hearing loss is continuing to increase worldwide. The etiology and pathology of hearing impairment vary drastically across countries. The effects of hearing loss on an individual's quality of life are highly dependent on a person's degree of loss, lifestyle, environment, and communicative wants and needs. Therefore, it is vital that hearing healthcare is individualized. For this reason, a biopsychosocial model that is based on the International Classification of Functioning, Disability, and Health framework (ICF) and a comprehensive Core Sets for Hearing Loss (CSHL) was developed internationally in Germany, the USA, the Netherlands, and Egypt. Across the world, the *HEAR-COMMAND Tool* was developed and administered to one hundred and nine respondents. This questionnaire includes one hundred and twenty items with ninety inquiring about functioning and thirty regarding demographics, hearing status, and personal factors. The goal of the *HEAR-COMMAND Tool* is to obtain information from patients to improve and implement patient-specific solutions in audiological services, treatment, and rehabilitation. These results provide a snapshot of diversity across the world and pave the way for future studies to implement patient-specific care in all aspects of hearing healthcare. The results from this study will provide a snapshot of reliability, descriptive, content validity, and other analysis (e.g. Mann-Whitney U test, Kruskal-Wallis test).

Title: South Asian immigrants: Acculturative stress and help-seeking attitudes

Primary Author: Asmita Saha

Additional Authors: ;Latifat Cabirou

Department/Program: Education

College: College of Education

Abstract: Limited research exists on acculturative stress and professional help-seeking behaviors among immigrant groups in the United States, particularly South Asians. The aim of the present study was to understand the relationship between acculturative and perceived stress on professional help-seeking attitudes among South Asian immigrants. Social support and generational status were moderators in our study. Three hundred and seventeen individuals were recruited from Prolific Academic (a crowdsourcing platform). Participants were first- and second-generation South Asian immigrants. 35.1% identified as males, 63.3% were female, and 1.6% were queer or gender non-conforming, ranging in age from 18 to 57 years (mean = 26.41). Hierarchical multiple regression was performed for moderation analyses. Results found that social support did not have a moderating effect on professional help-seeking attitudes for either perceived or acculturative stress. However, generational status was found to be a significant moderator between acculturative stress and help-seeking attitudes. First-generation South Asian immigrants were less likely to seek help from mental health professionals as compared to second-generation South Asian immigrants. This implies that there is a need to advocate for increased emotional and mental health literacy, as well as orientation to healthcare services, particularly among first-generation immigrants.

Title: Sotorasib, a clinically used KRAS-G12C inhibitor, induces chemoresistance by activating human pregnane xenobiotic receptor

Primary Author: Julia Salamat

Additional Authors: Kodye L. Abbott;Satyanarayana Pondugula;Elizabeth Ledbetter;Chuanling Xu

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: During multidrug chemotherapy, activation of human Pregnane Xenobiotic Receptor (hPXR) has been shown to play a role in chemoresistance. One mechanism could be due to upregulation of agonists-induced hPXR-regulated expression of cytochrome P450 3A4 (CYP3A4) and multidrug resistance protein 1 (MDR1). CYP3A4 and MDR1 contribute to the metabolism & disposition of over 50% of clinical drugs. Therefore, during multidrug chemotherapy, drug induction of CYP3A4 & MDR1 can reduce the therapeutic efficacy of co-administered drugs, leading to chemoresistance. Sotorasib (SOT) is the first FDA approved KRAS-G12C inhibitor for the treatment of non-small cell lung cancer with the KRAS-G12C mutation. It is currently unknown whether SOT can activate hPXR and induce hPXR target genes, resulting in chemoresistance. Therefore, we sought to determine whether SOT could upregulate hPXR target genes in human hepatocytes & LS180 colon cancer cells, and induce chemoresistance in LS180 cells. SOT, at its therapeutic concentrations, induced hPXR transactivation of CYP3A4 promoter activity and induced gene expression of CYP3A4 & MDR1. SOT also increased the functional expression of MDR1 in the Rhodamine123 accumulation assay. The inductive effect of SOT on CYP3A4 promoter activity was inhibited by a specific hPXR antagonist, SPA70, suggesting that SOT induces hPXR target genes by directly activating hPXR. Moreover, SOT bound to the ligand-binding domain of hPXR, suggesting that SOT can directly interact with hPXR to induce CYP3A4 & MDR1. Notably, SOT decreased the sensitivity of LS180 cells to irinotecan and its active metabolite SN-38, suggesting that SOT can induce chemoresistance. Taken together, our results suggest that SOT induces chemoresistance by activating hPXR and inducing CYP3A4 & MDR1. The inductive effects of SOT on CYP3A4 & MDR1 expression caution the use of SOT together with other chemotherapeutics metabolized and transported by CYP3A4 & MDR1, as this can lead to chemoresistance.

Title: A comparison of the soil microbiome between kudzu-invaded and uninvaded areas
Primary Author: Monger, Samuel C.

Additional Authors: Stein, Claudia; Koelling, Vanessa A.

Department/Program: Biology and Environmental Science

College/School: College of Sciences, Auburn University at Montgomery

Abstract:

Invasive plant species represent a major threat to native ecosystems. They reduce native biodiversity, disrupt nutrient cycles, habitat structure, food webs and microbial communities above- and belowground. Kudzu *Pueraria montana var. lobata* is one of the fastest growing and most noxious invasive plants in the US. As a legume, it has a strong influence not only on carbon and nitrogen dynamics but likely also on the composition of soil microbial communities. Recent studies suggest that alterations to the soil microbial community can hinder the successful establishment of desired native plant species that often require specific soil microorganisms, such as mutualistic mycorrhizal fungi, rhizobia, and other endophytic bacteria. In a greenhouse study, we showed that kudzu creates positive feedbacks via changes in the soil microbial communities that might further foster its invasion success. Soil microbes associated with kudzu suppress the growth of the native legume *Chamaecrista fasciculata* but are beneficial for kudzu itself. However, we do not know the identity of the microbes causing these drastic growth effects, limiting our ability to apply soil inoculations to increase restoration success. The increasing availability of novel molecular tools helps us to better explore soil microbial communities. To address this issue, we extracted soil DNA from the above-mentioned greenhouse experiment. Using these DNA samples, we will amplify four target regions using PCR. Each of these target regions is used to identify operational taxonomic units (OTUs) for a target group of microbes. Upon receiving results from our sequencing, we will analyze these data to sort sequences from the eight soil samples into OTUs, and test whether the soil microbial communities from the invaded vs. uninvaded soil are distinct from one another.

Title: Maternal parenting styles in adolescents adjudicated for serious offenses

Primary Author: Jackie Sandell

Additional Authors: ;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Family attachment patterns, potentially disrupted by traumatic childhood experiences, could serve as a potential explanation for the development of antisocial behavior such as illegal sexual behaviors and general delinquency. Parenting styles are often a focus of developmental studies of adolescents who commit serious offenses in order to determine criminal trajectories and the underlying factors contributing to adolescents offending. There is a strong link between maternal overcontrol, hostility, and rejection and later antisocial behavior, including juvenile delinquency. As such, understanding the unique parental attachment patterns and how those may be impacted by childhood trauma is critical when working to rehabilitate these youth with court-mandated services. This study seeks to identify associations between self-reported maternal attachment styles and childhood trauma and family discord in a sample (n = 529) of youth adjudicated for serious offenses. The current study utilized data collected from a pretreatment evaluation of adolescents enrolled in court-mandated residential treatment. A series of linear regressions were used to test the theory that maternal indifference, abuse, and overcontrol could predict self-reported abuse and family discord. For direct childhood abuse, the overall model was significant, with maternal indifference and maternal abuse as significant positive predictors. For family discord, the overall model was significant. These results could suggest that mental health services designed to improve family attachment styles may be an important focus for clinicians working with court-involved youth in the future. Findings and limitations will be further discussed.

Title: Urban economics and environmental design in the Montgomery peacock tract

Primary Author: Aubrey Sanders

Additional Authors: ;Robert Sproull

Department/Program: Architecture

College: College of Architecture

Abstract: In 1850 the Montgomery, Alabama Peacock Tract was a slave plantation. By its height circa 1950, the Peacock Tract neighborhood was the African American commercial and cultural heart that powered the Civil Rights Movement. Racially motivated state and federal funded urban development projects systematically hollowed out the neighborhood’s vital social infrastructure, leading to a total collapse of economic opportunities. Property values, incomes, and accessibility to walkable labor markets, goods and services have fallen well below their mid-century height, and remain significantly worse off than the adjacent Cloverdale neighborhood. The Peacock Tract is a shell of its former self searching for new life, whilst curbing threats of gentrification and razing of its many historical landmarks. Using site collected data on environmental conditions and publicly available demographic and economic databases, regressions are generated to understand how urban design and accessibility to social infrastructure over time have impacted land values, urban microclimates, and welfare outcomes for the neighborhood's residents. The resulting infographics provide a striking insight into the lives and conditions of decaying urban environments in the new south cities of the United States.

Title: Effect of different dietary protein sources on satellite cell mitotic activity and skeletal muscle growth characteristics of young piglets.

Primary Author: Jorge Luis Sandoval Escobar

Additional Authors: Charles Starkey;Jessica Starkey;Allan Calderon Jimenez;Samuel Francisco Leiva Murcia;Brian Anderson

Department/Program: Poultry Science

College: College of Agriculture

Abstract: To evaluate how different dietary protein sources fed to young piglets affect muscle fiber cross-sectional area (CSA), fiber density, and satellite cell (SC) proliferative activity, a randomized complete block design experiment was done with 123 piglets from 5 farrowing groups. Piglets were assigned to 1 of 4 treatments consisting of a control group (SOW) and 3 dietary treatments. The 3 commercial milk replacer-based diets contained: when only (MLK), MLK + spray dried plasma (SDP), and MLK + soy protein concentrate (SPC). After birth, all piglets were nursed < 36-h on the sow for colostrum intake, assigned to 1 of 3 dietary treatments, transferred to Rescue Decks®, and reared until tissue collection on d 6, 14, 19, and 25. The SOW group was nursed by the sow until sampling. On sampling d, pigs were injected with 5'-bromo-2'-deoxyuridine (BrdU) to label mitotically active cells. One-hour post-injection, longissimus dorsi (LD) and biceps femoris (BF) samples were collected for immunofluorescence microscopy analysis. Cell populations were classified as either mitotically inactive SC (MyoD+:BrdU-; Pax7+:BrdU-; MyoD+:Pax7+:BrdU-) or mitotically active SC (MyoD+:BrdU+; Pax7+:BrdU+; MyoD+:Pax7:BrdU+). Data were analyzed as a 2-way ANOVA using SAS V9.4 PROC GLIMMIX and means were separated using PDIFF at $P \leq 0.05$. Tendencies were declared when $0.0501 < P \leq 0.10$. At d 14 and 19, MLK-fed pigs had the lowest BWG ($P \leq 0.0810$). On d 14 and 19, LD fibers from MLK-fed pigs had the lowest CSA and greatest density ($P \leq 0.0459$). MLK-fed piglets had the lowest density of Pax7+:BrdU+ SC in BF ($P=0.0185$) and the greatest density of MyoD+ SC in LD ($P=0.0831$) on d 6 as well as the greatest density of MyoD+ SC in LD ($P=0.0551$) and proliferative MyoD+:BrdU+ SC in BF ($P=0.0799$) on d 19. These data indicate that supplementation of different dietary protein sources can impact satellite cell-mediated hypertrophic muscle growth of neonatal piglets though the mechanism will require further investigation.

Title: Light field cameras in the context of fluid-structure interactions

Primary Author: Bibek Sapkota

Additional Authors: ;Vrishank Raghav Shankare Gowda;Holger Mettelsiefen;Brian Thurow

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: Fluid-structure interaction (FSI) involves complex unsteady interactions between fluid flow and structural dynamics. To experimentally quantify these complex 3 - dimensional interactions, a non-intrusive optical diagnostics technique is desired. The conventional experimental analysis of fluid surface interaction involves an extensive 6-camera setup including 4-camera tomographic particle image velocimetry (PIV) and 2-camera stereo digital image correlation (DIC) for observing particles and surface motion. In addition to the high cost of hardware, alignment complexity, operational complexity, and shallow depth of field for simultaneous study, this conventional methodology also requires significant optical access to the experimental system. However, many experimental setups do not allow such optical excess for multi-camera-based measurements. To mitigate these challenges, a single camera-based approach with the ability to simultaneously capture both surface and flow field under interaction is desired. This work presents a single plenoptic camera approach for simultaneous PIV and DIC to study the FSI problem. The preliminary diagnostics methodology for simultaneous measurement of flow velocity and surface deflections has been successfully implemented. Equally spaced dots were marked on the surface and illuminated with LEDs, while PIV particles were illuminated with a laser. High-speed images of both particle and surface motion were captured. The dots were separated from the particles using image segmentation and their centroid positions were determined. The positions of the dots were matched and triangulated using light field ray bundling. Flow velocity was obtained using plenoptic PIV with 3D reconstruction and cross-correlation. The preliminary result suggests accuracy of the z-position of surface dots was found to be within 1% of the object distance, while the velocity vectors captured the flow field with reasonable accuracy. Further work is being performed to enhance surface motion resolution and improve particle-surface decoupling and velocity measurement.

Title: Factors predicting the food security status among U.S. adults during the COVID-19 pandemic

Primary Author: Yashu Sapkota

Additional Authors: ;James Lindner;David Shannon

Department/Program: Curriculum and Teaching

College: College of Education

Abstract: Amid the COVID-19 pandemic, a significant number of households in the U.S. have faced job losses or income shocks, particularly those with lower incomes, which has led to increased risk of low food security. While prior research explored the link between household-level factors and food security status, these studies had limited scope and sample size. This study aimed to investigate the association between household and geographic characteristics and food security status (overall, child, and adult) among a nationally representative sample of U.S. adults during the COVID-19 pandemic. To investigate this relationship, we analyzed retrospective cross-sectional panel data from the 2021 Current Population Survey (CPS) Food Security Supplements, which is nationally representative. Descriptive statistics were used to present summary data, while logistic regression was utilized to assess the association between household and geographic characteristics and each food security status. A total of 30343 households were included. Descriptive statistics for overall food security status showed 89.77% (n=27357) of the households were food secure whereas 10.23% (n=2937) were not food secure. For children, 93.77% (n=7553) were food secure whereas 6.23 % (n=472) were not food secure. For the adults, 82.93% (n=25346) were food secure whereas 17.07% (n=4948) were not food secure. Logistic regression analysis showed that household and geographical characteristics such as owning own house, having higher family income, owning own business and farm, and having income above 185% poverty level was predictor for greater food security. On the other hand, the increase in the number of family members residing in the south was predictor for low food security. Policymakers should provide income support and increase food assistance programs for households facing financial hardship.

Title: High conductivity β-Ga2O3 formed by hot Si ion implantation

Primary Author: ARKA Sardar

Additional Authors: Joseph N Merrett;Tamara Isaacs-smith;Ryan Comes;Sarit Dhar

Department/Program: Physics

College: College of Science and Mathematics

Abstract: Monoclinic Beta Gallium Oxide (β-Ga2O3) has received wide attention for electronic applications due to its large band-gap (~ 4.9 eV), high electric field strength (~ 8 MV/cm) and possible cost effective melt-growth techniques. Ion implantation is a key process for β-Ga2O3 device fabrication as it provides a conventional way to carry out selective area doping with excellent control. This work demonstrates the advantage of carrying out silicon ion (Si+) implantation at high temperature for forming controlled heavily doped regions in gallium oxide. Room temperature (RT, 25 °C) and high temperature (HT, 600 °C) Si implants were carried out into MBE grown (010) β-Ga2O3 films to form ~350 nm deep Si-doped layers with average concentrations up to ~1.2 x1020 cm-3. For such high concentration, the RT sample was too resistive for measurement, but the HT samples had 82.1% Si dopant activation efficiency, with a high sheet electron concentration of 3.3 x 1015 cm-2 and excellent mobility of 92.8 $cm^2/V \cdot s$ at room temperature. X-ray diffraction measurements indicate that HT implantation prevents the formation of other Ga2O3 phases and results in reduced structural defects and lattice damage. These results are highly encouraging for achieving ultra-low resistance heavily doped Ga2O3 layers using ion implantation.

Title: Eliza Haywood and twenty-first century popular romance

Primary Author: Louise Schulmann Darsy

Additional Authors: ;

Department/Program: English

College: College of Liberal Arts

Abstract: Popular romance novels are not only love stories, they are also a reflection of what society expects from women, what place they should adopt both in the personal and public spheres. In this paper, I'm going to argue here that Eliza Haywood's romance novels are protesting against the fact that women are supposed to change men and that their desires are being silenced by society. Haywood, an eighteenth-century British author, is a Nora Roberts precursor and a foreshadower of today's romance novels. It is eye-opening to put Haywood's fictions in parallel with today's popular romances as the comparison reveals a few changes, but also how relatively little has changed in the popular romance genre. A cultural studies lens brings out important aspects of Haywood's novels, especially because she went from great popularity to invisibility because of her reputation and the fact that romance novels were considered an inferior genre (which is still the case today). Today, she benefits from a feminist recovery that brings her novels back in the conversation. Whether in After (by Anna Todd) or It Ends with Us (by Colleen Hoover) or in Haywood's novels, the woman is the one who has to change the man in order to have a good "traditional" life. Some of their own desire is still suppressed by the patriarchal society, because all they are expected to do is to be a tool for the man's development.

Title: Leprosy and the nine-banded armadillo

Primary Author: Olivia Sciandra

Additional Authors: ;Wesley Anderson;Kelly Dunning;Sarah Zohdy

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: The nine-banded armadillo *Dasypus novemcinctus* is a reservoir of *Mycobacterium leprae* and *Mycobacterium lepromatosis*, causative agents of leprosy, or Hansen's disease. In Alabama, little is known about the leprosy prevalence in armadillos. In addition, the distribution of armadillos in urban and suburban areas across their range has not been evaluated. In the southeast United States, armadillos are also considered a nuisance species, causing damage to property that requires management; as a result, exposure to potentially infected individuals presents a public health concern. Armadillos in Lee County were collected from rural, urban, and suburban zones, as determined by land imperviousness features. Study sites included private property and public roadways. It was expected that prevalence would increase in urban and suburban areas due to an increased potential for individuals to overlap. Blood was collected from each armadillo and analysed using ELISA to detect IgM antibodies of PGL1. Tissue samples of the ear, liver, and spleen were collected for PCR assays. Body size and weight measurements were also collected for age determination. Between June and October 2022, 96 armadillos were collected with 48 being roadkill and 48 being live captures. In Lee County, 94 armadillos were collected with 44 in urban zones, 39 in suburban zones, and 11 in rural zones. 57 were male and 37 were female. 67 adults, 17 yearlings, and 7 juveniles were collected. Diagnostic testing revealed that one armadillo collected in a suburban zone of Lee County had tissue that tested positive for *M. leprae* via PCR. The 1% prevalence rate of leprosy observed in Lee County is less than expected based on previous studies. Our results do support previous findings that no yearlings and juveniles test positive for the bacteria. Future sampling in Mobile County will be done to compare Lee County's prevalence rate with a southern Alabama county in a coastal alluvial plain.

Title: Investigating the sustainability of aquaponics farming to reduce global hunger, food insecurity, and malnutrition

Primary Author: Ansley Scott

Additional Authors: ;David Blersch

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Between 9.2% to 10.4% of the global population is hungry, with over 1/3 of all food spoiled or discarded before consumption each year. Despite enough calories being produced annually to meet global energy needs, there is a deficit of nutritionally dense crops and widespread global malnutrition. Agricultural practices must be intensified to produce more nutrients per square foot in a sustainable way. Aquaponics is considered a sustainable high-intensity food production method which utilizes nutrient flow from waste streams to produce crops rich in nutrients such as protein and carbohydrates, as well as essential vitamins and minerals needed for a balanced diet. Aquaponics systems are widely operated, yet their sustainability to address issues of hunger and malnutrition has not been determined. This study investigates the sustainability of aquaponics to lessen food insecurity through analysis of system operational data collected from the E.W. Shell Fisheries Center in Auburn, Alabama. Analysis of nutrient intake and output was conducted with parameters including pounds of fresh vegetable and fish biomass harvested per day of operation, as well as density of nutrients harvested in grams per weight of biomass, and grams per dollar amount required to support system operation. Economic modeling was preformed based on aquaponics cost of construction and maintenance to assess the economic plausibility and potential financial obstacles for long-term aquaponics operation. Sustainability of aquaponics farming was considered with emphasis on adequate key nutrients necessary to support the nourishment of a community using aquaponics to fight hinger and reduce food insecurity.

Title: 3D printing of reactive porous media investigating CO_2 sequestration impacts

Primary Author: Harrish Kumar Senthil kumar

Additional Authors: ;Abdullah Al Nahian

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: There is a growing need to reduce the level of carbon dioxide (CO_2) in the atmosphere as the increasing atmospheric CO_2 has led to increases in global temperatures and other climate change impacts. Geological carbon sequestration aims to store captured CO_2 in deep geological formations. Therefore, understanding the rates and mechanisms of geochemical reactions in these subsurface systems when exposed to CO_2 is critical. As natural samples are heterogeneous and non-duplicative, we investigate methods for fabricating synthetic replicates of reactive rock samples using 3D printing to assess the impact of mineral dissolution and precipitation on porosity and permeability. X-ray Micro CT images of natural samples was used to generate 3D models for fused filament fabrication 3D printing of high impact polystyrene. Surface functionalization was applied to sulfonate the 3D printed surfaces, where the sulphonic acid moieties will subsequently seed calcite growth. FTIR spectroscopy was employed to confirm the surface presence of sulfonic acid groups. Precipitation of calcite crystals on 2D reactive HIPS films was evaluated gravimetrically, by X-ray Micro-CT and by XRD analysis. Weight based precipitation experiments show gradual increase in the calcite deposition on the 2D films over time. This approach is extended to 3D printed core samples and batch experiment showed internal precipitation of calcite as confirmed by XRD. Overall, this study helps to evaluate the reactive rock sample replicate's mineral reaction and precipitation within the porous structures using 3D printing, mimicking geochemical reactions from geochemical systems.

Title: An investigation of aerodynamic interaction of wings for vertical axis turbine applications

Primary Author: Syed Hassan Raza Shah

Additional Authors: ;

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: The increase in cost and environmental concerns of fossil fuels has forced scientists and engineers to look for efficient and sustainable green energy resources. Hydroelectric energy is one of the most inexpensive and abundantly available green energy resources. The conventional hydropower design works on converting the potential energy of falling water into mechanical and electrical power from a natural waterfall or artificial dams, which require a substantial initial investment and takes a long time to build. There is a recent interest in extracting energy from flowing water, known as a hydrokinetic system, which may considerably reduce the infrastructure requirements and costs. The design of such turbines is challenging because of the complex aerodynamic interaction of turbine blades. The research investigates the aerodynamic interaction of wings and wakes and their dependence on upstream conditions. The results show that the wings in close proximity are aerodynamically coupled, and performance strongly depends on upstream conditions. A working design of a hydrokinetic turbine is also presented.

Title: Validating lagrangian particle tracking in the hydrodynamic model of the Mississippi Sound using GPS-tagged drifters

Primary Author: Mehrzad Shahidzadehasadi

Additional Authors: ;Anna Linhoss

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: Data from GPS-tagged drifters are a valuable tool in studying oceanic circulation and water movements. One such application is the calibration and validation of Lagrangian particle tracking in a hydrodynamic model. In this study, GPS-tagged drifters deployed in the Mississippi Sound in 2017 are used to track the movement of water masses. The data collected from these drifters were then used to calibrate and validate a Lagrangian particle tracking model, which simulates the movement of particles in the water based on the underlying ocean currents and the wind in the Mississippi Sound. The calibrated model will capture the observed movements of the drifters, Furthermore, the model supposes to provide valuable insights into the key physical processes driving water movements in the region, such as the influence of oceanic open boundaries, winds, and freshwater inputs from rivers. The results of this study have important implications for various fields, including coastal management, maritime operations, and environmental monitoring. By providing a more accurate understanding of the movements of water masses in the Mississippi Sound, the calibrated Lagrangian particle tracking model can inform decisions related to coastal planning and management, as well as aid in responding to oil spills, cetaceans stranding events or other environmental disasters. Using GPS-tagged drifters data to calibrate and validate a Lagrangian particle tracking model is an important step forward in our ability to study oceanic circulation and water movements in the Mississippi Sound area. By combining the advantages of both observational data and numerical modeling, this approach offers a powerful tool for improving our understanding of this complex and dynamic system.

Title: Simulating the effect of winter wheat on nitrogen dynamics in Alabama row crop system using the DSSAT crop model

Primary Author: Arpita Sharma

Additional Authors: ;Rishi Prasad

Department/Program: Agriculture

College: College of Agriculture

Abstract: Farmers across the country struggle to keep up with the significant rise in the prices of fertilizers. According to the USDA, fertilizers constitute around 35% of farmers operating costs for cereals. These fertilizers, especially nitrogen (N) have become an indispensable source and are embedded deep in modern agriculture systems. There are major concerns arising from the low recovery of applied N fertilizer due to the N losses from nitrate-nitrogen (NO3 N) leaching, ammonia (NH3) volatilization, surface runoff, and denitrification. Past research findings show that leaching and volatilization are major losses associated with nitrogen. It is a rising concern, especially in Alabama, due to rainfall patterns and highly weathered soil types, which make the soils low in organic matter and susceptible to erosion and surface runoff losses. Thus, implementing winter crops is important to reduce runoff losses, recover leftover nitrogen from the previous crop and improve soil health. The objective of this study is to study how the inclusion of winter wheat affects the nitrogen dynamics in a row crop farm. The Decision Support System for Agrotechnology Transfer (DSSAT) crop model will be used to simulate nitrogen inputs and outflows for cropping sequence with and without winter crop. A farmer's field (118 acres) was selected in North Alabama for this study and the input data such as the weather, soil, crop, nitrogen runoff, and crop management data were collected following intensive sampling in 2021 and 2022. All these data will be used to calculate crop coefficients and for calibration of the model, followed by evaluation and validation to assess performance accuracy using root mean square error (RMSE), and normalized RMSE (n-RMSE). Once the model is validated, it is expected to run various simulations to compare management practices, N use efficiency and nitrogen losses. The N inputs and outputs data from the model will be used further to study the nitrogen mass balances and optimize the nitrogen management practice at the farm.

Title: Helping high schools make informed FAFSA decisions through consumer marketing

Primary Author: Alaundra Shealey

Additional Authors: ;Kristi Reid-Partin;Kelsei Marxen;Claire Simpson

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: The Pell Grant is the single largest source of free aid for college attendance. The average Pell grant award is $4,491, and on average 34% of students are eligible for Pell Grant. Yet $3.6 billion in Pell grant funding goes unclaimed annually because eligible students do not file Free Application for Federal Student Aid (FAFSA). In 2018, the governor of Alabama, Kay Ivey outlined the Success Plus Initiative, to add 500,000 highly skilled workers to the workforce by 2025. Making an international decision about FAFSA involves exploring post-secondary opportunities such as 4-year and 2-year colleges and universities, certification and licensure. In support of the workforce goal the state of Alabama adopted a FAFSA high school graduation policy. Using consumer awareness and nudge marketing methods, the Alabama FAST: FAFSA Application Survival Toolkit (ALFAST), delivered by Human Sciences Extension, was created to support high school educators, students & families by providing career counselors and coaches with support to meet the state mandate, raising FAFSA awareness among students and parents, and empowering families to make the best choice for their career aspirations and family financial situation. The intervention, a 1-hour workshop, FAFSA Ready, Set, Go, was piloted by Human Sciences Extension Agents in Fall 2023 with over 10,400 seniors in 89 Alabama high schools, and 33 career coaches and counselors. A pre-posttest design with 10-point Likert scale and qualitive open-ended questions was employed to investigate changes in student aspirations, knowledge, and confidence, and educator knowledge and behaviors. A team of faculty, graduate and undergraduate researchers assessed the results of the pilot program in Spring 2023. Researchers found that students' knowledge and confidence about FAFSA, and intention to complete FAFSA increased due to Alabama FAST workshop participation. Students also became more empowered to make an informed FAFSA choice for themselves and more prepared to talk to a parent/caregiver about FAFSA.

Title: Sequencing the nucleocapsid of tomato spotted wilt virus is a step towards understanding the peanut breaking resistance in Alabama

Primary Author: Abdelaal Hamaam Abdelaal Shehata

Additional Authors: ;Abdelaal Hamaam Abdelaal Shehata;Amanda Strayer-Scherer;Michael Mayfield;Wilson Clark;Alana Jacobson;Kathleen Martin

Department/Program:

College: College of Agriculture

Abstract: Two-thirds of the peanuts in the United States are grown in Georgia, Florida, and Alabama. The Orthotospovirus, Tomato spotted wilt virus (TSWV), is an ambisense RNA virus composed of three segments encoding six proteins. TSWV infects over 900 plant species in 70 botanical monocot and dicot plant families. TSWV was first recorded in Alabama, Georgia, and Florida in the 1980s and has become a major obstacle to peanut production over the past three decades. There are at least nine different species of thrips that transmit TSWV, however, the western flower thrips (*Frankliniella occidentalis*) and tobacco thrips (*Frankliniella fusca*) are of the most concern in Alabama. Peanut cultivars bred for resistance were used to manage TSWV in the field, however, an increase in the severity and incidence of symptoms was observed in 2021 and again in 2022. Our hypothesis is that mutations in the genome of TSWV could be the reason for this change. The nucleocapsid gene was utilized to determine the sequence variability as a first step toward understanding these changes. In 2021, 11 peanut samples were collected from the Wiregrass Research and Extension Center, and in 2022, the study was expanded to 115 peanut samples collected across the state from three different site locations, Wiregrass Research and Extension Center, Brewton Agricultural Research Unit, and Gulf Coast Research & Extension Center. Samples were selected based on symptoms of wilt and leaf ring spots. The sequencing results and the protein alignments indicate that six amino acid changes were found in the samples collected in 2021 and two more amino acid changes were found in the samples collected in 2022. These changes could be involved in the breaking resistance of the peanut to TSWV in Alabama.

Title: In vitro genetic modification of canine adenovirus type two

Primary Author: Isabella Shimko-Lofano

Additional Authors: ;Atonu Chakrabortty;Payal Agarwal;Maninder Sandey;Luke Eller

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Oncolytic adenoviruses have been proposed as a potential treatment for cancer therapy. But extensive genetic modification of the adenovirus is needed to target cancer cells exclusively, reduce toxicity, and increase the immune system's response to the tumor cells. Our research team has previously created two vectors; CAV2-AU-M1 and CAV2-AU-M2. CAV2-AU-M1 has had the RFP gene (red florescence protein) inserted into its genome under control of the CMV promoter. CAV2-AU-M1 was modified by substituting the E3 gene to express a single-domain antibody (sdAb) to canine PD-1 under control of the CMV promoter to form CAV2-AU-M2. Our current project is to add a secretory signal to the antibody of ICOCAV-15 which was the template for CAV2-AU-M1. CRISPR/Cas9 will be used to insert the modified gene constructs into ICOCAV-15. The modified virus genome will be transfected in the canine packaging cell line DKcre to rescue infectious virus particles. We will use PCR and electrophoresis to verify the gene modification, western blotting to verify sdAb secretion, and infection assays to show that the virus retains its infectious properties. We expect that we will be able to use CRISPR/Cas9 for genetic editing to create a genetically modified oncolytic adenovirus from ICOCAV-15. This editing will add a secretory signal to the antibody. Crisper/Cas9 is an efficient tool to genetically modify adenoviruses, and can potentially help create therapeutic viruses for cancer treatment in a relatively short time frame. Authors would like to acknowledge Dr. Aliaa Ismail and Rebecca Nance for collegial support.

Title: Carbon storage, fuel loading, and fire behavior consequences in hurricane-impacted, fire-dependent forests of the southeastern U.S.

Primary Author: Basanta Shrestha

Additional Authors: Jeffery B. Cannon;Heather Alexander;Yaniv Olshansky

Department/Program: School of Forestry and Wildlife Sciences

College: School of Forestry

Abstract: Intense hurricanes occur two out of three years across the southeastern U.S., where forests are managed with prescribed fire. Combinations of such disturbances (a hurricane followed by a prescribed burn) are expected to gradually decline the capacity of southeastern U.S. forests to act as carbon sinks. The primary goal of this study is to understand hurricane impacts on fuel loading, fire behavior, and carbon sequestration capacity of such forests impacted by recent hurricanes. We hypothesize that fire-managed forests store most carbon in stabilized soil organic matter and live vegetation, and hurricanes will convert them into dead wood and leaf litter C pools, resulting in an increased fuel load, leading to severe prescribed fire, and reducing C pools in vegetation. We also hypothesize that the recovery of carbon depends on the severity of hurricane damage. We are currently sampling sites with recent hurricane damage to quantify above- and below-ground carbon pools and fuel loading prior to fire (<1 month), immediately after fire (within 1 week), and 1 year after a prescribed fire. We independently evaluate each site for fire behavior in relation to fuel loading. Ultimately, our goal is to determine carbon recovery rates to establish an imperative correlation between hurricane, fire, and carbon dynamics in forest ecosystems. Understanding the response of forest carbon pools to disturbances (hurricane-prescribed fire) will improve understanding of hurricane impacts on fire behavior and carbon dynamics in fire-managed forests, which helps to predict the role of southeastern U.S. forests in climate mitigation.

Title: Effect of phosphorus placement method on corn and soybean yield in phosphorus stratified soil

Primary Author: Navdeep Singh Sidhu

Additional Authors: ;Rishi Prasad;Debolina Chakraborty

Department/Program:

College: College of Agriculture

Abstract: Alabama has highly weathered soil with low water holding capacity, making it prone to erosion after a precipitation event. Farmers started adopting conservation tillage practices to scale down soil erosion issues and ameliorate soil health. The No-Till system involves minimal mixing of soil that leads to the accumulation of non-mobile nutrients like phosphorus (P) on the upper soil profile followed by a sharp decline in P concentrations in lower depths. Phosphorus stratification can affect crops typically during water stress conditions as plant root goes deep in search of water to meet crop water requirement. Typically, stratified subsoil has inadequate P, which can lower the crop's P uptake and potentially lower crop yield. Therefore, the objective of this study was to evaluate the effect of deep placement of P fertilizer on corn and soybean yield in dryland conditions. The treatments comprised of three fertilizer placement methods – injection (6 inches deep), banding, and broadcast. Phosphorus fertilizer rates were determined based on the Phosphorus Saturation index (PSI, a single-point isotherm approach to estimate the P sorption capacity), and field trials were conducted in E.V. Smith (EVS), Gulf Coast Research and Extension Center (GCREC), and Tennessee Valley Research and Extension Centre (TVREC) located in Alabama. Initial soil samples were collected before planting from four depths (0-2, 2-6, 6-12, 12- 24 inch) and the final soil sampling was done at crop harvest. Soil samples were analyzed for water and Mehlich-1 extractable P to understand the environmental and agronomic P availability, respectively. Initial soil results confirmed the P stratification in all three locations. No significant difference in corn yield ($P>0.05$) was observed between treatments and control at GCREC, potentially due to high precipitation, whereas a significant difference in corn yield ($P<0.05$) was observed between treatments and control at EVS. These results suggested that P was a limiting nutrient at EVS, and a positive yield response was observed due to external P application.

Title: Using atmospheric plasma, a novel non-chemical technology to eliminate listeria monocytogenes from food processing surfaces

Primary Author: Katherine Sofia Sierra Melendrez

Additional Authors: ;Luis Jose Guzman Sabillon;Bet Wu Alvarado;Andrea Urrutia Giron;Garrett Royster;Laura Garner;Amit Morey

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Listeria monocytogenes (LM), a major foodborne pathogen, has the highest fatality rate of 16% and costs $2040 million annually to the US economy. Food-contact and non-food contact surfaces are the major sources for food contamination. Research was conducted to evaluate the efficacy of atmospheric plasma generated at room temperature plasma (RT-plasma), that uses energy and gases, to eliminate L. monocytogenes in planktonic and biofilm form on food processing surfaces. Experiment 1. Three common food processing surfaces (Neoprene, Polypropylene, and stainless steel) were cut into 5 squares each (2.5 cm x 2.5 cm) and inoculated with 5 logs of L. monocytogenes and placed at 4˚C for 30 minutes to allow cell attachment. Experiment 2. LM biofilms were grown on stainless steel coupons for 24 hours. All samples were exposed (0 to 20 min) to the RT-plasma generated using helium gas and an electrical input of 5.75 kW. Post- exposure, each sample was rinsed in buffer peptone water (10mL), serially diluted and then spread plated on Modified Oxford Agar plates and incubated for 24h at 37°C. After 24h, typical Listeria colonies were counted and reported as log CFU/sq.cm. The experiment was repeated three times and the data was analyzed using ANOVA ($p<0.05$) to find significant differences among the means. Room-temperature plasma was effective in eliminating LM at different ($p<0.05$) efficacies due to surfaces and exposure times. RT-plasma reduced ($p<0.05$) the population of LM on neoprene by 1 and 2 log after 10 and 20 min exposure, respectively. However, polypropylene and stainless-steel samples, did not demonstrate any reductions at 10 min but had a 2-log reduction after 20 min exposure. A 2.5 log reduction ($p<0.05$) was obtained on the LM biofilms exposed to RT-plasma for 10 min. RT-plasma can be used as a novel technology to eliminate L. monocytogenes contamination in both planktonic form as well as in biofilms on food processing surfaces.

Title: How to design safer rocket engines: Insights from thermoacoustics

Primary Author: Emma Signor

Additional Authors: ;Cody Shelton;Joseph Majdalani

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: In this work, the thermoacoustic field in an open-ended Rijke tube is characterized and subsequently discussed. Overall, a three-pronged approach consisting of theoretical, experimental, and numerical investigations of the Rijke tube's time-dependent field is undertaken. The main procedure that the present work focuses on, however, is based on a novel perturbation expansion that enables us to expand this approach to more complex flow configurations. The method in question leverages a naturally occurring small parameter in the open tube configuration. As such, it is capable of producing accurate predictions of pressure modal shapes and frequencies for an arbitrarily specified temperature distribution. It also leads to a set of linear partial differential equations that can be solved in conjunction with a Green's function expression for the thermoacoustic pressure, velocity, and heat oscillations. In the proposed investigation, the underlying framework is reconstructed and evaluated for both the pressure and velocity disturbances. Moreover, due to a reported inaccuracy in other studies for the prediction of acoustic mode shapes and frequencies, thermal profiles in the present study take into account the presence of local flame zones. At the outset, this approach is shown to overcome the limitations of the simplified discontinuous flame temperature assumption, which can lead to errors in mode shape predictions, as shown in previous work. Based on a preliminary feasibility study, the present profiles have the ability to produce highly accurate predictions when compared to both experimental measurements and computations, thus leading us to conclude that the prediction of acoustic mode shapes and frequencies in combustors remains strongly dependent on the mean temperature profile. It is hoped that the present analysis will extend the range of applicability of the underlying analytical model to gas turbine and rocket engine configurations.

Title: Directing hiPSC differentiation towards left and right ventricular cardiomyocytes in a scaffold-supported 3-Dimensional construct

Primary Author: Shireen Singh

Additional Authors: Sean M. Wu;Justin Harvell;Mohammadjafar Hashemi;Elizabeth Lipke;Selen Cremaschi;Della Kelly

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: During embryogenesis, the cardiac progenitor populations, first and second heart fields give rise to the left and right ventricles respectively. Heart development has been successfully studied in murine models however, human studies have been limited due to the inaccessibility of gastrulation-stage embryos. The knowledge of heart development in humans will enable us to better understand the cardiac development process and produce clinically relevant cardiomyocytes (CMs). Human-induced pluripotent stem cells (hiPSCs) can be differentiated into CMs and have been used in human studies. We have previously formed heart tissues by encapsulating hiPSCs in a biomaterial using a microfluidic device and differentiating them into CMs. However, a specific understanding of the subtypes of cardiomyocytes produced remains unknown. To answer this question, we are investigating an hiPSC line with a left ventricular reporter and a lineage tracing system that will help in the identification of left or right ventricular CMs formed during differentiation. Previous work with this cell line has shown that differentiation of monolayer cultures results in nearly all left ventricular CMs and that the monolayer differentiation is biased towards the left ventricle. In this work, we are investigating the differentiation of this cell line in a scaffold-supported microenvironment and aim to understand the role of the cellular microenvironment in directing cardiomyocyte subtype specification. Heart tissues were produced by direct differentiation of hiPSCs encapsulated in a biomaterial using a microfluidic device. HiPSCs were encapsulated on day -3 with growth media changes until day 0. Differentiation was initiated on day 0 by activating the Wnt signaling pathway followed by inhibition on day 3. Tissues were analyzed for cardiac troponin T (cTnT), Tdtomato, and TurboGFP expressions on day 10. HiPSCs differentiated into CMs with a %CM content of 75% analyzed using cTnT. The percentage of cells positive for both TurboGFP and Tdtomato will further help in the identification of left ventricular CMs.

Title: Artificial neural network-empowered projected future rainfall intensity-duration-frequency curves over the southeast United States

Primary Author: Takhellambam Bijoychandra Singh

Additional Authors: ;Jasmeet Lamba;Di Tian;Roberto Molinari

Department/Program: Biosystems Engineering

College: College of Engineering

Abstract: With the current trend of increasing greenhouse gases in the atmosphere, the temperature is expected to rise by 1.5 ℃ from the Pre-industrial Period by 2052, affecting future extreme rainfall events. This necessitates quantifying the extreme hydrologic events for planning and designing hydrologic and hydraulic structures using rainfall Intensity Duration Frequency (IDF) curves for adaptation to future climate scenarios. Our study developed future projected IDF curves for the Southeast United States using disaggregated sub-hourly (15-, 30-, and 45 min) monthly maximum rainfall from 2030 to 2059 using five climate models under the Representative Concentration Pathway 8.5 scenario. A computationally efficient feed-forward back-propagation Artificial Neural Network (ANN) based approach for disaggregating hourly rainfall datasets to sub-hourly monthly maximum rainfall datasets was found to be significantly superior to a stochastic model with an average Nash–Sutcliffe efficiency ranging from 0.67 to 0.84. The statistical result of the Kolmogorov-Smirnov test confirmed that the future and historical annual maximum rainfalls come from different distributions at a 5% significance level. The study found that there is an increasing rate of future projected rainfall in the range of 9% to 47% with reference to the historical period. The mean future projected IDF curves showed that annual maximum rainfall of 15-, 30-, and 45-min with a return period of 2-, 5-, 10-, 25-, 50-, and 100-year found in the range of 39 to 177 mm/hr with standard deviation ranging from 8 to 45 mm/hr. The spatial variation in future projected extreme rainfall depths showed that the Gulf-Atlantic coast and the Appalachian Mountains are expected to receive more extreme rainfall. This indicates the necessity of updating future IDF curves in the design of water resource infrastructures.

Title: Effect of political partisanship on environmental patent applications in United States: 1980-2014

Primary Author: Dibyajyoti Sinha

Additional Authors: ;

Department/Program: Economics, Liberal Arts

College: College of Liberal Arts

Abstract: Political partisanship over environmental policy has been increasing in the United States since the early 1990s. The impact of this changing partisanship on economic activity has been less explored in the field of innovation. Using state level political variation in the United States from 1980 to 2014, this paper offers insight into the influence of environmental partisanship on innovative activity. In this analysis, application counts of environmental patents serves as a proxy measure for innovative activity in the field of environmental technology. Preliminary analysis shows that, on an average, the Democratic states have had approximately 500 more environmental patents than their Republican counterparts. This exercise takes into control the effect of a Democratic federal government, state's dependency on fossil fuels and the lagged effects. However, how much of the effect comes from the state level Democratic Governors is not evident. To that end, a regression discontinuity approach is applied to evaluate Governors from both parties who are similar in terms of their victory margins. When the data is divided into two sub-samples (before and after 1991), the latter period (1992-2014) shows evidence in favor of the hypothesis with relatively greater effects of political partisanship on environmental patent applications.

Title: Sea urchin genomes encode sophisticated systems for viral detection

Primary Author: Connor Sisk

Additional Authors: ;Katherine Buckley;Amelia Williams

Department/Program: Biomedical Sciences (VET MED)

College: College of Science and Mathematics

Abstract: RIG-I-like receptors (RLRs) are cytoplasmic proteins that play central roles in mediating the immune response to intracellular viral infections. RLRs specifically bind to virally derived RNA molecules, which initiates a signaling cascade resulting in the activation of IRF transcription factors and upregulation of interferons. Although this family has been well-characterized at a molecular and functional level within the vertebrates, less is known about these important receptors within invertebrate biology. Here, we present an analysis of the gene family that encodes RLRs in the purple sea urchin *Stronglyocentrotus purpuratus*. We have identified 12 paralogs of RLRs within the current *S. purpuratus* genome assembly (v5.0), which are characterized by stereotypic C-terminal RNA-helicase domains. The aim of this work is to characterize tissue-specific expression patterns of these RLR transcripts within adult sea urchins. Findings from this work will shed light on understanding the evolution of these important immune recognition molecules.

Title: Post occupancy evaluation of evidence-based design in a Louisiana healthcare facility

Primary Author: Claire Sisson

Additional Authors: ;Taneshia West Albert

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: Using evidence-based design in women's healthcare facilities contributes to the betterment of user's comfort and the promotion of overall wellbeing. Different design aspects affect women's emotional and physical states. Studying successful projects and applying tactics used to future projects enables designers to create effective spaces that cater to individuals' real needs. Utilizing connections with contacts who work in the fourth and sixth floors of a New Orleans based women's hospital will allow the researcher to analyze the effectiveness of evidence-based design in practice. The researcher hypothesizes that the results will be positive, but areas of improvement have a high likelihood of being identified. Using post occupancy survey data from a third-party medical practice survey organization, the researcher reviewed patient satisfaction data to determine what areas of the hospital design could be improved for future design. Future implications of results include the possibility of increased importance of executing evidence-based design and the continuation of learning how to provide the most efficient design. Future research can be informed by the success or failure of evidence-based design on this project.

Title: Informed but tempted: A latent class analysis of college students' food preferences

Primary Author: Pathmanathan Sivashankar

Additional Authors: ;Samir Huseynov;Joshua Duke

Department/Program: Agricultural Economics and Rural Sociology

College: College of Agriculture

Abstract: Food consumption habits shape future diet choices and hence future health outcomes of consumers. Thus consumption habits during adolescents and young adult periods are crucial. Understanding the food consumption preferences of college students can be informative of their future food decisions and consequent health issues, which can help to fine-tune health policy interventions. We survey 267 college students from a southeastern university. Using the latent class analysis method, we classify survey participants based on temptation and taste variables. Our analyses identify two latent groups of students: *tempted indulgers* and *temptation restrainers*. *Tempted indulgers* are health conscious but overweight and succumb to temptation. *Temptation restrainers* are also health conscious but have normal BMI scores and control their temptation in food decisions. Latent classes' correlation with BMI and self-control measures validate our findings. We conclude that the food preferences of young adults are primarily driven by menu-dependent preferences rather than knowledge of food diet quality. Our findings explain why most nudge-based health interventions fail, and we show the importance of addressing menu-dependent visceral feelings in designing health policies.

Title: A biomechanical and biophysical study of the central rod domain of dystrophin

Primary Author: Toby Sizemore

Additional Authors: ;Rafael Bernardi;Diego Barreto Gomes;Priscila da Silva Figueiredo Celestino Gomes

Department/Program: Physics

College: College of Science and Mathematics

Abstract: Duchenne Muscular Dystrophy (DMD) is a devastating neuromuscular disorder that affects approximately one out of every 3,500 male newborns. This fatal genetic condition has an average life expectancy of 20-30 years and typically results in loss of the ability to walk by age 12. The disease is caused by a mutation in the dystrophin gene, which leads to an abnormal form of the dystrophin protein. This protein plays a complex role in maintaining the stability of muscle cells and protecting their integrity. To develop effective treatments for DMD, it is crucial to understand the biomechanical properties of dystrophin. In this project, we aimed to create accurate high-resolution structures for the spectrin-repeats (SR) of the central rod region of dystrophin using AlphaFold. The central rod domain contains 24 SR regions that can be divided into 4 fragments: SR01-05, SR06-10, SR11-17, and SR18-24. Using AlphaFold, structures for each individual SR and for each paired SR were created. The accuracy of the structures was determined through sequence and structural alignment with the crystal structure of SR01 (PDB ID: 3UUN). The resulting structures are now being utilized to conduct in silico single molecule force spectroscopy to understand the biomechanical properties of the mechanosensing proteins. The obtained data will help in gaining a deeper understanding of the biomechanical properties of dystrophin, which is crucial for the development of treatments for DMD.

Title: Improving fluid-thermal performance of impinging jet arrays with small-scale engineered surface augmentations in the fountain regions

Primary Author: Aaron Smith

Additional Authors: ;Sushil Bhavnani;Roy Knight

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: While much research has been completed on jet array design, there is significantly less effort into the effect of using surface augmentations. Meso-scale structures can inhibit preferred flow mechanics, requiring careful design to achieve desired performance. Crossflow effects from upstream jets can be detrimental to the performance of other jets downstream; spent fluid management is a necessity to attain uniform performance across the surface. The present study examines surface augmentations between impinging jets of water, in the fountain region, under either a flat or angled upper confining wall using a numerical model and particle image velocimetry. These were engineered to promote desired flow mechanics, with increased surface area being a secondary benefit. The augmentations include ribs of triangular cross-section oriented either parallel or normal to the direction of outflow, otherwise referred to as streamwise and transverse ribs, respectively. The streamwise-oriented ribs were highly effective at reducing the surface temperature, with average surface temperature reductions of 0.9 to 3.7°C corresponding to surface temperature rise reductions of 13 to 26%, through replacement of weak fountain interactions with impingement of the wall jet upon the rib face. The transverse ribs were effective in the same way under the angled confining wall, but flow separation under the flat wall resulted in highly impacted downstream jets; as such, ribs in this orientation are best applied with effective spent fluid management. Cones placed between jets in the streamwise direction were also examined. These were particularly successful at mitigating crossflow for both confining wall angles. While these resulted in less temperature rise reduction, from 0.1 to 0.6°C corresponding to surface temperature rise reductions of 1.9 to 4.8%, further analysis revealed that, depending on the flow rate, 43 to 71% of this reduction was caused by improvement of flow mechanics.

Title: Caffeine use and sleep quality among Auburn students: Blissful buzz or rest wrecker?

Primary Author: Iyanah Smith

Additional Authors: ;

Department/Program: Psychology

College: College of Liberal Arts

Abstract: Caffeine is the most widely used drug in the world. A study found that 92% of students had consumed caffeine within the past year. College students most often report consuming caffeine for both taste and its mood-altering effects. At least 50% of students report daytime sleepiness and 70% report inadequate sleep duration. Students are aware of the adverse effects of caffeine but still use it for stress relief and in response to perceived sleepiness. Using caffeine to combat stress and sleepiness may be counterproductive because caffeine is known to cause poor sleep quality. One study found that consumers of caffeinated energy drinks have higher levels of perceived stress compared to individuals that do not drink caffeine. In this study, we sought to analyze the effects of caffeine on sleep quality and well-being in a sample of Auburn students. We also investigated the relationships between caffeine use, sleep quality, perceived stress, alcohol use, and medication use. Survey data was collected in Qualtrics in the Fall 2020 and 2021 semesters. Both samples were asked about caffeine use, sleep habits, medication use, perceived stress, anxiety, and depression. 918 (82% female) total students took the survey. Sample 1 included 591 students. Sample 2 included 327 students. The results showed that students who used more caffeine acquired less sleep overall, experienced more difficulty staying awake during important activities and consumed more alcohol. We also found significant positive relationships between caffeine use, levels of anxiety, and depression. We found that women specifically were drinking more caffeine, though they were less likely to consume energy drinks. Women also reported higher levels of anxiety, sleep difficulties, sleeping pill and other medication use. These results suggest that Auburn students who consume caffeine may have more sleep difficulties and that women may be more negatively impacted by caffeine use.

Title: Linear enamel hypoplasia in African enslaved individuals from Newton Plantation, Barbados

Primary Author: Katie Smith

Additional Authors: Kristrina A. Shuler;Kris Shuler

Department/Program: Anthropology

College: College of Liberal Arts

Abstract: Dental remains from 17 individuals from the Newton Plantation Burying Ground in Barbados (ca. 1660-1820) were examined for presence of Linear Enamel Hypoplasia (LEH) and age at disruption. LEH have been repeatedly linked to early life stressors including malnourishment and effects of weaning. Bilateral maxillary and mandibular first molars, canines, and central incisors were hand-scored by both authors followed by inspection with a Dinolite W-20 digital microscope at 20x and a hand lens at 10x. LEH were measured using Mitutoyo digital needle-point calipers calibrated to .01mm from the defect's center to the CEJ. The total of 96 teeth from 17 individuals were scored. Antemortem tooth loss could not be assessed. LEH (n=6) were present in four individuals, two of whom displayed multiple defects. Based on Rose and Goodman (1991), LEH age at disruption ranged from 0.459 – 3.85 years. Malnutrition, environmental stressors, and other factors are well-documented archivally among the Barbadian enslaved, and these data suggest significant stress that started during early childhood. Presence of LEH only in individuals with isotopic signatures (Schroeder et al. 2009: 552) of Barbadian birthplace supports the prediction of especially high stress for individuals born into enslavement. These findings contribute to more than 40 years of bioarchaeological research at Newton Plantation and provide new data on early childhood stress.

Title: The effect of soil water retention on microorganisms' ability to secrete antimicrobial metabolites

Primary **Author:** Taylor Smith

Additional Authors: ;Allie Champagne;Kelsey Sammons

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The Biology 1021 CURE Lab provides opportunities for undergraduate students to learn advanced techniques to conduct authentic, supervised research for course credit. Students performed variations of the Tiny Earth project by collecting and testing various types of environmental samples for bacterial growth. For this project, bacterial organisms were grown from three environmental samples: earth soil, Crassula obvallata succulent soil, and clay. Each sample was diluted and incubated at room temperature for one week. Post incubation colonial growth was observed on Tryptic Soy Agar (TSA) and starch agar. Eight isolates displaying potential inhibition were grown in pure culture and were tested against *Bacillus mycoides*, a stand-in for *Proteus mirabilis*, that exhibits swarming motility. Zones of inhibition from each plate were measured and compared to determine whether water retention in soil influences microorganisms' antimicrobial production or not. The results show that soil types with high water retention, such as clay, may produce more antimicrobial metabolites than soil types with low water retention.

Title: Data-driven prediction of peptide-MHC binding using oscillations of physicochemical properties

Primary Author: Hyeju Song

Additional Authors: ;Christopher Kieslich

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: The Major Histocompatibility Complex (MHC) molecules play a major role in T-cell immunogenicity through the recognition of 'non-self' peptides derived from foreign antigens. Therefore, predicting peptides that trigger immune responses is of great interest for the general understanding of T-cell-mediated immunity and the design of peptide-based vaccines and cancer immunotherapy treatments. The presented work tests the performance of allele-specific SVM classification models in the prediction of pMHC binding. The models aim to classify MHC class II binding and non-binding peptides based on their amino acid sequences and derived features. In developing the models, we take advantage of underlying periodicity in physicochemical properties along the sequence of a peptide that has been shown to be predictive of protein structure and function. Once the physicochemical descriptors are generated, Fourier transforms are then applied to encode peptide sequences of varying lengths. In training and testing the model, a comprehensive dataset of MHC class II binding peptides that includes 44 unique MHC class II alleles (molecules) with 60630 binding affinities is taken from the IEDB database. Cross-validation and hyper-parameter tuning are applied across multiple train and test datasets. A feature selection algorithm is also incorporated into the model development to identify an essential set of predictive features. The blind test set prediction accuracy of the developed allele-specific models ranges from 0.58- 0.93, with an average classification accuracy of 0.73.

Title: Motivating Gen-Z to be active publics in the environmental issue: Applying the situational theory of problem-solving to the issue of fast fashion

Primary Author: Hyunseo Song

Additional Authors: ;

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Clothing retailers like Zara, Forever 21, and H&M, which offer reasonably priced and fashionable garments every season, satisfy the needs of youthful consumers. However, the Sheffield Hallam students' study found that 63% of respondents were concerned about the social repercussions of the fast fashion sector, while just 48% were concerned about its effects on the environment. Companies may use CSR tactics to help them produce more sustainably, and to demonstrate this, potential customers are willing to pay more for items that are more sustainably produced. Despite the challenge of encouraging generation Z to participate in rapid fashion, little study has been done on how businesses may draw generation Z's attention to the problem of how quick fashion contributes to environmental damage. The purpose of this study is to examine how to motivate generation Z to be public activists to solve fast fashion. Making young people, or members of generation Z, aware of the problem of fast fashion's damaging effects on the environment is crucial. It will be crucial to understand how they band together and take part in environmental efforts. By surveying college students and using data collection through computer programs, the data about the awareness and how they recognize their knowledge of fast fashion will be collected and addressed. The research about generation Z's choices between clothes made with eco-friendly materials and polluting materials is going to be in this study as well. Therefore, the main goal of this study is to inform fast fashion to generation Z by notifying them about this issue.

Title: Understanding Alzheimer's disease through proteomic analysis

Primary Author: Dylan Spivey

Additional Authors: ;Nour Fadel Mahmoud AL-GHRAIYBAH;Amal Khalil Kaddoumi

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Alzheimer's Disease (AD) is a neurodegenerative disorder characterized by cognitive impairment, inflammation of the CNS, and synaptic degeneration. AD can take many years to present noticeable symptoms. Currently, researchers are working to understand the disease pathology using imaging techniques and biomarkers in order to identify diagnostic tools and novel therapeutic targets. Proteomic analysis of brain tissue provides large-scale data regarding protein expression that may differ depending on certain factors, such as the progression of AD. By analyzing protein expression in AD brains, researchers hope to identify specific proteins in different brain regions that display stunted or promoted expression when compared to samples from cognitively healthy individuals. The majority of proteomic analysis in regard to AD functions by collecting small amounts of human tissue from affected brain regions, and then comparing protein expression to the healthy control samples via Liquid Chromatography Mass Spectrometry (LC-MS). While prior research had determined several proteins associated with AD, such as amyloid-β and tau, harnessing proteomic analysis has allowed researchers to identify additional proteins that are prevalent in the amyloid plaques and neurofibrillary tangle proteomes that are the hallmark neuropathological lesions associated with AD, and function as biomarkers. These studies have identified novel proteins associated with AD that can serve as a basis for further research and targeted studies. For the objective of this poster, I conducted a literature search with a focus on proteomics utilization in AD, which I will discuss in the poster. In conclusion, proteomic studies have led to an increased understanding of protein changes in the brain during AD and have provided a foundation for further hypothetical research and targets for drug studies.

Title: Elevated ozone effects on the Xanthomonas-Capsicum annuum pathosystem shown through physiological and transcriptomic data

Primary Author: Sheridan Spivey

Additional Authors: ;Courtney Leisner;Collin Modelski

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: The rise of carbon dioxide in the atmosphere is increasing land surface temperatures. Ozone production accelerates at these higher temperatures by photochemical reactions, decreasing plant growth, photosynthesis rates, and overall plant productivity. Both tropospheric ozone and bacterial infection increase reactive oxidative species production, suggesting their relationship could increase climate change effects on plant species. *Capsicum annuum* has a strong bacterial response to *Xanthomonas* species. Utilizing the Atmospheric Deposition site at Auburn University, plants were grown in *Xanthomonas* inoculated chambers, elevated ozone chambers, combined treatment chambers, or control chambers. Physiology data was gathered using LICOR and SPAD tools with regard to chamber growth conditions. Samples for transcriptomic analysis were also collected and RNA extraction processes were performed to analyze physiological results on a molecular level. The expected results were to observe overall lower plant productivity in elevated ozone chambers with amplified infection and ozone effects in combined treatment chambers. Physiology results confirmed the detrimental relationship between plant physiology and elevated ozone; however, the connection between elevated ozone and bacterial infection differed based on the cultivar. Lower photosynthetic rates, stomatal conductance, and above-ground biomass were recorded for plants grown in elevated ozone chambers. The *Xanthomonas-Capsicum* pathosystem was not enhanced by elevated ozone, nor did it disrupt infection in susceptible cultivars. However, disease severity increased in resistant cultivars when combined with elevated ozone. Future RNA data will show gene regulation patterns, which will be compared to physiological data to confirm results. The continuation of this project will give insights into future pepper breeding efforts and plant resiliency in order to counteract climate change impacts.

Title: Improving polymer morphology in electropolymerized films

Primary Author: Drake Spruill

Additional Authors: Christopher Grieco;Christopher Grieco;Austin Dorris

Department/Program: Chemistry-Biochemistry

College: College of Science and Mathematics

Abstract: Organic semiconducting polymers are promising alternatives to inorganic semiconductors due to their lower weight and higher charge storage capacities. However, their tendency to form irregular morphologies leads to low conductivity that limits their practical use. Electropolymerization is a polymer synthesis method with many easily adjustable parameters that we hypothesize could be optimized to improve the morphology, leading to higher conductivity. Poly(3,4-ethylenedioxythiophene) (PEDOT) films were electrochemically synthesized with varying cyclic voltammetry scan speeds and solution monomer concentrations. The organization of the polymer chains in the resulting films was probed optically using UV-vis absorption and Raman spectroscopies. Correlations between this spectroscopic data and electropolymerization conditions reveal new methods for improving polymer morphology needed to achieve higher conductivity.

Title: Microgravity results from the Asymmetric Sawtooth and Cavity-Enhanced Nucleation driven Transport (ASCENT) investigation aboard the space station

Primary Author: Karthekeyan Sridhar

Additional Authors: ;Sushil Bhavnani

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Several forces exert an influence on two-phase bubble dynamics under terrestrial conditions, chief among these being those due to buoyancy and surface tension. Under microgravity conditions, the absence of buoyancy forces disrupts bubble dynamics preventing bubbles from detaching from surfaces. The stagnant bubbles form a large vapor mass attached to the surface, leading to a considerable rise in surface temperature. In this study, a mesoscale-engineered surface in the form of saw-toothed structures has been produced that can provide access to liquid pockets across the troughs of the microstructure in microgravity and terrestrial adverse-gravity orientation. The surface is built with intentional nucleation sites that support consistent vapor germination in both environments. Following terrestrial studies on various surface morphologies and under varying degrees of subcooling, experiments were conducted onboard the International Space Station. The test chambers were square cross-sectioned glass ampoules with deposited thin film nichrome heaters. NASA's implementation partner developed the test and instrumentation hardware to conform to stringent flight requirements. The experimental investigation is titled Asymmetric Sawtooth and Cavity-Enhanced Nucleation-driven (ASCENT) and was conducted in the Pore Formation and Mobility Investigation (PFMI) furnace. The work discusses high-speed data obtained on vapor motion in microgravity and terrestrial downward-facing environments, providing insight into the differences between a flat surface and the microstructure. The images suggest the existence of a mobility diameter in microgravity, which enables favorable motion across the microstructure in both lateral directions. This mobility contrasts the slug mobility actuated by the sawtooth in the downward-facing terrestrial heater, where changes in the interfacial radius of curvature produce a net lateral motion in the direction of the long slope.

Title: Marketing towards first-generation students during the college decision making process

Primary Author: Katelyn Stalboerger

Additional Authors: ;

Department/Program: Educational Foundations, Leadership and Technology

College: College of Education

Abstract: The college decision process is one that can be stressful for students, particularly because of the amount of information an individual must look through when making their decision. The way the information is organized and how easy it is to find can also play a role in the decision-making process. Because of this, it is imperative for marketers to understand how to correctly market towards students. As marketing channels continue to change, it is important for marketers in higher education to stay up to date on current marketing trends so they can continue to reach students. Since 47% of consumers are blocking advertisements, it is more difficult to ensure the target market is seeing the marketing materials. Because of this, it is important to understand how students should be viewed in the higher education marketing process, if students use social media to aid in the decision-making process, and whether or not students should be treated as consumers. There is a gap when marketing towards first-generation college students as consumers and which marketing channels to use when marketing towards these students. Using previous research, this paper will look at the gap between first-generation students and marketing in higher education, which will result in a better understanding of how to decrease this gap.

Title: Real-world heavy-duty truck platooning benefits

Primary Author: Evan Stegner

Additional Authors: ;Will Bentley;Philip Snitzer;Mark Hoffman;David Bevly

Department/Program: Mechanical Engineering

College: College of Engineering

Abstract: Platooning is a Level I/II autonomous driving technology that enables vehicles to follow each other in close succession, significantly reducing aerodynamic drag and saving energy. The technology works well in controlled environments, but it remains to be seen how effective platooning will be in real-world applications. This presentation will explore recent research advances that enable practical, real-world platooning and extend the methodology toward alternative powertrain technologies.

Title: Investigating whether broiler chick sex impacts the stress response to different transportation distances

Primary Author: Valeria Suazo Tabora

Additional Authors: ;Caroline Gregg;Brittany Wall;Jessica Starkey;Catarina Stefanello;Ally Jackson;Bethany Baker;Jorge Luis Sandoval Escobar

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Transportation of one-day old chicks is a potential stressor that can affect their welfare and performance later in life. Blood analytes change with external stressors and are, therefore, used to assess transport stress in adult birds. In order to assess welfare and stress during transportation, a trial was conducted to ascertain if sex impacts blood analytes when chicks are transported different distances. Day-old broiler chicks (n=18) of both sexes, were randomly selected after being transported for either 152.85 km (H1; 6 males|2 females) or 373.28 km (H2; 5 males|5 females). Whole heparinized chick blood samples were taken and analyzed for pH, PCO2, PO2, HCO3, sodium (Na), potassium (K), ionized calcium (iCa), glucose (Glu), hematocrit (Hct) and hemoglobin (Hb) using the I-STAT Alinity V blood analyzer. Two-way ANOVA (Proc Glimmix, SAS 9.4) for fixed effects of transport distance and sex was performed, with bleeding time as block and chick as the replicate unit, with Tukey's HSD for means separation and a significance at $P \leq 0.05$. An interactive effect for transport distance and sex was only observed for Glu (mg/dL), with females from H1 having lower glucose concentrations (μ= 193.05) than males from H1 (μ=224.35) and females from H2 (μ=220.49) with a $P<0.01$. PCO2 (mmHg) concentrations were lower in chicks that were transported a shorter distance (H1 (μ=28.85); H2 (μ=32 .46)). Na (mmol/L) and iCa (mmol/ L) concentrations were lower in chicks from H2 (Na: μ=148.40, iCa: μ=1.29) than H1 (Na: μ=159.55, iCa: μ=1.51) respectively. Chicks from H1 tended ($P=0.08$) to have lower blood glucose concentrations than those from H2 (μ=217.62). There was no effect of transport distance or sex on body weight, pH, PO2, HCO3, K, Hct and Hb. Overall, the only blood analyte that differed with sex when chicks were exposed to different transportation distances was blood glucose, whilst Na, iCa and PCO2 only differed with transportation distance but not with chick sex.

Title: Development of an experimental design to measure the effects of açaí extracts and anticancer agents on breast cancer cells

Primary Author: Destini Thornton

Additional Authors: ;Angela Calderon;Satyanarayana Pondugula;Rinbam Kromtit

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Açaí, (*Euterpe oleracea* Mart.), is a palm tree located in Central and South America cultivated primarily for its fruit which has many bioactive compounds that contribute to anti-inflammatory and anti-proliferative effect in humans. Many Americans who are diagnosed with cancer tend to use açaí fruit botanical dietary supplements along with their chemotherapy treatment. There are studies on açaí fruit and cancer but there are none on açaí fruit in combination with anticancer agents. To study the pharmacodynamic interactions between açaí botanical dietary supplements and anticancer agents, two breast cancer cell lines and one normal breast cell line will be cultured and tested. A cell seeding density experiment was performed on two breast cancer cells, MCF-7 and MDA-MB-231, using RPMI 1640 media to confirm the number of cells to place in each well of the 96 well plate that was used for testing. To determine cell viability among the different cell seeding densities, a colorimetric MTT assay was used. For the MCF-7 cell line, the optimized cell densities were 5,000 and 10,000 cells/well and for the MDA-MB-231 cell line, 10,000 and 20,000 cells per/well were optimized. An initial experiment of obtaining IC50 values for the anticancer agents was performed. The IC50s for MCF-7 against doxorubicin, methotrexate, and tamoxifen were 50.38, 94, and 30.51 µM, respectively. The IC50s for MDA-MB-231 were 56, 29, and 20.53 µM, respectively. The next experiment to perform will be to treat the cell lines with 7 extracts of açaí fruit raw material and botanical dietary supplements at human equivalent concentration. In brief, we have optimized the experimental design to measure, *in vitro*, pharmacodynamic interactions of açaí and three anticancer agents.

Title: Python developed GUI with AI aided object classification

Primary Author: Jacob Thornton

Additional Authors: ;Jean-Francois Louf;Tofayel Ahammad Ovee

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: Soft robotics is a growing subfield of traditional robotics that leverages the properties of soft materials to ensure safe object and human interactions. However, one of the current limitations in soft robotics is to impart mechanosensing abilities to a soft robot. Motivated by this challenge, we designed a smart skin imparting mechanosensing abilities to a traditional hard robot using pressure as an information signal. A key step in our design is to analyze the strain-pressure measurements input live in order to extract the mechanical properties of the tested object. To this end, we built a graphical user interface (GUI) that combines the tkinter, pyfirmata, and threading packages in Python to control the robot, collect data, and display information. The data collected and displayed by the GUI includes the distance between the jaws of the grasper and the pressure read from the sensor. By combining these measurements with contact mechanics laws, our algorithm then calculates the effective Young's Modulus of the tested object. To ensure safe human interactions and object manipulations, we imposed maximum strain and pressure values at which the grasper jaws stop closing. Our next step in this study is to realize object classification of soft objects using time series and Young's moduli data input to a neural network.

Title: Prenatal cannabinoid exposure elicits memory deficits associated with reduced PSA-NCAM expression

Primary Author: Tia Daniels

Additional Authors: Subhrajit Bhattacharya;Miranda Reed;Miles Wiley;Emma Redmon;Priyanka Das Pinky;Jenna Bloemer;Warren Smith;Jeremiah Pfitzer;Kawsar Chowdhury;Vishnu Suppiramaniam

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Cannabis is one of the most abused substances among pregnant women. This is disturbing because prenatal cannabinoid exposure (PCE) during embryonic development causes neurotransmitter and cognitive deficits during adolescence. This study investigates the mechanisms of learning and memory deficiencies resulting from PCE using adolescent pups. Delta-9-tetrahydrocannabinol (THC), the main psychoactive substance in cannabis, was administered via gavage to pregnant Sprague Dawley rats, and then in the adolescent pups at postnatal days 40-65, a series of behavioral tests were performed to identify possible memory deficits. Afterward, hippocampi were collected and examined for changes in synaptic proteins. PCE animals exhibited deficits in the Morris water maze (MWM) task, indicating impairment in hippocampal-dependent spatial memory. In the spatial novelty preference y-maze test, PCE animals entered the novel arm significantly fewer times, indicating a deficit in hippocampal-dependent behavior. Immunoblotting results showed a decrease in hippocampal synaptic proteins critical for synaptic plasticity and memory, including GluA1 and GluN2A, as well as their downstream signaling (i.e., decreased p-CAMKII & p-CREB). Moreover, PCE pups were deficient in polysialylated-NCAM (PSA-NCAM), which we have previously shown to mediate memory performance. Future studies will test the hypothesis that restoration of PSA-NCAM will ameliorate memory deficits and synaptic alterations associated with PCE. Together, these findings indicate a novel therapeutic target for the treatment of memory deficits induced by PCE.

Title: When do courts agree with clinicians? A quantitative investigation with high-risk court involved youth

Primary Author: Cameron Tice

Additional Authors: Kathryn Babbitt;Kelli Thompson

Department/Program: Psychology

College: College of Liberal Arts

Abstract: This presentation analyzes the degree of agreement between clinical assessment recommendations and juvenile court outcomes when evaluating and assigning risk to adolescents adjudicated for illegal sexual behavior (AISB). The clinical recommendations assessed in this study were given by a team of trained mental health professionals, representing a thorough evaluation of each adolescent. Evaluations are provided to the presiding juvenile court to help determine youth registry and public notification guidelines. Therefore, these recommendations should be weighted heavily in the final decision of the courts. However, borrowing from the literature on the adult criminal justice system, a large amount of “noise” has been found affecting the outcome of trials, often outweighing the recommendations of trained clinicians. This study includes a sample (n = 89) of AISB who completed a court-mandated residential treatment program between the years 2018 and 2022. To operationalize the degree of agreement between clinal team recommendations and court outcomes, a categorical variable describing the youth’s risk level for re-offending was created. The clinical team recommendations were coded from clinical Risk Assessment Files, and court files containing court-assigned risk levels were obtained through the Alabama Department of Youth Services. Preliminary results indicate that over 95% of AISB completed the program with “low” risk recommendations, suggesting the clinical team had evidence of adequate response to treatment with little justification for registry restrictions for the courts. There was only one case identified in which the court disagreed and assigned a higher risk level than recommended. This case study will be presented in more detail. Analyzing agreement in this way can provide better insight into the court’s rationale, translating to a fairer court system where professionals are trusted and unimportant prejudices are rightfully ignored.

Title: Characterization of unsaturated lipids using ambient ionization techniques (paper spray ion mobility-mass spectrometry (PS-IM-MS))

Primary Author: Lexie Toney

Additional Authors: ;Kimberly Kartowikromo

Department/Program: Chemistry

College: College of Science and Mathematics

Abstract: Lipids have very important roles in biological systems and can function as key components of cell membranes, energy storehouses, chemical messengers and much more. They can have a variety of isomerism through variation in the headgroup, chain length, sn-position, double bond position, and configuration of double bonds (i.e., cis and trans), which causes structural characterization to be challenging. Identification and characterization of lipids are very beneficial as recent studies show that healthy tissue and cancerous tissue can be discriminated based on lipid structure isomers, such as a higher presence of certain double bond configurations. Utilizing Ion Mobility Mass Spectrometry (IM-MS) would be of great advantage because double bond isomerism differentiation is strenuous only with high resolution mass spectrometry. Epoxidation reactions were performed on various PC and PG lipids to form epoxides at the double bonds, mono-epoxide and di-epoxide, that fragmented the ions with collision-induced dissociation (CID) in tandem MS. The fragmentation of these various lipids produced diagnostic ion pairs, that were also validated with ion mobility tandem MS by comparing their drift time range.

Title: Seeding rate and planting date effect on corn yield in Alabama

Primary Author: Murilo Trimer Morata

Additional Authors: ;Maria Leticia Pacheco da Silva;Eros Francisco

Department/Program:

College: College of Agriculture

Abstract: Seeding rate and planting date have major effect on corn (Zea mays L.) yield. While seeding rate affects primarily as a direct yield component, planting date will indirectly impact on the performance of the plants in response to different environmental conditions during the season. This study was carried out in three locations in Alabama testing five seeding rates (12-18-24-30-36,000 plants/acre), five planting dates (Mar-15, Apr-1, Apr-15, May-1, and May-15), and two hybrids (P1319R and P2042VYHR) outlined in a complete randomized split plot design with 4 replicates.. The following parameters were measured: plant population, plant height, stalk diameter, ear height, length, weight and diameter, number of ears per plant, grain yield, and test weight. Hybrid was a source of variation for the number of ears per plant, plant height, ear height, ear weight, and grain yield in one location and for ear height and number of ears per plant in another. Seeding rate significantly impacted on plant population, number of ears per plant, ear weight, and yield in all the locations, while planting date was a source of variation for most of the parameters evaluated. An assessment of yield impact related to lower plant populations and late planting dates was conducted and will help farmers with replant decision in corn fields when early initial stand is poor or is not homogeneously distributed on the field.

Title: Screening for clinically relevant drug-drug interactions between direct oral anticoagulants and antineoplastic agents: A pharmacovigilance approach

Primary Author: Bang Truong

Additional Authors: ;Brent Fox;C. Edward Chou;Jingjing Qian;Lori Hornsby;Jingyi Zheng

Department/Program: HORP

College: School of Pharmacy

Abstract: Use of direct oral anticoagulants (DOACs) in patients with cancer remains suboptimal due to the concern regarding potential drug-drug interactions (DDIs) with antineoplastic treatments. However, the clinical relevance of these DDIs is unknown. We conducted a pharmacovigilance study of adverse event (AE) reports from the US Food and Drug Administration Adverse Event Reporting System from 1/1/2004 to 12/31/2021. AE reports containing DOACs and antineoplastic agents with CYP3A4/P-gp inhibitory or inducing activity suggested by published pharmacokinetic studies were included (n=36,066). The outcomes of interest were bleeding or stroke, identified by MedDRA dictionary version 25.0. We used disproportionality analyses (DPA), logistic regression models (LR), and Multi-item Gamma-Poisson Shrinker (MGPS) (Empirical Bayes Geometric Means (EBGM) and 90% credible intervals (90% credible intervals - CIs)) algorithms to identify the safety signal of DDIs. The highest bleeding rates in each drug class were the combination of DOACs with neratinib (39.08%, n=34), tamoxifen (21.22%, n=104), irinotecan (20.54%, n=83), and cyclosporine (19.17%, n=227). The highest rate of stroke was found for prednisolone (2.43%, n=113). In the primary analysis, no signal of DDIs by the antineoplastic therapeutic class was detected by MGPS, DPA, and LR approaches. By individual antineoplastic drug, DOACs-neratinib was the only signal detected [EBGM (EB05-EB95)=2.71 (2.03-3.54)]. No signal of DDIs between DOACs and antineoplastic agents was detected, except for DOAC-neratinib. Most DDIs between DOACs and antineoplastic agents may not be clinically relevant. The DDIs between DOACs and neratinib should be further examined in future research.

Title: Description, life cycle of a new species of *Proterometra* (Digenea: Azygiidae) from the Cahaba River, Alabama, U.S.A. and phylogenetic analyses

Primary Author: Nhat Triet TRUONG

Additional Authors: Paul D. Johnson;Ash Bullard;Nathan Whelan

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: We herein describe a new species of *Proterometra* (Digenea: Azygiidae: Azygiinae) from the Cahaba River, Alabama, USA, and document that it asexually reproduces in the round cocksnail, *Elimia ampla* (Anthony, 1854) (Cerithioidea: Pleuroceridae) and matures in the oesophagus of the blackbanded darter, *Percina nigrofasciata* (Agassiz, 1854) (Perciformes: Percidae). Adults of the new species differ from congeners by having a small body and eggs having a wholly fimbriated surface, appearing colloquially as a cilia-like brush border. Naturally-shed cercariae of the new species differ from those of its congeners by having a strongly claviform tail stem bearing aspinose mammillae, a single furca, excretory pores that open on the posterior margin of the single furca, and few eggs in the cercarial distome. The behaviour of the cercaria further differentiates the new species. Live naturally-shed cercariae of the new species secreted a jelly-like adhesive that coated the surface of the furca and evidently facilitated attachment to the surface of glass, plastic, and snail shell. The attached cercariae vigorously wiggled and thrashed about once attached, perhaps as if mimicking the larva of a stream insect. Phylogenetic analyses recovered monophyletic Azygiidae, which comprised a monophyletic Leuceruthrinae Goldberger, 1911 and polyphyletic Azygiinae Lühe, 1909. The present study is the largest taxon sampling for Azygiidae and the first to include 28S sequences of a species of *Leuceruthrus*. Round cocksnail and blackbanded darter are new host records for *Proterometra*. The new species is the 3rd congener reported from the Cahaba River, a region renowned for its fish and snail endemic biodiversity.

Title: Evaluating the geochemical characteristics of groundwater contaminants from Quaternary alluvial aquifers of southwest coastal regions of Bangladesh

Primary Author: Md Riaz Uddin

Additional Authors: Dr. Anwar Zahid;Ashraf Uddin;Ming-kuo Lee;Jake Nelson

Department/Program: Geology

College: College of Science and Mathematics

Abstract: Saltwater intrusion and the occurrence of significant quantity of naturally occurring arsenic (As) in the groundwater have become a serious public health problem in the coastal aquifers of Bangladesh. Access to freshwater has been significantly reduced due to the saltwater and arsenic contamination of both shallow (<50 m depth) and deep (>150 m depth) aquifers in the southwest portion of the country. Weathering and dissolution of soil, rock, and organic matter allows salts and arsenic entering in the groundwater which persists for a longer time and are unable to naturally degrade. Groundwater analysis from 12 monitoring wells shows that average arsenic (As) concentrations are 20.65 ug/L and 45.12 ug/L during dry and wet season respectively, which is much higher than the EPA permissible limit (10 ug/L for As). The average groundwater salinity of 19.61 ug/L is a major concern in the study area. Textural studies from three core samples suggest major aquifer sediments comprise 92% of fine to medium sand and 8% fine grained particles of silt and clay fractions. Moreover, bulk concentration of heavy minerals is found at the 0.063 mm size fractions. The present study has utilized GIS models to interpret the spatial extent of these groundwater contaminants in the coastal aquifers of southwest Bangladesh. The study also recognized connections between climate change induced impacts and groundwater contamination on public health as well as on the socioeconomic conditions of coastal Bangladesh.

Title: Empirical assessment of U.S. industry productivity data with a focus on the U.S. construction industry

Primary Author: Muhammad Umer

Additional Authors: ;Eric Wetzel

Department/Program: Building Science Construction

College: College of Architecture

Abstract: The data from BLS and MGI show that overall construction productivity decreased in the last five decades, and anecdotal evidence suggests the same trend continues. However, productivity in the manufacturing and other sectors has increased dramatically. Some academics contend that these numbers are inaccurate because they fail to consider the enormous increases in the scale and complexity of construction over the span of fifty years. An assessment of the literature makes the case that there is no agreement on the trend of construction productivity and that neither a common description of labor activities nor a productivity measurement system exists. Since the construction has significant heterogeneity, using just one industry-level productivity measure is insufficient. Additionally, the fact that productivity in the construction sector has two parts (organizational effectiveness and administration of the construction project on the job site) is a problem. This research attempts to model the data through logistic regression to determine statistically significant and negatively impacting factors on construction productivity. Literature suggests that despite four industrial revolutions, the construction industry has lagged behind other sectors. At the beginning of this decade, the industry was exposed to a novel concept called Industry 4.0. The ideas that support this concept include big data and analytics, autonomous robotics, simulation, system integration, the internet of things, cybersecurity and cyber-physical systems, cloud computing, additive manufacturing, and augmented reality. Construction 4.0 refers to efforts by industry professionals and technology firms to introduce Industry 4.0 ideas, digital technologies, and new management practices into the construction sector. For true productivity measurements to take place, the industry needs to de-learn and re-learn the concepts that are propagated by Construction 4.0.

Title: Effects of isoleucine and valine ratios to lysine in response to varying leucine to lysine ratios on jejunal protein expression in commercial broilers

Primary Author: Diego Ernesto Ventura Urbina

Additional Authors: Charles Starkey;Jessica Starkey;Cristopher Isaac Almendares Sanchez

Department/Program: Poultry Science

College: College of Agriculture

Abstract: A central composite design (CCD) study was conducted to understand the relationship among dietary branched chain amino acid (BCAA) ratios and expression of proteins in the jejunum of broilers. A total of 2,592 d-old Ross 344 × 708 male broilers were randomly placed in 144 floor pens. Each pen received 1 of 15 dietary treatments in a 23 CCD with 6 center points from 20 to 35 d of age, varying in digestible ratios of isoleucine:lysine (Ile:Lys; 52 to 75), valine:lysine (Val:Lys; 64 to 87), and leucine:lysine (Leu:Lys; 110 to 185). On d 35, one bird per pen was selected, euthanized, and jejunum tissue samples were collected for protein extraction and proteomic analysis via data independent acquisition protein sequencing with a timsTOF Pro 2 LC/MS/MS and Spectronaut 15 software. Glycogen synthase kinase-3 beta (GSK3A), dihydrolipoamide acetyltransferase (PDHX), AMP deaminase (AMPD3), succinyl-CoA-Ketoacid-coenzyme A transferase (OXCT1), adipocyte-type fatty acid-binding protein (FABP4), and O-N-acetylglucosamine transferase subunit p110 (OGT) were identified and quantified. Protein quantification data were analyzed as a CCD using the RSREG procedure of SAS v. 9.4 with significance declared at $P \leq 0.10$. The surface response model for OGT expression was significant ($P = 0.028$; R2 = 0.20). However, the models for GSK3A, PDHX, AMPD3, OXCT1, and FABP4 were not significant ($P \geq 0.1356$) and the R2 values ≤ 0.15 did not allow for prediction of protein expression means. The coefficients for the Val:Lys ratio effect on PDHX ($P = 0.09$), the Leu:Lys ratio effect on PDHX ($P = 0.0716$) and OGT ($P = 0.0763$) protein expression were significant. In addition, the Ile:Lys × Leu:Lys interaction for PDHX ($P = 0.0415$) and the cross-product coefficient for Ile:Lys ratio effect on OGT ($P = 0.0535$) protein expression were also significant. The expression of OGT was affected by the Leu:Lys ratio ($P = 0.0511$) and the Ile:Lys ratio altered GSK3A ($P = 0.0633$) expression. Varying concentrations of dietary BCAA and their interactions seem to alter jejunal protein expression.

Title: Does suicidality in veterinarians reflect the general population? Trends across career stages and a test of the Interpersonal Theory of Suicide

Primary Author: Sydney Waitz-Kudla

Additional Authors: ;Tracy Witte;Cassidy Brydon;Jordan Alvarez;Johanna Branham

Department/Program: Psychology

College: College of Liberal Arts

Abstract: The aims of this study were to investigate differences in suicide ideation and attempt between men and women across different career stages (i.e. before, during, and after veterinary school), and test hypotheses derived from the Interpersonal Theory of Suicide (IPTS) in a sample of veterinarians. We hypothesized that 1) women would be more likely to experience suicide ideation and attempt across career stages compared to men, 2) perceived burdensomeness, thwarted belongingness, hopelessness, and their interaction would be positively associated with suicide ideation and attempt, and 3) lifetime suicide attempt would be positively associated with fearlessness about death and pain tolerance. Our sample was composed of currently practicing veterinarians (N = 10,319) who completed an online self-report questionnaire. As expected, women generally had a higher prevalence of suicide ideation and attempt across career stages with one exception: men and women showed similar rates of suicide attempt after veterinary school. Contrary to hypotheses, no interaction effects between IPTS variables were observed. However, perceived burdensomeness, thwarted belongingness, and hopelessness exhibited main effects on suicide ideation, and there were main effects of perceived burdensomeness and hopelessness on suicide attempt. Notably, hopelessness had a more robust relationship with suicide ideation than perceived burdensomeness and thwarted belongingness. Finally, we found a positive relationship between fearlessness about death and suicide attempt, but no relationship between self-reported pain tolerance and suicide attempt. In conclusion, some findings were consistent with the IPTS while others were not. Future research would benefit from a longitudinal examination of suicidality in veterinarians.

Title: Predicting college freshmen recruitment decisions using statistical and machine learning techniques

Primary Author: Davy Walker

Additional Authors: ;Jingyi Zheng;Nedret Billor

Department/Program:

College: College of Science and Mathematics

Abstract: One of the keys to success when building a college football team is highly skilled talent. As follows, such talent is in high demand, with finite resources existing with which to sway it. Predicting recruits' decisions before they occur is, accordingly, important for recruiting staff. This knowledge allows them to optimally distribute their resources among players, filling gaps before they occur and recruiting the best players available to the team. Making this prediction on the individual scale is difficult, however. College applications shape the rest of a player's life, so the pressure on them rises accordingly and makes predicting individual decision making a challenge. To combat this, this study uses statistical analysis enhanced with machine learning techniques such as random forest traversals, nearest prototype classifications, multi-layer perceptrons, and support vector machines to create a model which determines if a recruit will play for a given team. This model is validated using a dataset with 30 features on the 1,200 students Auburn University has made an offer to within the past 5 years. In this snapshot of high school recruits, we find significant success, with a high degree of correlation between our features and the decisions recruits make, paving the way for future utilization of machine learning in decision prediction.

Title: Evaluation of dietary nutrient reduction on broiler chicken growth performance, carcass characteristics, and breast meat quality defects

Primary Author: Brittany Wall

Additional Authors: Charles Starkey;Caroline Gregg;Joshua Flees;Jessica Starkey;Cristopher Isaac Almendares Sanchez;Orlando Benjamin Fiallos Soto

Department/Program: Poultry Science

College: College of Agriculture

Abstract: Numerous nutritional intervention strategies have been investigated with the aim of eliminating breast meat quality defects, Wooden Breast (WB), and White Striping (WS). The etiology of these defects is still unknown. Previously, feeding diets in meal form with a 30% reduction in metabolizable energy (ME), digestible Lys (dLys), and digestible Met (dMet) during the starter diet phase decreased WB incidence, BW, BWG in birds fed to d 21. The objective here was to develop a feeding model resulting in broilers with a variety of WB and WS scores. A corn and soybean meal-based commercial diet served as the control (C), and the second diet was formulated with a 30% reduction in ME, dLys, and dMet (R). C diets were fed as crumbles in the starter; grower and finisher phases were fed as pellets, whereas R diets were fed in meal form in all feeding phases. Feeding C and R diets during 3 feeding phases produced 4 treatments: CCC, RCC, RRC, and RRR. Male, Ross 708 x Yield Plus chicks were randomly allotted to 1 of 4 treatments and reared in floor pens until processing when carcass weights and part yields and incidence and severity of WB and WS were assessed. Data were analyzed as a 1-way ANOVA using SAS, and a complete pairwise mean comparison analysis was done using the PDIFF option at $P \leq 0.05$. BWG and FCR worsened the more phases the broilers were fed R diet ($P < 0.0001$). Carcass, breast, tender, wing, thigh, and drum weights and yields were lowest in RRR-fed broilers, highest in CCC-fed broilers, with the RRC and RCC-fed broilers being intermediate ($P < 0.0001$). The incidence and severity of both WB and WS were lowest in the RRR-fed broilers compared with all other treatments ($P < 0.0001$). However, it is important to note that this feeding strategy did not eliminate either breast meat quality defect. Overall, the feeding strategy employed here with 30% targeted reductions in ME, dLys, and dMet produced a population of broilers exhibiting a variety of WB and WS severities.

Title: Evaluating the pharmacodynamic effects of *Withania somnifera* in chronic insomnia

Primary Author: Carson Walters

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Quality of sleep is a crucial aspect of every individual's health. With the increase in stress and anxiety-induced events in today's world, insomnia has become a primary antagonist of sleep quality. Insomnia currently affects 9-20% of the United States population. Insomnia is a neurological disease caused by an increase in the secretion of glucocorticoids from the adrenal cortex causing hyperarousal of the hypothalamus-pituitary-adrenal axis leading to poor quality or quantity of sleep. Chronic insomnia is defined as insomnia lasting more than three months at a frequency of at least three times per week. Current treatments for insomnia include but are not limited to benzodiazepines, orexin receptor antagonists, melatonin supplements, and cognitive behavioral therapy. These therapeutical methods have shown to be effective in their own respective way. However, they each have significant adverse effects that can increasingly become worse over time. The current study will elucidate the therapeutic efficacy and pharmacodynamic actions of *Withania somnifera*. The study will be conducted by evaluating the effects of oral consumption of concentrated *Withania somnifera* root extract in female adults diagnosed with chronic insomnia. The proposed results are that *Withania somnifera* root extract will dose-dependently decrease cortisol levels and increase GABA levels in the bloodstream over a 60-day period. The results of this study can potentially lead to a safer alternative to treating chronic insomnia.

Title: Feline Gangliosidosis as a model for Alzheimer's Disease histopathology

Primary Author: Malia Walton

Additional Authors: ;Arthur Zimmerman;Douglas Martin

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Alzheimer's Disease (AD) is a degenerative brain disorder and the most common form of dementia. The presence of amyloid-beta (Aβ) plaques, neurofibrillary tangles (NFTs), and loss of neuronal connections are hallmarks of this disease. Gangliosidosis, on the other hand, is a set of rare lysosomal disorders that are associated with ganglioside buildup in the brain, and there is much literature suggesting ganglioside-bound Aβ (GAβ) may accelerate Aβ accumulation and be enriched within neurons of AD patients. Therefore, we hypothesize that gangliosidosis affected cats could be a novel model for studying progression of AD pathogenesis and for testing current and new AD therapies. Here, we examined four different brain regions in gangliosidosis affected cats as well as age-matched controls for the presence and subtypes of amyloid plaques. Our results suggest that the plaques in gangliosidosis affected cats are expressed in correlation with AD progression. They appear earlier in regions affected during early stages of AD, and increase in likelihood and number during the later stages of gangliosidosis in a manner comparable to later stages of AD. In addition, the progression of plaque subtypes throughout the brain of gangliosidosis affected cats may reflect the same pattern of progression in AD. Overall, we show that gangliosidosis affected cats could be a novel model for the study of AD pathogenesis and for the testing of AD therapies. In future studies, we will characterize gangliosidosis affected cats for tau phosphorylation and the presence of NFTs.

Title: Profiling tumor cell-derived exosome using on-chip nanoplasmatic sandwich immunoessay for cancer diagnoses and immune checkpoint therapy

Primary Author: Chuanyu Wang

Additional Authors: ;

Department/Program: Materials Engineering

College: College of Engineering

Abstract: Tumor-derived exosomes play a vital role in the process of cancer development. Quantitative analysis of exosomes and exosome shuttled proteins would be of immense value in understanding cancer progression and generating reliable predictive biomarkers for cancer diagnosis and treatment. Recent studies indicate the critical role of exosomal programmed death ligand 1 (PD-L1) in immune checkpoint therapy and its application as a patient stratification biomarker in cancer immunotherapy. Here, we present a nanoplasmonic exosome immunoassay utilizing gold silver (Au@Ag) core-shell nanobipyramids and gold nanorods which form sandwich immune-complexes with target exosomes. The immunoassay generates a distinct plasmonic signal pattern unique to exosomes with specific exosomal PD-L1 expression allowing rapid, highly-sensitive exosome detection and accurate identification of PD-L1 exosome subtypes in a single assay. The developed nanoplasmonic sandwich immunoassay provides a novel and viable approach for tumor cell-derived exosome detection and analysis with quantitative molecular details of key exosomal proteins, manifesting its great potential as a transformative diagnostic tool for early cancer detection, prognosis, and post-treatment monitoring.

Title: hAmylin modulates amyloid-β precursor protein and gangliosides processing in Alzheimer's disease

Primary Author: Junwei Wang

Additional Authors: ;Orobola Olajide;Ahmed Hamid;Julia Odum;Amal Khalil Kaddoumi

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Alzheimer's disease (AD) is a progressive neurodegenerative disorder that impairs mental ability development, interrupts cognitive functions, and causes dementia. Pre-existing type 2 diabetes (T2D) has been shown to significantly increase the risk of developing AD. One of the well-known characterizations of both AD and T2D is the presence of misfolded protein aggregate, which results in the formation of amyloid-β (Aβ) and human amylin (hAmylin) accumulates in AD and T2D, respectively. It is known that hAmylin and Aβ interact with each other, and that hAmylin promotes Aβ aggregation leading to the formation of cross-seeded oligomers. Our lab has successfully shown that hAmylin and its synthetic analogue pramlintide increased the Aβ production in AD mouse brains by inducing the amyloid-β precursor protein (APP) processing in lipid rafts. Gangliosides, which are synthesized by GalNAc-T and several other glycosyltransferases, have been reported for their involvement in the pathogenesis of AD. Previously, we have discovered that hAmylin significantly enhanced GalNAc-T levels in the AD mouse brain by four-fold, which was associated with increased Aβ level and Aβ42: Aβ40 ratio, synaptic loss, and apoptosis. However, the mechanism remains unclear. The objective of this work is to investigate the mechanism by which amylin induces GalNac-T, disrupts ganglioside synthesis, and induces APP processing in lipid rafts. In this abstract, we will focus on the in vitro study of hAmylin effect on APP processing and γ- secretase activity on total lysate and lipid raft in a concentration-dependent response. SH-SY5Y, a human neuronal cell line, transfected with APP695 (SH-SY5Y-APP), and its corresponding non-transfected SH-SY5Y cell were applied in the studies. The completion of this work will help us approach the correlation of the induced Aβ production with dysregulated ganglioside synthesis in our future work.

Title: Elesclomol-copper/ES-Cu manoparticles with mitochondria oxidative stress induction in drug-resistant cancer cells and M1 phenotype polarization of Raw

Primary Author: Qi Wang

Additional Authors: ;Jayachandra Ramapuram

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Elesclomol (ES) has been used in clinical trials with paclitaxel to enhance therapeutic effect. ES is a copper-binding ionophore that can chelate with copper ions (Cu(II)) to form Elesclomol-copper complex (ES-Cu). Studies have reported that ES-Cu can induce intracellular mitochondria oxidative stress and lead to a copper-dependent cell death (cuproptosis). Here, we developed a D-⍰-tocopherol polyethylene glycol 1000 succinate/Chondroitin sulfate-Cholic acid (TPGS/CS-CA) based nanoparticle for codelivering ES and Cu(II). The nanoparticle showed good ES-Cu encapsulation efficiency and serum stability. The ES-Cu nanoparticle showed excellent cytotoxicity against drug-resistant cancer cells (DU145TXR, PC3TXR, and A549TXR). ES-Cu nanoparticles induced cell death by promoting intracellular mitochondria oxidative stress and ubiquitin accumulation in DU145TXR cells. ES and ES-Cu were demonstrated not to be the substrate of P glycoprotein, indicating ES-Cu could be used against drug-resistant cells. Moreover, the extracellular mitochondria DNA released from DU145TXR after being treated with ES-Cu nanoparticles was able to act as an endogenous damage-associated molecular patterns (DAMP) and trigger the polarization of Raw 264.7 macrophages into M1 phenotype, which could possibly then trigger an innate immune response. Consequently, the new delivery system provides a promising and efficient approach for codelivery of ES and Cu(II) for cancer therapy.

Title: Role of artificial intelligence in cancer

Primary Author: Kiersten Ward

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: The incorporation of artificial intelligence in modern healthcare has soared in recent years as it has provided efficient and cost-effective diagnosis and treatment measures in medicine. Recent strides in medical technological systems allow for computerized devices to prevent, diagnose, and treat a variety of diseases that pose a threat to the global society. As the focus of this paper is the effects of artificial intelligence on cancer in the central nervous system, I will directly discuss its elucidation on the three aforementioned areas as well as the decrease in morbidity and mortality in those affected by these cancers. Cancer in the brain poses significant mental health adversities, which can be monitored and prevented using identified markers- i.e. sleep, activity, voice- and assessed with wearable extensions (identified in the FAITH project). This is one of the many applications in which artificial intelligence has positively affected not only the physiopathology of the disease, but also other side effects of the disease.

Title: Implementing micro hotels in modern society to benefit travelers, companies, and the environment

Primary Author: Mikayla Watson

Additional Authors: ;Anna Ruth Gatlin

Department/Program: Consumer and Design Sciences

College: College of Human Sciences

Abstract: The rise of Airbnb and a slow return to pre-pandemic travel levels in the US has caused many hotels to experience difficulties. The average price of a US hotel room has risen to about $180/night making many hotel room options unaffordable for many potential travelers. Though not well-known outside of urban areas like Tokyo and even New York City, the idea of a micro-room is not new. Micro rooms may allow hoteliers to make more money/sq ft., save travelers money/night, and potentially increase travel as a result. The purpose of this research is to use systems thinking theory to create an adapted micro-hotel room design that combines comfort and practicality, that can be used as a format for renovations of existing hotels and for new construction. The micro rooms designed for this study will be 110 sq ft.—one-third the size of the average 325 sq ft. standard hotel room. Unlike many existing micro rooms, these will include a personal bathroom. As urban centers progressively expand, and the world becomes more globalized, micro-rooms can provide cost-effective and sustainable alternatives to traditional hotel rooms; this ties into systems thinking theory which recognizes that the holistic is greater than the component parts. Adapting micro-rooms in a large scale can positively impact the individual, the company, and the environment. This research will not only present a prototype: it will also present the business case for providing micro-room options, including a sq ft. cost estimate based in geographic averages. The sustainability case will also be shown, mapped to the four points of the Sustainability Compass and using the LEED certification checklist.

Title: Viscoelastic bias in bistable mechanical metamaterials

Primary Author: Robin Weaver

Additional Authors: ;

Department/Program: Aerospace Engineering

College: College of Engineering

Abstract: Energy absorbing structures are crucial to many engineered systems, but large amounts of absorbed energy can cause permanent deformation and damage, thus reducing the reusability of the structure. Polymer additive manufacturing methods can be used to fabricate bistable, mechanical metamaterial structures capable of dissipating energy while maintaining a factor of reusability. Bistable mechanical metamaterials possess a negative stiffness region due to reversible buckling of a sinusoidal beam, which allows them to exhibit two stable configurations. However, the viscoelastic properties of additively manufactured polymers introduce a bias in the snap-through behavior. This study will evaluate the effects of viscoelasticity on the snap-through behavior of the bistable structures and investigate methods of overcoming these effects in order to tailor the energy absorbing properties of the bistable structure. We will focus on how print state and thermal aging impart viscoelastic bias in the structures. We will evaluate three print states: collapsed, expanded, and modular metamaterials (wherein the beam is independently printed in the flat state). Further separating the unit cell into modular components allows convenience in tailoring the mechanical properties by interchanging the beam. When focusing on the effects of aging the structures will be exposed to temperature dependent aging to understand how to control the viscoelastic bias. Understanding how print state and temperature dependent aging impart a viscoelastic bias allows bistable structures to be optimized in a manner that provides more effective energy absorption properties.

Title: Functional analysis of DNA ligase gene polymorphisms in human cancers

Primary Author: Abigail Weir

Additional Authors: Srikanta Kumar Rath;Katie Marlow;Amit Mitra;Salsabil Ahmed;Suman Mazumder

Department/Program: Chemistry-Biochemistry

College: College of Science and Mathematics

Abstract: Understanding the global genomic diversity within DNA repair genes requires fine mapping and functional analysis of single nucleotide polymorphisms (SNPs) in subpopulations across the world. Using DNA sequencing and Illumina BeadArray-based SNP genotyping in 55 subpopulations representing the ethnic diversity of India, we have identified nine SNPs in the DNA ligase I gene (LIG1). In this study, we used several bioinformatics tools to determine the predicted effect of these SNPs on regulatory regions like gene promoter, alternative splicing, and protein function (SIFT/ Polyphen) based on position, minor allele frequencies (MAF), and clinical significance. Next, we investigated the presence of LIG1 SNPs in six (6) human cancer cell lines U266P, JIM3, U266VR, RPMI8226VR, MMISVR, and UTMC2, representing the inter-individual variation in anti-cancer drug response. Primers were designed using Primer3 for the regions flanking 500bp upstream and downstream of each SNP and verified using in silico PCR. Genomic DNA was isolated, quantified, and the target DNA sequence was amplified using Polymerase Chain Reaction (PCR) with annealing temperatures determined by gradient PCR. Sanger DNA sequencing was performed using SeqStudio. Each sample was sequenced twice (bidirectional sequencing) using the forward primer and the reverse primer. DNA sequences were pre-processed and aligned against the Hg38 reference genome for LIG1 using Lasergene software. From the list of nine SNPs, five SNPs were found to be of interest, and the most functionally relevant nonsynonymous SNP, rs4987181, was selected for further experimentation. Multiple sequence alignment also showed two intronic SNPs, rs3730861 and rs3730862, with high MAF. Next, we will investigate the effect of these LIG1 SNPs in DNA repair as well as the potential involvement of the variants in differential response to cancer chemotherapy (drug resistance). This will allow for personalized therapy or precision medicine in the future.

Title: Positive approaches to trauma healing (PATH) for foster parents: Developing a trauma-informed training curriculum

Primary Author: Jenna Wettstein

Additional Authors: ;Silvia L. Vilches

Department/Program: Human Development and Family Studies

College: College of Human Sciences

Abstract: Although foster parents (caregivers) work with children who have experienced trauma, almost no training prepares caregivers to address child behavioral issues that may be related to prior trauma. Placement instability is important; a pattern of inconsistency in the child's life is a risk factor for increasing internalizing and externalizing behaviors. However, foster children with clinically significant trauma-induced behaviors are more at risk for placement instability. Thus, a trauma cycle may ensue where the child continues to be re-traumatized through placement rotations. Understanding the link between trauma and behaviors may help caregivers increase placement stability and avoid re-traumatizing children. Based on prior project achievements, we know that a parenting education intervention, Tuning in to Kids, that focuses on social-emotional development results in statistically significant increases in parental knowledge about developmental needs. For this study, we are working with a community agency: They affirm the importance of understanding child trauma for the caregivers and families they support in their reunification work. We consulted with caregivers through a pilot workshop and two focus groups. Qualitative analysis will be presented of key themes that could inform an effective trauma-informed caregiver training program. The outcomes will be translated into a trauma-informed training curriculum to help caregivers better support young children and potentially address the high placement turnover rate will be presented.

Title: Effects of permeating and non-permeating cryoprotectants on sperm kinematics in Southern flounder (*Paralichthys lethostigma*)

Primary Author: Malin White

Additional Authors: ;Ian Butts;Helen Montague;MacKenzie Tackett

Department/Program: Fisheries and Allied Aquacultures

College: College of Agriculture

Abstract: Southern flounder is a recreationally and commercially important flatfish; in 2021, 8.4 million pounds were harvested. Unfortunately, flounder stocks are declining due to overfishing and climate change. Thus, we need to develop techniques to cryopreserve genetic resources (i.e., create a sperm bank) for conservation efforts that may be needed in the future. This repository would facilitate conservation and hatchery production by synchronizing parental gamete availability, conserving sperm, reducing males in hatcheries, reducing disease, and conserving genetics. Developing a cryopreservation protocol is no simple task, as the optimal diluent as well as freezing and thawing rates should be assessed to create a successful protocol. Freezing solutions must also contain a cryoprotective agent, which is a liquid that prevents cell damage during freezing and thawing. Cryoprotectants are classified as permeating or non-permeating based on their ability to penetrate through cell membranes. Dimethyl sulfoxide (DMSO) and 1,2-propanediol (PG) are commonly used permeating cryoprotectants. In addition, non-permeating cryoprotectants, like trehalose and lactose, have been added to cryo-solutions to prevent damage to the extra-cellular surface of plasma membranes. This study investigated the effects of two permeating cryoprotectants (DMSO and PG) and two non-permeating cryoprotectants (trehalose at 200 mM and 400 mM and lactose at 0.5% and 1.0%) on sperm kinematics. Sperm were obtained from seven males, and cells were diluted in HEPES solution at 1×108 cells/mL and supplemented with DMSO (v/v 10%) or PG (v/v 10%) in combination with trehalose (at 200 mM and 400 mM) or lactose (at 0.5% and 1.0%). Sperm were frozen at -20ºC/min from +5ºC to -80ºC and submerged in liquid nitrogen. Cryo-straws are now being thawed in a 30ºC water bath for 7 s and assessed using sperm analysis software. Initial visual observations are promising, as post-thaw motility values range from ~10-20% across multiple treatments. This technology will support conservation efforts for this valued species.

Title: Discrepancies in cell-based Pregnane X receptor reporter gene assays

Primary Author: Frank Wilbanks

Additional Authors: Kodye L. Abbott;Satyanarayana Pondugula;Julia Salamat

Department/Program: Veterinary Medicine

College: School of Veterinary Medicine

Abstract: Pregnane X receptor (PXR) is a ligand-dependent nuclear receptor and a transcription factor that is activated by endobiotics and xenobiotics, including clinical drugs and environmental compounds. PXR regulates gene expression of enzymes and proteins involved in a variety of biological processes, including drug metabolism. Modulation of PXR has been associated with adverse drug interactions and chemoresistance via dysregulation of PXR target genes. It is therefore crucial to screen xenobiotics, including novel compounds in drug discovery stage, for their potential to modulate PXR. Cell-based PXR reporter gene assays that involve overexpression of the exogenous PXR and a reporter gene are widely implemented in both industry and academia to screen xenobiotics. Specifically, PXR luciferase reporter gene assays, in which the luciferase gene expression driven by the promoter of PXR target genes, such as cytochrome p450 3A4 (CYP3A4), are commonly used. It is known that the effect of xenobiotics on PXR reporter gene expression could differ from their effects on the endogenous PXR target gene expression. However, it is unclear whether xenobiotics can also induce differential effects on the PXR reporter gene expression in a cell-dependent manner. The current study shows that belinostat, a histone deacetylase inhibitor used to treat lymphoma, induces differential effects on the PXR reporter gene expression in a cell-dependent manner. However, belinostat exhibits consistent effects on the endogenous gene expression in all cell types. The observed discrepancies among the exogenous systems can be attributed to imbalance of PXR regulation machinery as well as the metabolic machinery in the overexpressed exogenous systems.

Title: The male gonad is a target for environmental chemicals

Primary Author: Katherine Wilkinson

Additional Authors: ;Benson Akingbemi;Samantha Bradley

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: Testicular Leydig cells are the predominant source of the sex hormone testosterone (T) which maintains male fertility, the musculoskeletal system, and cognitive function. Many environmental chemicals can interfere with the endocrine axis and are classified as endocrine disrupting chemicals. Bisphenol S (BPS) is present in consumer products and has superior thermal stability than its analog bisphenol A (BPA). However, the safety profiles of both compounds are yet to be clarified. The chemical 17α-ethinyl estradiol (EE2) is a constituent of female oral contraceptives present in water supplies. This study investigated BPA, BPS and, EE2 effects on sex steroid secretion in the growing male rat gonad. To abrogate the influence of the hypothalamus-pituitary axis and show that these agents act directly in testicular cells, Leydig cells were isolated from 35-day-old male rats (n = 34) and incubated in DMEM/F-12 culture medium containing test chemicals (EE2, BPA, BPS) at 0, 0.01, 0.1, 1, and 10 μM in the presence of ovine LH (10 ηg/mL NIDDK) for 3 hours at a temperature of 34 ◦C. At the end of culture, T concentrations were analyzed by RIA. Exposure of Leydig cells to EE2 increased T production at the 0.01 μM ($p<0.001$), 0.1 μM ($p<0.00001$), and 1 μM ($p<0.001$) concentrations, but this effect was not seen with BPA and BPS treatment groups. However, the 10 μM concentration tended to decrease T production in all three treatment groups. These observations support the view that chemicals present in our food and water supplies may have impact on reproductive health. Ongoing experiments will confirm these results in animal studies and determine a role for the hypothalamus and pituitary gland in chemical exposure effects. Additional experiments will investigate individual versus combined chemical exposures on steroid hormone secretion. This study is supported by an award from the Animal Health and Disease Research Program at the Auburn University College of Veterinary Medicine.

Title: The effects of reproduction and environment stress-driven mtDNA aging in semi-natural enclosed wild-derived house mice

Primary Author: Ashley Williams

Additional Authors: ;Wendy Hood

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: Under the cost of reproduction (COR) hypothesis, the reproduction-longevity tradeoff may be influenced by high reproductive demand placed on maternal physiology with mitochondria-induced oxidative stress (OS) damage to proteins, lipids, and mitochondrial DNA (mtDNA) as a major contributor resulting in reduced longevity. Evidence supporting the hypothesis is challenging as hormetic mechanisms are often engaged to reduce OS damage to preserve somatic maintenance and function. In addition, previous studies utilizing animals maintained under sterile and isolated conditions often do not consider how environmental factors might influence somatic maintenance and reproductive female longevity. To investigate if environmental or reproductive stressors are stronger contributors to aged mutation phenotypes in liver, brain and hindlimb skeletal muscle tissue mtDNA, we compared and characterized mutations observed in reproducing and non-reproducing genetically variable wild-derived female *Mus* maintained in semi-natural enclosures and traditional rodent boxes. We report although environmental stress is a stronger contributor to mtDNA aging, reproduction may increase OS mediated GC:TA transversions overcoming mtDNA repair thereby reducing longevity of the liver. We additionally identified mitochondrial gene mt-TrnR in the brain as being significantly mutated in aged, non-reproductive, and reproductive mice, and mt-Rnr2 as being heavily mutated in the hindlimb skeletal muscle of non-reproductives. Furthermore, we uniquely report a negative relationship between brain and liver mtDNA mutations and lifetime reproductive effort as mice who produced the greatest litter masses in their lifetimes displayed the fewest mtDNA mutations. This suggests within natural populations, dominant females may have better conditioned mitochondria and mtDNA maintenance.

Title: The therapeutic properties of *Centella Asiatica* on various organ systems

Primary Author: Mackenzie Williams

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Sindhu Ramesh;Jack Deruiter;Timothy Moore

Department/Program: Biomedical Sciences

College: College of Science and Mathematics

Abstract: Click or tap here to enter text. Modern medicine has advanced the healthcare system of the world today predominately through the use of synthetic drugs. Before the discovery of modern medicine, the natural botanicals used to create synthetic drugs were used to treat many chronic and acute conditions. These natural botanicals, also known as herbal medicine, were commonly used throughout the world for the treatment of routine healthcare needs. One particularly effective botanical is *Centella Asiatica*. Both odorless and tasteless, *C. asiatica* has shown curative properties that significantly affect organ systems such as the central and peripheral nervous systems. In this review, we have combed through the current literature on *C. asiatica* to create a significant overview of its prophylactic and pharmacodynamic effects. Our research found that *C. asiatica* has numerous therapeutic targets. Specifically related to its prophylactic effects, *C. asiatica* can be considered a potent antioxidant agent that enhances the Nrf2 response pathway. This suggests that *C. asiatica* could act as synergistic therapy in occurrence with other herbal or synthetic drugs. Regarding its pharmacodynamic attributes, *C. asiatica* can carry neurological, ocular, cardiovascular, respiratory, gastrointestinal, immunological, muscular, renal, and reproductive effects. For instance, the literature has demonstrated *C. asiatica* can effectively serve as an antidepressant, cardioprotective medicine, and birth control. These are typical healthcare issues that are primarily addressed through the use of synthetic and invasive measures. However, in most recent decades, patients have desired more natural remedies rather than the gold standard that Western Medicine has become. It is our hope that through this review, *C. asiatica* can be brought into the light as an effective and alternative treatment strategy for healthcare needs for patients wanting more natural options.

Title: Using multi-scale 3D computed tomography to quantify pore structures of Carbonate abundant samples for geologic Carbon sequestration in the Southeast

Primary Author: Otis Williams

Additional Authors: ;Lauren Beckingham

Department/Program: Civil Engineering

College: College of Engineering

Abstract: Geologic Carbon Sequestration (GCS) is a technology that can be used to lower anthropogenic CO2 in the atmosphere. In these systems, CO2 is captured and injected into a saline aquifer deep underground for permanent storage. Post-injection, the CO2 interacts with the aquifer brine and existing minerals, which can permanently trap the CO2 in the form of Carbonate rock. One of the major challenges of GCS is determining the timescale and extent to which CO2 will be transformed into the desired minerals. Previous work has shown that this timescale is heavily dependent on the characteristics of the geologic formation, where sandstones and carbonates could be promising storage formations. Existing carbonate minerals react quickly with the mixture of CO2 and brine, but the implications of this are not fully understood. The difficulty in prediction is due to the complex, multi-scale nature of the pore structure of carbonate formations. This makes determining the rate, extent, and impact of reactions of formation properties difficult. Using a multi-scale 3D X-ray micro computed tomography (CT) imaging method, the pore structure of some potential carbonate storage formations is examined on multiple scales. CT Images are processed to quantify multi-scale porosity, pore connectivity, and the accessible surface area of the reactive mineral phases. The data for the multiple formations with varying mineralogy will be compared based on these quantifications.

Title: Expansive nutraceutical use of cannabis

Primary Author: Parker Wilson

Additional Authors: ;Muralikrishnan Dhanasekaran;Suhrud Pathak;Sindhu Ramesh;Timothy Moore

Department/Program: Pharmacy

College: School of Pharmacy

Abstract: Besides its recreational and medical uses, Cannabis is an excellent source of fiber, protein, and fat. Cannabis has been used as human food in the US for around more than a decade. Nutraceuticals are any products derived from food sources that are used for both health and nutrition. They may potentially help preserve the body's structure and function, avoid chronic illnesses, and increase life expectancy. Some of the most widely used worldwide nutraceuticals in recent decades have been echinacea, ginseng, green tea, glucosamine, omega-3, lutein, folic acid, and cod liver oil, and recently Cannabis. Pharmaceuticals, food additives, and nutritional supplements are all controlled nutraceuticals. Nutraceuticals are categorized by their source, activity, chemical structure, and makeup. The hemp seed oil has significant preventive and therapeutic potential for different human health issues. Cannabis includes bioactive compounds and polyunsaturated fatty acids that may be beneficial to present and future generations. Cannabis, alone or in conjunction with other nutraceuticals, may benefit human health. The global nutraceutical use of Cannabis has great potential economic value. The cannabis nutraceuticals market is expected to reach 19.25 billion USD by 2028. This presentation discusses nutraceuticals, their categorization, health advantages, and the possibility of Cannabis as a nutraceutical source.

Title: Impact of different comonomers (PEGMA, PEGMEA, and PEGMEMA) on solute co- transport in PEGDA and PEGMA-AMPS membranes

Primary Author: Ryan Wozniak

Additional Authors: ;

Department/Program: Chemical Engineering

College: College of Engineering

Abstract: As CO2 emissions increase, methods of converting CO2 into other valuable resources are becoming increasingly important. The electrolytic cell is one such device that achieves this goal by reducing CO2 through the usage of an ion exchange membrane. Ion exchange membranes in these electrolytic cells transport certain ions across the membrane to perform a reduction process with CO2 while blocking the transport of neutral molecules and other ions to preserve cell efficiency. The objective of this project is to synthesize and characterize PEGDA (poly(ethylene glycol) diacrylate) membranes with a varying charger comonomer AMPS (2-acrylamido-2-methylpropane sulfonic acid) and different uncharged comonomers PEGMA (poly(ethylene glycol) methacrylate), PEGMEA (poly(ethylene glycol) methyl ether acrylate), and PEGMEMA (poly(ethylene glycol) methyl ether methacrylate) with differing chain ends. The membranes were synthesized through free-radical polymerization using photolytic decomposition of an initiator molecule, HCPK (1-hydroxyl-cyclohexyl phenyl ketone). The membranes were characterized for water volume fraction (and thereby fractional free volume) and diffusivity of two carboxylate salts, sodium formate and sodium acetate, to determine transport behavior.

Title: Adverse event reporting of marketed biosimilar and biological monoclonal antibody cancer treatments in the United States

Primary Author: Xiangzhong Xue

Additional Authors: ;Bang Truong;Jingjing Qian

Department/Program: HORP

College: School of Pharmacy

Abstract: By September 8, 2022, 10 biological monoclonal antibody (mAb) biosimilar products for cancer treatment had been approved and marketed in the United States (U.S.). These biosimilars were approved based on bioequivalence studies conducted among healthy volunteers, but their post-marketing investigations for safety are limited. To examine adverse event (AE) reporting patterns and disproportionate reporting signals for mAb biosimilars in the U.S. compared to their originator biologics. The U.S. Food and Drug Adverse Event Reporting System database (January 1, 2004–December 31, 2021) was used to identify AE reports for Rituxan®, Avastin®, Herceptin®, and their biosimilars. Proportions of patient age and sex, as well as type of reporters of AEs were described for these reports. Reporting odds ratios (RORs) with 95% confidence intervals (CIs) were calculated to compare reporting disproportionality in serious, death, and specific AEs between mAb biologics/biosimilars (index) and all other drugs. Breslow-Day statistic was used to determine homogeneity in RORs between each mAb biologic–biosimilar pair at $p<0.05$. More AEs for all biologics, as well as Avastin® and Herceptin® biosimilars, were reported by health professionals, while consumers were the highest proportion of reporters for Rituxan® biosimilars (67.3%). We observed no risk signals of serious or death AE reporting for all three mAb biosimilars. However, a signal of disproportionate reporting of death was detected between Avastin® and its biosimilars. Our findings support the similarity in signals of disproportionate AE reporting between mAb originator biologics and biosimilars, except for death between Avastin® and its biosimilars.

Title: Antibody gene therapy for rabies encephalitis

Primary Author: Jyoti Yadav

Additional Authors: S. Satheshkumar Panayampalli, L. Claire Godino, Kent R. Van Kampen, , Miguel Sena-Esteves;Amanda Gross;Douglas Martin;Henry Baker;Giovanna Panepinto;Ywh-Min Tzou

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: Rabies virus is one of the most crippling neurotrophic viruses with an almost 100% fatality rate worldwide. Vaccination strategies that are currently used to prevent rabies infection primarily rely on the generation of the host serum-neutralizing antibodies against the rabies virus. The major caveat of serum neutralizing antibodies-based therapy is that while the rabies virus can easily breach the blood-brain barrier, the antibodies cannot, making them largely ineffective in the treatment of symptomatic brain encephalitis. Hence, we propose to use the recombinant AAV9 (rAAV9) viral vector to traverse the blood-brain barrier and express a broadly neutralizing human immunoglobulin against rabies glycoprotein (CR57) in the brain. The rAAV9 vector was used to treat C57BL/6J mice intravenously for dose escalation study and longitudinal study. Additionally, 4-month-old cats were treated with low or high doses of rAAV9 intravenously and tissues were further analyzed. The rabies-neutralizing antibody level in mouse serum was >200 times higher than the protective titer suggested by the WHO (0.5 IU/ml) 1-3 months after the administration of the rAAV9 vector. The CR57 expression was further confirmed in neurons and brain endothelial cells by IHC. The level of CR57 was persistent in mouse serum for 60 days post-injection. However, neutralizing antibodies were absent in the lowest dose treatment group. In rAAV9-treated cats, the high-dose treatment group showed significant levels of rabies neutralizing antibodies in serum for at least 15 months and in CSF for 3 months post-injection. Antibodies were also observed in cat serum of the low-dose cohort for 15 months after treatment. The rabies neutralizing antibodies were also detected in the feline brain of the high-dose treatment group at the endpoint (25-months post-treatment) by IHC. The data suggest that the AAV9 vector injected intravenously in two species expresses broadly neutralizing antibodies in brain cells and thereby may provide protection against, or treatment of, viral encephalitis.

Title: Associations between Important human values and noticing calorie information on the menu: A cross-sectional study

Primary Author: Heqin Yang

Additional Authors: ;Kimberly Garza;Nabin Poudel

Department/Program: HORP

College: School of Pharmacy

Abstract: Labeling calorie information on the menu helps people make healthier dietary choices and prevent obesity and related chronic diseases. According to the Schwartz Theory of Basic Values, the relative importance of human values guide actions, such as health-related behavior. Basic human values could be grouped into self-transcendence and self-enhancement values based on their motivation. The activation of self-transcendent values could lead to better health-related behavior. This study aims to identify the association between the most important human values and noticing calorie information on the menu. We examined cross-sectional nationally representative data from the 2020 Health Information National Trends Survey (HINTS 5, Cycle 4). Respondents chose the most important value (MIV) in their day-to-day life from seven values (making their own decision, being happy, helping people, being loyal to family, connection to religion, keeping themselves healthy, and assuring family safety). Multivariate logistic regression examined the association of the MIV with the binary dependent variable noticing calorie information on the menu. Key demographic characteristics (e.g., age, gender, race, educational background), and chronic conditions were included as independent variables. The final sample consisted of 3,865 respondents, mean age of 48.5 (se=0.27) with 51.4% female, 50.6% married, 69.5% had some college or higher education, and 78.7% White. Multivariate logistic regression showed that compared to the respondents who value making their own decision, those who value helping people had higher odds of noticing calorie information on the menu (OR=2.30; 95 % CI: 1.20, 4.42, p =.01). The associations between other MIVs and noticing calories information on the menu are not statistically significant. Valuing helping people, as one of the self-transcendent values, is associated with noticing calorie information on the menu. Activating the value of helping people holds the potential to guide people to notice information on the menu, which could lead to better dietary choices.

Title: Influence of ethyl cellulose on thickness, porosity, and photocurrent of $CuGaO_2$ mesoporous nanocrystalline thin films

Primary Author: Humaira Yeasmin

Additional Authors: Alexandria R. C. Bredar;Byron Farnum

Department/Program: Chemistry-Biochemistry

College: College of Science and Mathematics

Abstract: Delafossite materials ($Cu^IM^{III}O_2$) are p-type metal oxides which can be used as hole transport layers in a wide range of heterojunction solar cells. These materials are interesting because of their crystal structure that can facilitate hole diffusion through the valance band. The electrochemistry of $CuGaO_2$ can reveal much information about the capacitance of the material and therefore the electronic density of valance band states. Here we have investigated the structural and electrochemical properties of $CuGaO_2$ nanocrystalline thin films in acetonitrile solution with $LiClO_4$ electrolyte. Nanocrystalline films are produced by dispersion of $CuGaO_2$ nanocrystals in a polymer solution designed to control the porosity of the resulting film. We have used four different chain lengths of ethyl cellulose polymers (10, 22, 100 and 300 cP) to understand their impact on film morphology. We compared photocurrent from dye sensitized $CuGaO_2$ electrodes and normalized the data with respect to dye loading where the film having thickness 1.5 µm was found to give maximum charge collection efficiency in terms of thickness, as the observed photocurrent decreased for thicker film. Photocurrent is limited to thicker films due to hole diffusion length. After comparing two different synthetic pH for $CuGaO_2$ (pH 5 and 9),we found significant differences in particle size, color, conductivity, and defects. Photocurrent was found to be always higher in case of pH9 films compared to pH5 because of smaller particle size and higher mobility of particles synthesized in pH9. After fitting the EIS data using transmission line model, lowest charge transport resistance was found for H_2 annealed film (pH9) compared to Ar and O_2 which supports the highest photocurrent for this condition. Higher hole density, faster charge transport and higher hole lifetime make it (pH9 condition films) a better semiconductor material as a cathode in p-DSSC.

Title: An improved DBSCAN algorithm for efficient spatial clustering analysis in network space

Primary Author: Sai Deepthi Yeddula

Additional Authors: ;Po-wei Harn;Bo Hui;Wei-Shinn Jeff Ku

Department/Program: Computer Science and Software Engineering

College: College of Engineering

Abstract: Spatial clustering is one of the key data mining techniques used to identify and group similar objects in spatial datasets. By discovering patterns that can aid in improving safety measures and reducing future risks, it can be used to solve a wide range of real-world problems, from identifying traffic accident hotspots to predicting forest fire hotspots. Although there are many types of spatial clustering algorithms, the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm has been proven efficient in clustering even non-linear or unusually shaped structures, something that we often encounter when working with spatial data sets. Despite its popularity, its application in real-world networks is less explored, and it is sensitive to its input density parameters, *Eps*, and *MinPts*, which are hard to choose. This study proposes an improved DBSCAN that extends DBSCAN into the network space and determines optimal density parameters by applying heuristics. Experiments have been conducted on a real-world street network containing event points distributed across the network. The results indicate that the parameters determined by our improved DBSCAN algorithm produce accurate cluster formations with high Silhouette scores and faster execution times than the traditional network clustering algorithms.

Title: Exposure to counterstereotypical scientific role models impact how students identify with and perceive scientists

Primary Author: Rachel Youngblood

Additional Authors: Marjorie Weber;Emily Driessen;Cissy Ballen;Robin Costello

Department/Program: Biological Sciences

College: College of Science and Mathematics

Abstract: To test the hypothesis that diversifying and humanizing scientists impact student perceptions, we measured (1) the extent to which students related to a counterstereotypical scientist and (2) how students viewed the types of people who do science. Students worked on a biology activity that highlighted counterstereotypical contemporary scientists but that varied in the depth to which students learned about the scientists: in treatment one, the biology activity was not accompanied by a picture of the scientist or humanizing information; in treatment two, the activity included a picture but no humanizing information; in treatment three, the activity included a picture and an extended 'About Me' section that included humanizing information. We recruited 34 biology instructors across the United States, and they randomly implemented one of the three treatments (N > 1700 students). We collected survey data across the semester from three surveys administered at the end of each biology activity. We analyzed open-ended responses to the prompts: (1) "Describe how you related to the featured scientist" and (2) "What did you learn about the types of people who do science?". Two researchers used qualitative coding in order to obtain the student logic behind their reasoning. We found that for the first prompt (1) students who engaged in treatment three, an activity that also included a picture and an extended 'About Me' section highlighting the scientist, were more likely to relate to diversifying elements of the scientist than students who received no information about the scientist or just a picture. For the second prompt (2), we found that students exposed to treatment three were most likely to report that scientists have diverse identities. Our results underscore the importance of highlighting counterstereotypical scientists during biology activities.

Title: The secret history of women in Leonora Sansay's the *Horrors of St. Domingo*

Primary Author: Zana Christjohn

Additional Authors: ;

Department/Program: English

College: College of Liberal Arts

Abstract: The Cult of True Womanhood encapsulates the ideologies that surrounded women for centuries, reflected in the literature and media of the past. Heavy research into the significance of patriarchy within cultures, especially in European/American studies, has uncovered the impact of male-dominated ideology on women's lived reality in these spheres. Throughout the Americas' colonial development, the European concept of a submissive, pure, chaste, and pious woman as the "Angel" of the home spread, which also reinforced ideas of fallen women (typically poor, independent, and black women). Writing during this period, Leonora Sansay enters literary circles with her work *Horrors of St. Domingo*. Written through female characters' perspectives, <<Horrors>> provides a look into the female experience during the Haitian Revolution and the experience of all women shaped by the Cult of True Womanhood's ideals. I examine Sansay's depiction of her female characters in her work, especially her characterization of Clara, locating the underlying presence of the Cult. Utilizing close readings of the text and incorporating research on relationships, female sexuality, the true woman, patriarchal societies, and colonial women's experiences reveals that Sansay deliberately commentates on the ideological expectation of women during her time. Establishing the historical basis of the Cult and the ideology's influence on society, I move through the general depictions and perceptions of Clara and Mary and examine the specific relationships and interactions these characters have with men and women. I argue that through her employment of physical description, female action, relationships, and sexuality, Sansay operates within the limits of the Cult to oppose the ideology surrounding women, offering her readers a more dynamic view of womanhood. Sansay's work transcends the bounds of the narrative, exposing the disparity between women's lived experiences and the idealization of the True Woman.

Title: Forage mass and nutritive value of cool-season grass-legume mixtures overseeded into bahiagrass pastures

Primary Author: Peyton Zessin

Additional Authors: Kim Mullenix;Kim Mullenix;Leanne Dillard;Maggie Justice;Micayla West

Department/Program: Agriculture

College: College of Agriculture

Abstract: To overcome the shortage in forage production during the late fall and winter months, during bahiagrass dormancy, overseeding pastures with cool-season annuals can be used as an option for providing forage during this period. The objective of the study was to evaluate forage mass and nutritive value of cool-season forage mixtures overseeded into bahiagrass pastures. Six, 0.40-ha paddocks of 'Pensacola' bahiagrass were overseeded with one of three cool-season forage mixtures (n = 2 paddocks/treatment) : 1) oat (*Avena sativa*), wheat (*Triticum aestivum*), and balansa (*Trifolium michelianum*), red (*Trifolium pratense*), and white clover (*Trifolium repens*; 'clovers'); 2) oat, cereal rye (*Secale cereale*), and clovers; and 3) cereal rye, annual ryegrass (*Lolium multiflorum*), and clovers. Paddocks were managed using flash mob stocking with beef cow-calf pairs to graze to a target height of 10 cm. Herbage mass, nutritive value, botanical composition and height samples were collected pre- and post-grazing events. There was no treatment ($P = 0.240$) or treatment × harvest ($P = 0.4239$) effect on forage mass. Harvest date affected ($P = 0.029$) forage mass, with greater forage mass at late harvest (1903.33 kg DM ha-1) than at early (1253.33 kg DM ha-1) in the growing season. There were no treatment effects observed for species components ($P > 0.05$), although grasses dominated the forage mixtures with an average of 80% grass presence. There was a treatment effect ($P = 0.003$) on CP, where oat-rye-clovers had the greatest CP and rye-ryegrass-clover had the lowest CP. Oat-wheat-clover mixtures had greater TDN (79.2%), less NDF (39.8%), and ADF (18.7%) than cereal rye-ryegrass-clover (75.4%, 46.1%, and 22.2% for TDN, NDF, and ADF, respectively), but did not differ from oat-cereal rye-clover mixtures (76.6%, 45.7%, 21.0% for TDN, NDF, and ADF, respectively). In year 1 of this study, overseeding bahiagrass supported forage production over a 2-month period and can be a management tool used to reduce the need for supplementing in the dormancy periods of warm season perennial grasses.

Title: Amikacin coated 3D-printed metal devices for prevention of postsurgical infections

Primary Author: Chu Zhang

Additional Authors: ;Robert Rusty Arnold;Manjusha Annaji;Nur Mita;Jayachandra Ramapuram;Peter Panizzi;Ishwor Poudel;Nima Shamsaei

Department/Program: Pharmacal Sciences

College: School of Pharmacy

Abstract: Personalized 3D-printed metallic implant delivery systems are being explored to repair bone fractures. 3D printing enables the customization of medical implants that respond to each patient's specific need, making it potentially more effective and of greater quality than mass-produced devices. However, problems associated with postsurgical infections caused by bacterial adhesion and biofilm formation on the surface of implants remain a clinical challenge. Due to the potential for multidrug-resistant infections, local antibiotic therapies are being developed to reduce the risk of implant-related infections. Amikacin is clinically approved and becoming one of the most widely used drugs to treat serious aminoglycoside-resistant infections. Amikacin has a broad spectrum of activity compared to other aminoglycosides, and it offers better effectiveness against microorganisms. Both Poly Lactic-co-Glycolic Acid (PLGA) and chitosan are biodegradable polymers used as drug delivery matrices. Multiple possibilities of adjusting drug release without considering other surgical complications of their residence at the site of action can be provided by incorporating such polymers on metal implants. The aim of this project was to develop an effective amikacin delivery coating on stainless steel implants to inhibit bacterial growth and mitigate the risk of infections. To determine the optimal amikacin implant formulation, we compared release profiles with different molecular weights of chitosan in PLGA-chitosan-amikacin formulations using high-pressure liquid chromatography (HPLC) with visible absorbance (UV detector) analysis. An HPLC method was developed and validated to quantify drug amount on the surface of implants. Roughness and surface morphological characteristics of the implant's surface were investigated. The time-course and degree of antimicrobial efficacy were also determined. These data suggest amikacin polymeric coatings can be used to control the release and antimicrobial activity of 3D-printed implants.

Title: The nuclear receptor corepressor in the adrenal gland controls the cell fate of aged adrenocortical cells

Primary Author: Huifei Zheng

Additional Authors: ;

Department/Program: Biomedical Sciences (VET MED)

College: School of Veterinary Medicine

Abstract: The nuclear receptor corepressor 1 (NCoR1) interacts with different nuclear proteins to modulate gene expression. It is ubiquitously expressed in many tissues. In vivo and in vitro studies demonstrated that NCoR1 is an important player in regulating various physiological activities, such as tissue insulin sensitivity, oxidative metabolism, and cell differentiation. NCoR1 also regulates many pathways, including the thyroid hormone signaling pathway. We found that thyroid hormone treatment delays the cell regression of the mouse adrenal gland inner cortex (the X-zone), a structure that originates from the fetal adrenal gland. Because NCoR1 is a key corepressor controlling the thyroid hormone signaling pathway and is the major nuclear corepressor expressed in the adrenal gland, we hypothesize that NCoR1 involves in the cell fate regulation of the adrenal X-zone. To further study this ubiquitously expressed corepressor and its function in the adrenal cortex, we conditionally deleted Ncor1 in the adrenal cortex by crossing the Ncor1 floxed mice with the steroidogenic factor 1 (SF1) Cre mice. The Ncor1;Sf1-Cre mice (Ncor1 cKO mice) are viable. Immunostaining showed a delayed regression of the inner cortex in male Ncor1 cKO mice. Interestingly, the RNA sequencing analysis revealed that the top differentially expressed genes were highly related to lipid metabolism with the upregulation of 24-dehydrocholesterol reductase (Dhcr24), a key gene that controls cholesterol synthesis. We further found that the X-zone regression was accelerated in Dhcr24 conditional knockout mice. In summary, our finding indicates that the NCoR1-regulated lipid homeostasis is linked to the cell fate of the adrenal gland inner cortex. This result helps decipher the connection between the cell–protective effect and the lipid metabolic reprogramming, a hallmark of many developmental events and disease progression such as cancer aggressiveness.

Title: Distributed policy gradient with heterogeneous computation for federated reinforcement learning

Primary Author: Ye Zhu

Additional Authors: ;

Department/Program: Electrical Engineering

College: College of Engineering

Abstract: The rapid advances in federated learning (FL) in the past few years have recently inspired federated reinforcement learning (FRL), where multiple reinforcement learning (RL) agents collaboratively learn a common decision-making policy without exchanging their raw interaction data with their environments. In this paper, we consider a general FRL framework where agents interact with different environments with identical state and action spaces, but different rewards and dynamics. Motivated by the fact that agents often have heterogeneous computation capabilities, we propose a Federated Heterogeneous Policy Gradient (FedHPG) algorithm for FRL, where agents can use different numbers of data trajectories (i.e., batch sizes) and different numbers of local computation iterations for their respective PG algorithms. We characterize performance bounds for the learning accuracy of FedHPG, which shows that it achieves a learning accuracy ϵ with sample complexity of O(1/ϵ^2), which matches the performance of existing RL algorithms. The results also show the impacts of local iteration numbers and batch sizes for iteration on the learning accuracy. We also extend FedHPG to heterogeneous policy gradient variance reduction (FedHPGVR) algorithm based on the variance reduction method, and analyze the convergence of this algorithm. The theoretical results are verified empirically for benchmark RL tasks.

Title: Comparison of physiological characteristics of Southern highbush blueberries cultivated in high tunnels and open field

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Department/Program: Horticulture

College: College of Agriculture

Abstract: Alternative systems of production have allowed producers to create favorable conditions for blueberry production. Reports show that blueberries under high tunnels accumulate more biomass due to the microclimate under the polyethylene film, which can promote healthy plant growth. The objective of this study was to compare southern highbush blueberry production in a high tunnel and open field system. A total of 180 Southern Highbush Blueberry plants from Farthing, Indigo Crisp, and Legacy cultivars were planted in March 2022, under high tunnel and open field conditions. Sensors were used to monitor ambient temperature, soil temperature, relative humidity, and daily light intervals. Destructive measurements took place to analyze biomass accumulation and leaf area. Using a gas exchange analyzer, diurnal photosynthesis and transpiration were measured. Environmental data showed higher maximum temperatures under the high tunnel as well as a decreased daily light interval compared to outside conditions. Gas exchange analysis results showed Indigo Crisp-In 4.8µmol m-2 day-1 and Farthing-In 4.3µmol m-2 day-1 were the cultivars with the highest carbon assimilation rate on a daily average. Transpiration was highest in Legacy-Out, 0.0023mol m^{-2} s^{-1}, and Indigo Crisp-In 0.0024mol m^{-2} s^{-1} on a daily average throughout the season. By the end of the growing season. Results from the biomass analysis showed that by the end of the growing season Legacy-Out, 193.1g, and Indigo Crisp-In, 162.8g had the highest dry-weight values. The leaf area shared the same tendencies as dry weight where Legacy-Out showed 4862.03cm^3 and Farthing-In showed 4633.33cm^3. The statement that using high tunnels to create optimal conditions for blueberries is dependent on the cultivar. The cultivars in the study showed varied responses in high tunnel conditions. These results will help producers make informed decisions on what cultivars to use for production under high tunnels based on cultivar performance.

Title: Text message interventions for physical activity among university students: A systematic review and meta-analyses

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Department/Program: HORP

College: School of Pharmacy

Abstract: Evidence supports the effectiveness of text messaging as a tool to address behavior change for public health issues, including physical activity. The objective of this systematic review and meta-analysis was to synthesize evidence on the effectiveness of text messaging interventions to promote physical activity among university students. A structured electronic search was conducted in October 2022 using PsycINFO, MEDLINE, SPORTDiscuss, and CINAHL through the EBSCO interface and Web of Science to select experimental studies focusing on text messaging interventions for physical activity. Studies with the same study design were included in several meta-analyses with different outcomes. Among the 18 studies included in the systematic review, 13 (72.22%) were randomized controlled trials (RCTs). In the university setting, texts were commonly sent on a daily basis for 2–6 weeks, incorporating them into various physical activity programs. In the meta-analyses of eight studies, three RCTs focused on the total metabolic equivalent of task (MET), indicating that text messaging interventions resulted in significantly greater total MET (SMD = 0.67, $p<0.001$) compared with control groups that did not receive texts. However, text messaging interventions did not result in statistically significant post-intervention differences in daily standing time (SMD=0.10, $p=0.66$), daily sitting time (SMD=-0.63, $p=0.16$), or daily walking time (SMD=-0.03, $p=0.84$). For the analysis of intervention effects on body mass index (BMI), statistically significant differences were not observed in either RCTs (SMD = -0.11, $p = 0.22$) or one-group studies (SMD = -0.00, $p = 0.96$). Positive effects of text messaging on university students' physical activity have been observed for MET but not for other outcomes. Text messaging intervention studies using a well-controlled study design are required to investigate the associations and identify characteristics of effective texts among university students.