

**K-State Graduate
Research, Arts, and Discovery (GRAD)
Forum**

Program Booklet

March 30 and 31, 2022
K-State Student Union

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Graduate Student Council
Graduate School
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PROGRAM SCHEDULE

MARCH 30

Poster Sessions

11:00am - 1:00pm Poster presentations and judging *K-State Student Union Courtyard*

MARCH 31

Morning Oral Presentations

9:30 – 11:00am Agricultural Sciences *Big 12 Room*

10:30am – 12:00pm Engineering and Physical Sciences *Room 227*

Afternoon Oral Presentations

1:00 – 2:45pm Social Sciences, Humanities, and Education *Big 12 Room*

1:30 – 3:00pm Biological Sciences *Room 227*

Awards Ceremony

4:00pm *Big 12 Room*

Poster Titles and Presenters

Agricultural Sciences

K-State Student Union Courtyard

Presentations and judging: 11:00AM - 1:00PM

1. IMAGE CLASSIFICATION OF SUGARCANE APHID DENSITIES USING MACHINE LEARNING

Ivan Grijalva

2. THERE'S A PHOTON IN MY WATER! THE APPLICATION OF ULTRAVIOLET LIGHT TECHNOLOGY TO ENHANCE THE SAFETY OF AGRICULTURAL WATER

Olivia Haley

3. BIG BLUESTEM TALLGRASS GROWTH IMPROVES WHEN MATCHED TO LOCAL SOIL MICROBES ACROSS A PRECIPITATION GRADIENT

Eli Hartung

4. BAKING PERFORMANCE OF LENTILS, YELLOW PEAS, AND CHICKPEAS WHEN INCORPORATED INTO REFINED WHEAT FLOUR

Eric Nkurikiye

5. DOMINANT PRAIRIE GRASS IN RECIPROCAL GARDENS ACROSS THE RAINFALL GRADIENT OF THE US CENTRAL GRASSLANDS: DECADEAL PATTERNS

Jack Sytsma

6. EVALUATING ANTIMICROBIAL EFFICACY OF COVER CROPS TO REDUCE PATHOGEN LOAD IN CONTAMINATED SOIL

Yeqi Zhao

Biological Sciences

K-State Student Union Courtyard

Presentations and judging: 11:00AM - 1:00PM

**7. MICROBIAL COMMUNITIES IN THE TROPICAL HORSE TICK, DERMACENTOR NITENS
(ACARI: IXODIDAE)**

Andres Holguin

**8. THE EFFECTS OF SUPPLEMENTAL OXYGEN ON DIAPHRAGM MUSCLE BLOOD FLOW
AND OXYGEN DELIVERY DURING MECHANICAL VENTILATION**

Andrew Horn

9. ANTIBODIES AGAINST ALPHA-GAL IN DENGUE FEVER

Olayinka Olajiga

**10. RE-INTRODUCTION OF MICROBIOTA EARLY IN LIFE OF DYSBIOTIC IL-10 KO MICE HAS
A LONG-LASTING EFFECT ON HOST IMMUNITY**

Tanner Richie

Engineering, Math, and Physical Sciences
K-State Student Union Courtyard
Presentations and judging: 11:00AM - 1:00PM

11. STABILITY OF FAULTY PLANAR ROBOTS

Spandan Das

**12. DEVELOPING A REGRESSION MODEL FOR PREDICTING COUNTY-SCALE CORN YIELDS
IN KANSAS**

Meenakshi Rawat

13. IMPACT OF SPATIAL SOIL VARIABILITY ON MAIZE YIELD UNDER CHANGING CLIMATE

Rintu Sen

**14. EXTENT AND GLACIAL HISTORY OF THE CORDILLERAN ICE SHEET IN NW MONTANA:
USING OSL TO DATE GLACIAL SEDIMENTS FROM THE SOUTHEASTERN FLATHEAD
LOBE OF THE CORDILLERAN ICE SHEET**

Vidhesh Shukla

Social Sciences, Humanities, and Education

K-State Student Union Courtyard

Presentations and judging: 11:00AM - 1:00PM

15. PERCEIVED BENEFITS OF TWO INTERVENTION APPROACHES TO REDUCE SITTING WHILE WORKING FROM HOME

Justin Montney

16. SPECIALTY CROP NON-PROFIT ORGANIZATION MEMBERSHIP BRAND AWARENESS, PERCEPTIONS, AND COMMUNICATION

Lauren Raley

17. COLORS FROM CEYLON: UTILIZATION OF COCONUT (COCOS NUCIFERA) HUSK WASTE AS A POTENTIAL SOURCE OF NATURAL DYE FOR SUSTAINABLE AND ENTREPRENEURIAL DEVELOPMENT IN THE FASHION AND CRAFT INDUSTRY

Nadeeshani Ratnayaka

18. SOURCES FOR DISSEMINATING SOIL HEALTH INFORMATION TO KANSAS PRODUCERS

Megan Underwood

Poster Abstracts

Agricultural Sciences

IMAGE CLASSIFICATION OF SUGARCANE APHID DENSITIES USING MACHINE LEARNING

Ivan Grijalva, Brian Spiesman, and Brian McCornack

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BACKGROUND AND PURPOSE: Due to the outbreak in 2013, sugarcane aphid (SCA) *Melanaphis sacchari* (Zehntner) has caused significant yield loss across the sorghum growing region in the U.S. Adequate management of SCA depends on monitoring the pest and spraying insecticides once the infestation reaches an economic threshold. However, scouting this pest is time-consuming and inefficient in lower-value crops like sorghum. To assist pest monitoring, we propose using computer vision models to automatically classify SCA's infestation on leaves according to images of different density levels. **METHOD:** We used a total of 5,048 images collected during field scouting, and we evaluated the performance of four models: Inception v3, DenseNet 121, Resnet 50, and Xception. We trained the models to classify aphid densities into 6 classes: no aphids (0 SCA/leaf), no threat (1-10, 11-39 SCA/leaf), and consider using insecticide (40-125, 126-500, and >500 SCA/leaf) to manage SCA in field conditions. **RESULTS/FINDINGS:** Among these models, Inception v3 and Xception showed an overall accuracy score of 86%. The models correctly classified aphids as above or below threshold density 95% of the time. **CONCLUSION:** In the future, the methodology developed, and the models tested in this study can be used in mobile applications or remote sensing technologies to assist sorghum growers and researchers to automate scouting SCA in sorghum fields.

THERE'S A PHOTON IN MY WATER! THE APPLICATION OF ULTRAVIOLET LIGHT TECHNOLOGY TO ENHANCE THE SAFETY OF AGRICULTURAL WATER

Olivia Haley¹, Yeqi Zhao¹, Trevor Hefley^{1,2}, and Manreet Bhullar^{1,3}

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BACKGROUND AND PURPOSE: Ultraviolet (UV) light is an increasingly investigated alternative to chemical sanitizers for agricultural surface water disinfection as it is effective, user-friendly, and does not produce toxic by-products. However, the relatively high concentration of particulate matter in surface water which “shields” microbes from disinfection is a major challenge to expanding its application in agriculture. The objective of this project was to test the microbial reduction efficacy of two commercial UV reactors in agricultural water. **METHOD:** The microbial reduction efficacy of the Minipure MIN-9 system was investigated through in-lab validation trials using water inoculated with *Escherichia coli*, *Salmonella* Typhimurium, or *Listeria innocua*; superhume was used to adjust the UV transmission to 20%, 30%, and 40%. An on-farm case study using three agricultural water sources was performed to determine the efficacy of the Minipure MIN-9 and Sarin UV systems in natural agricultural water. Agar-based methodology and Colilert with Quanti-tray/2000 was used to enumerate the surviving microbial population in the in-lab and on-farm trials, respectively. **RESULTS/FINDINGS:** For in-lab validation, a maximum of 2.96 log reduction was achieved, and was dependent on flow rate ($p < 0.0001$), UV-transmission ($p < 0.0001$), and target pathogen ($p < 0.0001$). For on-farm trials, a maximum of 3.38 log reduction was achieved and microbial reduction was dependent on reactor type ($p < 0.0001$), source ($p < 0.0001$), and UV-transmission ($p < 0.0001$). **CONCLUSION:** These results demonstrate the efficacy of UV light for treating agricultural water and reducing the microbial risk. Further studies are needed using different UV devices, flow rates and UV-transmissions to develop guidance for growers.

BIG BLUESTEM TALLGRASS GROWTH IMPROVES WHEN MATCHED TO LOCAL SOIL MICROBES ACROSS A PRECIPITATION GRADIENT

Eli Hartung, Soumyadev Sarkar, Kian Fogarty, Anna Kazarina, Jack Sytsma, Kierra Holloman, Nassima Amiar, Kori Howe, Ari Jumpponen, Sonny T M Lee, and Loretta Johnson
Division of Biology, College of Arts and Sciences

BACKGROUND AND PURPOSE: Big Bluestem (*Andropogon gerardii*) is a dominant forage grass of prairies and is distributed across a steep rainfall gradient in the Great Plains. This gradient has given rise to locally adapted wet and dry ecotypes of Big Bluestem. Soil microbes likely vary along with plant ecotypes and may play a role in nutrient availability. We investigated how locally adapted soil microbes affect Big Bluestem growth and whether or not specific plant ecotypes are matched to their local soil microbes. We predicted that each ecotype would grow better when grown with its native microbes. **METHOD:** We collected seed and soils from six native Big Bluestem populations from western KS and Illinois. We grew plants in greenhouse in garden soil with 6 replicates per treatment. We isolated microbes from roots and soil and reciprocally injected wet and dry microbes (plus control) into the soil weekly for 12 weeks. Plant form and function were measured weekly. **RESULTS:** Chlorophyll absorbance and biomass production were enhanced in ecotypes growing with their local microbes, suggesting effects of microbe-mediated nutrient availability. Microbe origin (wet vs dry) was less important in affecting traits such as height and leaf width. For these traits, ecotype was more important such that the wet ecotype had wider leaves and were taller than the dry ecotype. **CONCLUSION:** These results provide insight into how plants interact with their native microbes. These results will inform land managers to optimize forage, improve restoration, and mitigate drought through matching with beneficial microbes.

BAKING PERFORMANCE OF LENTILS, YELLOW PEAS, AND CHICKPEAS WHEN INCORPORATED INTO REFINED WHEAT FLOUR

Eric Nkurikiye and Yonghui Li
Department of Grain Science and Industry, College of Agriculture

BACKGROUND AND PURPOSE: The growing demand for pulses due to their nutrition and health benefits in addition to their potential for sustainable agriculture has led international organizations to encourage the use and diversification in the utilization of pulses. The objective was to incorporate lentil, yellow pea, and chickpea flour in white flour and identify the most suitable pulse type and replacement level for incorporation in the baking industry. **METHOD:** Each type of pulse grain was milled to produce three flours of different particle sizes ranging from 50 μm to 101 μm with the same composition. Each flour was incorporated in refined wheat flour at levels of 5, 12.5, and 20%; this was followed with a baking test according to approved methods. **RESULTS:** The study found that the particle size of the pulse flours does not significantly affect the bread volume or the texture. This study also showed that when increasing the pulse flour incorporation, the bread volume decreases while the hardness of the bread increases. Among the three pulses, it was found that chickpea performed much better compared to others while yellow pea produced bread with lower volume at all levels of incorporation. **CONCLUSION:** The incorporation of pulse is optimal at or below 12.5% and chickpea is more suitable for incorporation. More studies are being conducted to investigate the mechanism that leads chickpea to produce better bread than other pulses.

DOMINANT PRAIRIE GRASS IN RECIPROCAL GARDENS ACROSS THE RAINFALL GRADIENT OF THE US CENTRAL GRASSLANDS: DECADEAL PATTERNS

Jack Sytsma¹, Kori Howe¹, Matthew Galliard², Sara G. Baer³, Eli Hartung¹, David Gibson⁴, Loretta Johnson¹
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BACKGROUND AND PURPOSE: Big bluestem (*Andropogon gerardii*) is a dominant, native, tall grass that is for critical cattle forage, conservation, and restoration. This grass has a wide geographic distribution across the Great Plains rainfall gradient (500-1200 mm rain/yr). Distinct wet and dry ecotypes, each adapted to its local climate, have been recognized based on genetic differences. The objectives were to observe growth of big bluestem ecotypes that were cross-transplanted into wet and dry climates. We predicted that each ecotype would perform best in their home site, but perform poorly planted in foreign sites. **METHOD:** Reciprocal gardens were established in 2010 and canopy cover and biomass were monitored over time until 2021 in four garden sites across the rainfall gradient (driest to wettest: Colby, Hays and Manhattan, KS to Carbondale IL). To examine the effects of drought, rainfall was reduced by 50% using rainout shelters in three sites. Canopy cover was measured to estimate growth and biomass measured at the end of the growing season. **RESULTS/FINDINGS:** By 2021, wet and dry ecotypes demonstrated local adaptation, based on cover and biomass. These results confirm that wet and dry ecotypes perform best in their home environments. Interestingly, the mesic ecotype had intermediate cover and biomass in all four sites. Experimental rainfall reduction resulted in increased cover in the dry ecotype in the wet site. **CONCLUSION:** These results indicate the prominent role of ecotypes across natural and experimental rainfall conditions. Thus, restoration should consider the use of climate-adapted ecotypes in anticipation of future droughts.

EVALUATING ANTIMICROBIAL EFFICACY OF COVER CROPS TO REDUCE PATHOGEN LOAD IN CONTAMINATED SOIL

Yeqi Zhao¹, Manreet Bhullar^{1,2}, Olivia Haley¹, and Cary Rivard¹

¹*Department of Horticulture and Natural Resources, College of Agriculture;* ²*Food Science Institute, College of Agriculture*

BACKGROUND AND PURPOSE: The contamination of fresh produce can occur at any time during the produce supply chain. Beyond agricultural water runoff events (flooding), farm soil management can constitute a high risk for pathogen transmission due to the popularity of practices like mixed crop-livestock farming and application of animal wastes (i.e., manure) for fertilization. This study aims to determine the microbial reduction of generic *Escherichia coli* by using three different cover crops. **METHOD:** Three cover crops including mustard greens (*Brassica juncea*, 'Kodiak'), sunn hemp (*Peena Inoculum*), and buckwheat (*Fagopyrum esculentum*) were used for this study. Autoclaved farm soil was inoculated with rifampicin resistant generic *E. coli* (ATCC 25922) and experiment was setup in the food microbiology lab at K-State Olathe. Sterile DI water was added weekly to maintain the soil moisture. The data on pot weight, room temperature, humidity, and generic *E. coli* survivor population were recorded on day 0, 4, 10, 15, 20, 30, 40. **RESULTS:** From day 0 to day 40, all three cover crops reduced generic *E. coli* population as compared to control (buckwheat > mustard greens > sunn hemp). The sampling day ($p < 0.0001$), cover crop type ($p < 0.0001$) and the interaction between sampling day*cover crop type ($p < 0.0001$) were all statistically significant. **CONCLUSION:** The study demonstrates the antimicrobial efficacy of cover crops and contributes to increased understanding of human pathogen survival in contaminated soils. Future studies should include identifying the best performing cover crops regarding their antimicrobial effects and help develop a targeted bio-mitigation strategy to improve food safety on farm.

MICROBIAL COMMUNITIES IN THE TROPICAL HORSE TICK, *DERMACENTOR NITENS* (ACARI: IXODIDAE)

Andres F. Holguin-Rocha¹, L. Paulina Maldonado-Ruiz¹, Soheila Fatehi¹, Kristopher Silver¹, Berlin Londono-Renteria², and Yoonseong Park¹

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BACKGROUND AND PURPOSE: Ticks are obligate hematophagous ectoparasites and transmit pathogens among various vertebrates, including humans. The tropical horse tick, *Dermacentor nitens*, is distributed throughout the Americas and it is recognized as a natural vector of *Babesia caballi* and *Theileria equi*, causal agents of equine piroplasmiasis. In order to understand microbial communities associated with *D. nitens*, including symbionts and pathogens, we performed 16S rRNA sequencing on samples from field sites in three distinct geographical areas in Colombia. **METHOD:** Partially-fed *D. nitens* adults were collected on horses from Bolivar, Antioquia, and Cordoba. DNA was extracted, amplified for ~450 bp V3 and V4 regions of 16S rRNA gene, and sequenced on an Illumina-Hiseq platform. The sequence data were analyzed for microbial taxonomic assignment using the software Mothur, and further statistical analyses were made in R-Studio. **RESULTS/FINDINGS:** The endosymbiont group, *Francisellaceae/Francisella*, was predominant over other bacterial groups in the samples from all regions. Differences in the microbial community composition among the regions were found with the data excluding the endosymbionts *Francisellaceae/Francisella*. The most prevalent bacteria in different regions were; *Corynebacterium* in Bolivar, *Staphylococcus* in Antioquia, and *Pseudomonas* in Cordoba. **CONCLUSION:** We found differences in the abundance of microbial groups among the ticks in different regions. This finding can potentially be used to make regional distinctions among the ticks and their microbial compositions. A deeper understanding of the microbial communities hosted by ticks may allow us to develop a measure to mitigate the pathogens transmitted by the ticks.

THE EFFECTS OF SUPPLEMENTAL OXYGEN ON DIAPHRAGM MUSCLE BLOOD FLOW AND OXYGEN DELIVERY DURING MECHANICAL VENTILATION

Andrew G. Horn¹, Kiana M. Schulze¹, Olivia N. Kunkel¹, Ramona E. Weber¹, David C. Poole^{1,2}, and Bradley J. Behnke^{1,3}

¹Department of Kinesiology, College of Health and Human Sciences; ²Department of Anatomy and Physiology, College of Veterinary Medicine; ³Johnson Cancer Research Center

BACKGROUND AND PURPOSE: The diaphragm is the primary inspiratory muscle. Prolonged mechanical ventilation (MV) reduces diaphragm muscle blood flow and impairs diaphragm blood vessel vasomotor function, which compromises oxygen (O₂) delivery and contractile function. Previous studies demonstrate that hyperoxia (100% O₂) exacerbates ventilator-induced diaphragmatic dysfunction (VIDD). Therefore, we hypothesized that MV with 100% O₂ would decrease diaphragmatic blood flow and O₂ delivery to a greater extent than MV alone. **METHOD:** In adult female Sprague-Dawley rats ($n=10$), costal diaphragm blood flow and O₂ delivery were determined, via fluorescent microspheres, during spontaneous breathing (SB), 30 min of MV (room air), and 30 min of MV + 100% O₂. **RESULTS/FINDINGS:** MV with room air resulted in a $42 \pm 7\%$ reduction in costal diaphragm blood flow and decreased O₂ delivery by $34 \pm 8\%$ versus SB ($P<0.05$). Supplementing 100% O₂ during MV further reduced costal diaphragm blood flow by $28 \pm 5\%$ and O₂ delivery by $15 \pm 7\%$ ($P<0.05$). Overall, hyperoxic MV diminished costal diaphragm blood flow by ~70% and O₂ delivery by ~60% versus SB ($P<0.05$). **CONCLUSION:** These data demonstrate that MV + 100% O₂ diminishes diaphragmatic blood flow and O₂ delivery to a greater degree than MV alone. The larger reductions in diaphragm perfusion and O₂ delivery with hyperoxic MV may accelerate the diaphragm blood vessel vasomotor dysfunction associated with prolonged MV; which contributes to VIDD and ventilator dependence as well as patient morbidity and death. Future research will determine the mechanistic bases for the impact of prolonged hyperoxic MV on diaphragm vascular function.

ANTIBODIES AGAINST ALPHA-GAL IN DENGUE FEVER

Olayinka Olajiga¹, Paulina Maldonado-Ruiz¹, Berlin Londono-Renteria², and Yoonseong Park¹

¹Department of Entomology, College of Agriculture; ²School of Public Health and Tropical Medicine, Tulane University of New Orleans, L.A.

BACKGROUND AND PURPOSE: Galactose- α -1-3-galactose also known as Alpha-Gal is a glycan commonly found in proteins of all animal cells with exception of humans and old-world non-human primates. This glycan is also found in pathogens transmitted by arthropod vectors, such as *Trypanosoma*, and *Leishmania*, resulting in the production of antibodies when transmitted to humans. Dengue fever is an important disease in the tropics and subtropics including the US. It is transmitted by *Aedes* mosquitoes. Dengue virus serotype-2 generated from insect cells also presents alpha-Gal as one of its five N-linked glycosylation sites. This is important to study since the most effective responses against DENV are antibody-mediated. However, antibodies can also induce severity through a mechanism known as antibody-dependent enhancement (ADE), but the function of alpha-Gal epitope-induced antibodies in dengue fever progression is unknown. Thus, we investigated changes in alpha-Gal antibody titer in the course of Dengue infection. **METHOD:** In 2019, we collected 253 serum samples from dengue-like symptom participants in several municipalities of Norte de Santander, Colombia. Xerion DENGUE antibody and NS1 rapid diagnostic tests were used to confirm dengue-positive individuals. The level of alpha-Gal antibodies in serum was tested using an enzyme immunosorbent assay. **RESULTS/FINDINGS:** Results revealed that levels of alpha-Gal antibodies defer based on an individual's place of residence. We further anticipate the study's findings to reveal the influence of alpha-Gal antibody levels on dengue fever outcomes. **CONCLUSION:** Geographical difference associated with mosquito biting frequency is associated with alpha-Gal antibodies. Therefore, more accurate mechanisms and roles of alpha-Gal antibodies during dengue fever require further studies.

RE-INTRODUCTION OF MICROBIOTA EARLY IN LIFE OF DYSBIOTIC IL-10 KO MICE HAS A LONG-LASTING EFFECT ON HOST IMMUNITY AND DISEASE OUTCOME

Tanner Richie, Leah Heeren, Abigail Kamke, Trey Summers, Soumyadev Sarkar, and Sonny T. M. Lee

Division of Biology, College of Arts and Sciences

BACKGROUND AND PURPOSE: The microbiota has profound influence on the host through interactions with the immune system beginning early in host development. These interactions are crucial in understanding diseases where pathogenesis is not fully understood, such as Inflammatory Bowel Disease (IBD). Here, we examined how re-introducing a microbiota to dysbiotic IL-10 KO mice during development impacted outcomes of colitis, host immune responses and microbial functional changes. **METHOD:** Pregnant dams were treated with the antibiotic cefoperazone to vertically transmit dysbiosis. Dysbiotic pups received oral gavage of fecal microbiota transplants (FMT) from control mice, at 2, 3, and 8 weeks after birth. After 23 weeks, mice were supplemented with 2.5% DSS to induce colitis if they did not exhibit colitis symptoms. **RESULTS:** Colon histology, host RNA transcripts, and immune serum markers were used to determine colitis status, host functional changes, and immune status in adult mice. Shotgun metagenomic sequencing of fecal content collected from dams and pups highlighted microbial functions that differed in the FMT mice compared to dysbiotic groups. Histology suggested mice receiving FMT had less colon inflammation and fewer neutrophils than mice with no gavage or gavage control. Cytokine levels for IL-2 and IL-17 showed significant increase in mice with FMT indicating probable immune education. Initial metagenomic data illustrated differing microbial makeups among treatment groups. *Akkermansia muciniphila* was highly detected in all mice, while *Oscillibacter* were detected in control and FMT mice. **CONCLUSION:** Understanding how early microbial influences pathogenesis of IBD can lead to development of preventatives or therapeutics for treatment of this increasingly prevalent disease.

STABILITY OF FAULTY PLANAR ROBOTS

Spandan Das and Pavithra Prabhakar

Department of Computer Science, College of Engineering

BACKGROUND AND PURPOSE: Verification of autonomous systems is a relevant area of research since it can guarantee increased safety and security of these systems. It is indeed desirable for self-driving cars to avoid unwanted accidents if a pedestrian suddenly comes in front of it. The goal of our research was to verify stability of planar robots with faulty angle actuator. **METHOD:** We studied both absolute and probabilistic stability of such robots in search of an algorithm to verify them. First, we defined a subclass of Stochastic Hybrid Systems, viz. Planar Probabilistic Piecewise Constant Derivative Systems (Planar PPCD) to model exactly model the motion of such robots. Then we reduced the stability problem of Planar PPCD to the convergence problem of Discrete Time Markov Chains with edge weights. Finally we developed an exact algorithm to analyze absolute and probabilistic stability of PPCD using properties of Discrete Time Markov Chains. **RESULTS:** Our experimental results on planar robots with erroneous angle actuator demonstrate the practical feasibility of this approach. In our research we have been able to show that verification of stability of planar robots is actually decidable. **CONCLUSION:** We hope to extend these ideas to higher dimensions and more complex dynamics of robots. But for that we will need to extend our analysis to Markov Decision Process that will result as the reduced system. We believe that our research will help improve design of planar autonomous systems, such as self-driving cars.

DEVELOPING A REGRESSION MODEL FOR PREDICTING COUNTY-SCALE CORN YIELDS IN KANSAS

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BACKGROUND AND PURPOSE: Several factors including environment, management, and genetics and their complex interaction make prediction of crop yield prediction challenging. Changing climate and the projected increase in variability and frequency of extremes events make accurate prediction of crop yield critically important for addressing emerging challenges in food security. Precise and timely prediction of crop yield can provide valuable information to agronomists, producers, and decision makers. Kansas' geographic location makes it's crop production systems vulnerable to the changing climate. Therefore, this study was undertaken to develop a corn yield prediction model at the county scale to explain varying corn yield dependency on climate parameters across the counties; estimating the corn yield using process-based crop models and comparing the outcome with regression-based models. **METHOD:** The multiple linear regression models were developed using growing degree days (GDD), extreme degree days (EDD) and precipitation as independent variables and interaction terms of the climate parameters. The model also considers the impact of technological advancements, improved seed varieties, fertilizers and chemicals on crop yield. Extensive cross-validation along with statistical investigation including RMSE and R^2 were used to assess the accuracy of the developed models for all Kansas counties. **RESULTS/FINDINGS:** The relationship with GDD is weakly positive, and that with EDD is weakly negative. The R^2 of the fit for rainfed counties is between 0.3 to 0.76. **CONCLUSION:** GDD are indicative of higher yields, and EDD results in yield decline. The interaction regression model performs satisfactorily. It can be improved if more data on corn yield is available.

IMPACT OF SPATIAL SOIL VARIABILITY ON MAIZE YIELD UNDER CHANGING CLIMATE

Rintu Sen¹, Vaishali Sharda¹, Xiaomao Lin², and Zach Zambreski²

¹*Carl and Melinda Helwig Department of Biological and Agricultural Engineering, College of Engineering;*

²*Department of Agronomy, College of Agriculture*

BACKGROUND AND PURPOSE: Soil variability plays an important role to determine crop performance, and it is more significant when the crop is grown under rainfed conditions. This study was conducted to assess the impact of spatial soil variability on maize yield in the Eastern Kansas River Basin (EKSRB) under climate change scenarios. **METHOD:** For this study, the cropping system model CERES-Maize of Decision Support System for Agrotechnology Transfer (DSSAT) was calibrated using the observed yield of maize from the historic National Agricultural Statistical Service (NASS). The model was calibrated based on soil fertility factor (SLPF) and Genotype Coefficient Calculator (GENCALC) was used to calibrate five genetic cultivar coefficients for maize. SSURGO soil datasets were used as input in the DSSAT model for simulating the growth, development, and yields of maize for each county. The simulated yield was compared with observed yield from USDA NASS and the performance of the model was evaluated by a statistical analysis like RMSE and d-stat value. The calibrated model was then used with average annual temperature and average accumulated precipitation for two representative concentration pathways (RCP4.5 and RCP8.5) from 18 downscaled global climate models (CMIP5) to simulate yield components and end of season yield. **RESULTS:** The result showed how the spatial variation of soils affected the maize yield under future climate scenarios. The map showed the yield differences for different soils under baseline (2000-2019) and future climate conditions (2023-2099). **CONCLUSION:** This study emphasized the importance of spatial soil variability and depicted the best soil for maize production in the future.

EXTENT AND GLACIAL HISTORY OF THE CORDILLERAN ICE SHEET IN NW MONTANA: USING OSL TO DATE GLACIAL SEDIMENTS FROM THE SOUTHEASTERN FLATHEAD LOBE OF THE CORDILLERAN ICE SHEET

Vidhesh Shukla¹ and Joel Spencer²

Department of Geology, College of Arts and Sciences

BACKGROUND AND PURPOSE: The study of past climate change is important to understand how the modern climate system works so we can better anticipate future changes, particularly the melting of ice sheets. To better understand these changes, we must understand the mechanisms behind climate shifts, which requires regional and global correlation of past climates using proxies preserved in the geologic record. The advance and retreat of past ice sheets can throw new light on our understanding of the cryosphere. Studying the response of the past ice sheets, such as Cordilleran Ice Sheet (CIS), to climate variability can help us understand the response of present-day ice sheets to climate variability. Cordilleran Ice Sheet (CIS) was one of the major late quaternary ice sheets. CIS initially developed in southern Alaska but spread south during the Fraser Glaciation, reaching maximum extent in southern British Columbia and northern Washington. The chronology of the western lobes of the CIS is well constrained, but not the easternmost lobes. **METHOD:** We propose to build on quartz luminescence analyses of glacio-deltaic and moraine deposits from the furthest southeasterly extent of the Flathead Lobe in northwestern Montana and determine the age of the extent of the easternmost lobe of the CIS. **RESULTS:** Samples were collected from Quaternary moraine deposits, glacial lake deposits, glacial lake outwash and glacial till in the vicinity of Flathead Lobe, northwestern Montana. Objectives of the study include using small aliquot and single-grain luminescence analysis of quartz or feldspar from glacial sediments; reconstructing environmental radioactivity via an on-site, lab, and modeling approaches; refining the glacial chronology and placing the reconstruction in the regional climate history. **CONCLUSION:** The chronological record of ice-sheet retreat for the last deglaciation and last interglaciation permits several conclusions on the past behavior of ice sheets in a warming climate.

Social Sciences, Humanities, and Education

PERCEIVED BENEFITS OF TWO INTERVENTION APPROACHES TO REDUCE SITTING WHILE WORKING FROM HOME

Justin Montney¹, Mia Talley¹, Sara Rosenkranz², Richard R. Rosenkranz², Elizabeth Ablah³, and Emily Mailey¹

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BACKGROUND AND PURPOSE: COVID-19 popularized working from home prompting high levels of sedentary behavior. Reducing sedentary behavior of home-based workers could produce improvements in physical/mental health and work performance. This study examines positive changes reported by participants who received height-adjustable desk and/or web-based behavioral program interventions while working from home. **METHODS:** Participants ($N=95$) were randomly assigned to one of four conditions: Desk Only, Program Only, Desk + Program, or Control. Desk Only participants received a height-adjustable desk; Program Only participants received a web-based intervention. Participants logged minutes of workday sitting across five days at the beginning and end of their intervention. Participants also answered open-ended questions about positive changes they noticed. **RESULTS:** Participants in all intervention groups reported significant reductions in sitting while working, ranging from 96 min/workday in the Program Only condition to 206 min/workday in the Desk + Program group. Among those who received a desk, 60% reported using the desk at least 4 hours/day. Positive changes reported with desk use included: improved work performance (49%), improved energy (39%), increased activity levels (32%), and reduced pain/stiffness/soreness (32%). Over 66.7% of program recipients logging onto the website at least once per week. Program recipients reported: increased activity during work (45%), increased activity outside of work (36%), increased healthy habit awareness (36%), and improved diet (24%). **CONCLUSIONS:** In addition to reductions in sitting, participants reported numerous other benefits associated with using the height-adjustable desk and/or behavioral program. These mental and physical health benefits should be emphasized to employers to decrease sedentary behavior and improve employee wellness.

BRAND AWARENESS, PERCEPTIONS, AND COMMUNICATION PREFERENCES OF SPECIALTY CROP, NON-PROFIT ORGANIZATION MEMBERSHIP

Lauren Raley and Nellie Hill

Department of Communications and Agricultural Education, College of Agriculture

BACKGROUND AND PURPOSE: Non-profit organizations provide services and resources to community members based on their needs. Effective communication is important to maintain quality relationships with the interested community members. Determining a common message increases brand fluidity. The Chile Pepper Institute (CPI) is a non-profit organization whose mission is focused on education and research related to *Capsicum*, or chile peppers. Institute membership helps to drive these efforts financially and directionally. Utilizing effective membership community engagement results in clear institute goals and objectives. The purpose behind this study was to investigate the brand awareness, perceptions, and communication preferences of CPI membership. Uses and gratifications theory was utilized as the conceptual framework for this study. **METHOD:** Data were collected via survey methodology employing an online questionnaire. Of the total responses ($n = 219$) collected between February 26 and March 28, 2021, 68 were complete, fit the scope of the study, and were included in analysis. **RESULTS:** Despite respondent's high likelihood to tell others about CPI and recently seeing information from the Institute, they reported low familiarity with the activities and initiatives of CPI. Members most strongly preferred information delivered via newsletters. They have the strongest agreement about using CPI to learn about new chile pepper varieties and want to read about how to grow them. **CONCLUSION:** These findings can inform CPI communications content and channel improvements to meet the needs of and enhance relations with their membership. This insight can be used to cultivate support for and direction of the Institute.

COLORS FROM CEYLON: A DESIGN EXHIBIT OF SUSTAINABLE TEXTILES DYED WITH COCONUT (*COCOS NUCIFERA*) HUSK WASTE

Nadeeshani Ratnayaka and Sherry Haar

Department of Interior Design and Fashion Studies, College of Health and Human Sciences

BACKGROUND: Inheriting tradition is an aspect of slow design that explores ways to sustain lost art and traditions, as well as develop modern products with meaning (Faud-Luke, 2005). Even though natural dyeing was heavily practiced in Sri Lanka, most of the country's textile and craft industry has diverted to using synthetic dyes (Ranatunga, et. al., 2020). Coconut husk is easily obtained at minimal to no cost in Sri Lanka. Hence, it is an economical and sustainable dye option. **PURPOSE:** This study will explore the dyeing potential and design possibilities of coconut (*cocos nucifera*) husk fiber as a source of natural dye with hopes to bring together sustainable color, design, culture, and social responsibility through the art of textile design. **METHOD:** While utilizing a practice-based design approach (Gray & Malins, 2004), the data is expected to evolve throughout each process. Fabrics will be pretreated, dyed, and visually analyzed for color potential. Surface design techniques will be used to create prints on various textiles. The outcomes will be exhibited in a public venue to create awareness and promote the use of natural dyes. **RESULTS/FINDINGS:** The initial stage of dye experimentation will create the natural dye color palette, study different techniques of dye application and behavior on various textile materials. The print designs will celebrate the traditional craft of Dumbara weaving in Sri Lanka. **CONCLUSION:** The outcomes of this study will extend the use of coconuts to textile design as an initial step in reintroducing the craft of natural dyeing and contribute to the sustainable development of the craft industry promoting responsible fashion practices.

SOURCES FOR DISSEMINATING SOIL HEALTH INFORMATION TO KANSAS PRODUCERS

Megan Underwood, Nellie Hill, Katie Burke, Levy Randolph, and Jason Ellis

Department of Communications and Agricultural Education

BACKGROUND AND PURPOSE: Adoption of conservation practices by agricultural producers is improved when producers have a positive attitude and awareness of conservation practices. The literature recommends communicators disseminate the benefits of such practices and programs to enhance additional practice adoption. Communicators need to provide content that is current with issues and information important to landowners making decisions about soil health practices. There is a need to know how such content can effectively be shared among the producer social systems. The purpose of this study was to describe the communication channels utilized by Kansas landowner/operators to learn about soil health. The objectives that guided this study were to (1) describe landowner/operator perceived trustworthiness of select sources for obtaining information about soil health information and (2) describe landowner/operator interpersonal communications about soil health practices. The theoretical framework for this study was diffusion of innovations. The theory originated in communication to explain how an idea gains momentum and diffuses through a social system. **METHOD:** A quantitative research approach guided the study to collect data through a survey sent to Kansas agricultural producers. **RESULTS:** Preliminary findings suggest landowner/operators are the most trustworthy of the Natural Resource Conservation Service, Extension agents, and the County Conservation District as sources for soil information. Participants consistently reported balanced, neutral use of interpersonal relationships to discuss soil health practices. **CONCLUSION:** Findings point agricultural communicators toward utilizing sources with expertise in soil health when communicating with Kansas landowner/operators. Interpersonal relationships are just a part of the larger social system landowner/operators use to discuss soil health practices.

Oral Session Schedules

Agricultural Sciences

Big 12 Room

9:30AM – 10:45AM

9:30 **COMPUTER-AIDED APPROACHES FOR PREDICTING, SCREENING, AND DESIGNING ANTIOXIDATIVE TRIPEPTIDES AND APPLICATION TO SORGHUM PROTEINS**

Zhenjiao Du

9:45 **DUPLICATION, REDUNDANCY, AND DIVERGENCE: ROLES OF THE ASPERGILLUS NIDULANS PARALOGOUS TRANSCRIPTION FACTORS**

Joel Steyer

10:00 **BIOACCESSIBLE LEAD DETERMINATION IN DUST WIPE SAMPLES**

Chandima Wekumbura

10:15 **ADJUSTING N RATE IS THE FIRST STEP IN N APPLICATION INTENSIFICATION**

Luana Simao

10:30 **LOCATION VS. HOST: ENVIRONMENT MORE IMPORTANT THAN HOST IN CONTROLLING MICROBES**

Anna Kazarina

Engineering, Math, and Physical Sciences

Room 227

10:30AM – 11:45AM

10:30 SUSTAINABLE RECOVERY OF VOLATILE FATTY ACIDS FROM SWINE WASTEWATER

Priyasha Fernando

10:45 MULTIAGENT WIRELESS DATA COMMUNICATION FOR PRECISION AGRICULTURE

Ketan Shende

**11:00 CORN PLANT STAND RESPONSE TO GAUGE WHEEL LOAD AND GROUND SPEED
COMBINATION ON NO-TILL SYSTEM**

José Peiretti

11:15 PREDICTING THE FROST DURABILITY FROM FRESH PROPERTIES OF CONCRETE

Ragini Krishna Nikumbh

**11:30 PLASMON-INDUCED EXCITATION ENERGY TRANSFER IN SILVER NANOPARTICLE
DIMERS: A REAL-TIME TDDFTB INVESTIGATION**

Zhen Liu

Social Sciences, Humanities, and Education

Big 12 Room

1:15PM – 3:00PM

- 1:15 **FINDING CHILDCARE IN AMERICA (PHASE I): PRELIMINARY RESULTS FROM AN ASSESSMENT OF INTERNATIONAL STUDENTS AND SCHOLARS JOURNEYS**
Adelaide Klutse
- 1:30 **PARENTING STYLE AND FAMILY FACTORS CONNECTED TO CHILD EMOTIONAL AWARENESS: A LONGITUDINAL STUDY**
Lindsay Howard
- 1:45 **WHERE WERE THEY WHEN THE WATER RAN OUT? IN A WORD, ABSENT**
Jacob Miller-Klugesherz
- 2:00 **RHETORICAL DECEPTION AND THE COVID-19 CURE: ARE ALL EXPERTS THE RIGHT AUTHORITY?**
Willhelmina Antwi
- 2:15 **ARTS-BASED AND ARTS-INFORMED RESEARCH: DESCRIPTIONS, DISTINCTIONS, AND DESIGNS FOR RESEARCH IN EQUITABLE ADULT EDUCATION**
Melissa Kay Hort Overton
- 2:30 **DISPELLING DISABILITY STEREOTYPES: A CONTENT ANALYSIS OF AVATAR: THE LAST AIRBENDER**
Abigaile Weiser
- 2:45 **UNDERSTANDING MENTAL HEALTH AWARENESS AND COUNSELING-SEEKING BEHAVIORS OF INTERNATIONAL STUDENTS AT KANSAS**
Sakshi Bhati

Biological Sciences

Room 227

1:30PM – 3:00PM

- 1:30 **EVALUATING THE UTILITY OF A CO₂ SURGICAL LASER FOR PIGLET TAIL DOCKING TO REDUCE BEHAVIORAL AND PHYSIOLOGICAL INDICATORS OF PAIN AND TO IMPROVE WOUND HEALING: A PILOT STUDY**
Maria Lou
- 1:45 **SEX DIFFERENCES IN SKELETAL MUSCLE OXYGENATION DURING EXERCISE IN PULMONARY HYPERTENSION**
Kiana Schulze
- 2:00 **IMPROVING SKELETAL MUSCLE OXYGENATION IN HEART FAILURE**
Ramona Weber
- 2:15 **IMPACT OF CLIP SERINE PROTEASES AND THEIR NON-CATALYTIC HOMOLOGS IN ANOPHELES GAMBIAE ANTIMICROBIAL IMMUNITY**
Bianca Morejon Viteri
- 2:30 **MOSQUITO KILLER: A KANSAS FUNGUS FOR LOCAL MOSQUITO CONTROL**
Patil Tawidian
- 2:45 **INVESTIGATING A LOW RNAI RESPONSE IN LARVAE OF THE BITING MIDGE CULICOIDES SONORENSIS**
Cameron Osborne
- 3:00 **HOST-MICROBIOME ASSOCIATIONS IN LIVEBEARING FISHES ADAPTED TO SULFIDIC ENVIRONMENTS**
Libby Wilson

Oral Presentation Abstracts

Agricultural Sciences

COMPUTER-AIDED APPROACHES FOR PREDICTING, SCREENING, AND DESIGNING ANTIOXIDATIVE TRIPEPTIDES AND APPLICATION TO SORGHUM PROTEINS

Zhenjiao Du and Yonghui Li

Department of Grain Science and Industry, College of Agriculture

BACKGROUND AND PURPOSE: Tremendous studies on peptides enable us to make use of the accumulated data by modeling quantitative structure-activity relationship. The antioxidative peptides production can be a great booster for those underutilized proteins (e.g., sorghum proteins). Machine learning methods has shown its superiority over traditional modeling methods in biochemistry and not yet been thoroughly studied on antioxidative tripeptide activity, which have demonstrated ideal absorption and bioavailability. The objective of this study was to compare most popular machine learning methods for antioxidant activity modeling and identify the critical amino acid features that determine the activity, and apply the developed model to sorghum protein-derived tripeptides. **METHOD:** A total of 1659 numerical indices were used to characterize 130 known tripeptides with antioxidative activity, and then six advanced feature selection methods plus were used to screen the important indices for model building by fourteen machine learning methods. A peptidecutter tool was designed to get the possible tripeptides from nine sorghum proteins and the developed model was used to predict their activity. **RESULTS/FINDINGS:** Among the 84 models, the best model with R^2_{Test} of 0.847 and MSE_{Test} of 0.393 based on feature selection by random forest plus extreme gradient booster regression. Eleven sorghum-derived tripeptides were screened and predicted to exhibit high antioxidative activity. **CONCLUSION:** C-terminal amino acids contributed the most to antioxidant activity, while the central amino acid contributed the least. High activity tripeptides tend to have tyrosine, tryptophan, or cysteine at the C-terminal position. The developed tool and model can be employed to any protein for antioxidative peptides exploration.

DUPLICATION, REDUNDANCY, AND DIVERGENCE: ROLES OF THE *ASPERGILLUS NIDULANS* PARALOGOUS TRANSCRIPTION FACTORS LEUR AND LEUB IN LEUCINE BIOSYNTHESIS, NITROGEN ASSIMILATION, AND TRANSCRIPTOME REGULATION.

Joel T. Steyer, Damien J. Downes, Cameron C. Hunter, and Richard B. Todd

Department of Plant Pathology, College of Agriculture

BACKGROUND AND PURPOSE: Numerous fungal species can synthesize branched chain amino acids (BCAAs) while animals cannot. Proper regulation of BCAA metabolism is important for protein synthesis, growth, and virulence. In the fungus *Aspergillus nidulans*, the transcription factor LeuB regulates the leucine biosynthesis pathway and *gdhA*, which encodes a key nitrogen assimilation enzyme. We have identified LeuR, a transcription factor closely related to LeuB, and examined the intersection of LeuB and LeuR in leucine biosynthesis and *gdhA* regulation. **METHODS AND RESULTS:** Phylogenetic analysis showed that LeuB is conserved broadly in Ascomycete fungi whereas LeuR showed a narrower species distribution. We constructed a *leuR*Δ deletion mutant, which showed normal growth, unlike the *leuB*Δ deletion mutant, which shows partial growth without additional leucine. However, the *leuB*Δ *leuR*Δ double mutant exhibited a strict growth requirement for leucine, indicating a role for LeuR in regulating leucine biosynthesis. Using *gdhA-lacZ* reporter gene assays, we showed that LeuR also regulates *gdhA* expression and we used a series of promoter deletions in *gdhA-lacZ* to compare the wild-type strain to *leuB*Δ, *leuR*Δ, and *leuB*Δ *leuR*Δ mutants and identified the site of action for LeuR. Additionally, we performed RNA-Seq with the wild type, *leuB*Δ, *leuR*Δ, and *leuB*Δ *leuR*Δ mutants to determine the genome-wide direct and indirect targets and overall physiological roles of LeuB and LeuR. **CONCLUSION:** Our experiments show that the transcription factors LeuB and LeuR overlap in regulating nitrogen assimilation and leucine biosynthesis. However, LeuB and LeuR diverge in the total number of genes regulated and play distinct roles in the regulation of several metabolic pathways.

BIOACCESSIBLE LEAD DETERMINATION IN DUST WIPE SAMPLES

Chandima Wekumbura¹, Ganga M. Hettiarachchi¹, and Christina Sobin²

¹Department of Agronomy, College of Agriculture; ²Department of Public Health Sciences, University of Texas at El Paso

BACKGROUND AND PURPOSE: Although the dust wipes sampling (DW) methods have been used routinely for the collection of household dust, there is no standard protocol for determining bioaccessible Pb (BaPb) in dust wipe samples. **METHOD:** Simulated soil (SDM1, SDM2, SDM3; 1200, 800, 400 mg kg⁻¹ respectively) and paint dust mixtures (PDM1, PDM2, PDM3, PDM4; 2000, 1000, 700, 400 mg kg⁻¹ respectively) with different Pb concentrations were created mixing house dust with Pb contaminated soil and paint materials. Laboratory-controlled surface applied dust was collected following the standard dust wipe protocol. Collected DW samples were used to assess total Pb and BaPb content using *in vitro* BaPb determination methods i.e. Physiologically based extraction test (PBET 2.5 pH) and the US-EPA's *in vitro* bioaccessible assay method (IVBA 1.5 and 2.5 pH). Sample analysis was done using ICP-OES. **FINDINGS:** Simulated soil and paint dust BaPb contents were significantly different among the applied BaPb determination method. Mean percent BaPb for IVBA pH 1.5, 80-83 % in soil dust while it was 100% for all different paint dust mixtures. The IVBA pH 2.5 recorded 55-67% and 91-97 % BaPb for simulated soil and paint dust respectively. The PBET pH 2.5 showed the lowest percent BaPb for both dust mixtures, i.e. 49-58% for soil dust and 74-82 % for paint dust. **CONCLUSION:** DW might be used to both BaPb and total Pb determination. Overall, dust mixtures' percent BaPb content depended on the extraction pH and the extraction solution of the *in vitro* BaPb determination method irrespectively to the Pb concentrations in the dust.

ADJUSTING N RATE IS THE FIRST STEP IN N APPLICATION INTENSIFICATION

Luana Simão, Dorivar Ruiz Diaz, and Romulo Lollato

Department of Agronomy, College of Agriculture

BACKGROUND AND PURPOSE: Nitrogen (N) is part of the composition of amino acids (hence, proteins) in plants, and synthetic fertilizers are the most used source to supply N in plants. It is estimated that 48% of the global population is fed by food grown using synthetic N fertilizer, and nearly 70% of the N applied in the soil is lost to the atmosphere. This research aimed to compare two types of N application (Standard and Progressive) on winter wheat production. **METHOD:** Standard N application consisted of a simple approach: one single broadcasted N application at 80 lbs ac⁻¹ during winter wheat growing season. Progressive N management consisted of a robust N application: split N application into two different timings during growing season, using a more precise applicator, with the addition of N loss inhibitors molecules to the soil, and with variable N rate (80 lbs ac⁻¹ in the first year and 67 lbs ac⁻¹ in the second year, as recommended by specialists modelers). **RESULTS/FINDINGS:** In the first year, in which the total amount of N applied was the same for both Standard and Progressive, winter wheat production was similar between the two N application methods. In the second year, in which Progressive N management had less total N applied, Progressive treatment significantly produced less winter wheat than Standard N application, even though it had a more precise application method. **CONCLUSION:** This research showed that adjusting the total N applied to supply the crop demand is the first step before investing in more robust application methods.

LOCATION VS. HOST: ENVIRONMENT MORE IMPORTANT THAN HOST IN CONTROLLING MICROBES

Anna Kazarina, Ari Jumpponen, Loretta Johnson, and Sonny T. M. Lee
Division of Biology, College of Arts and Sciences

BACKGROUND AND PURPOSE: Understanding adaptation of organisms to their environment is critical in predicting species responses to climate change. Our study focused on *Andropogon gerardii*, (big bluestem). The broad distribution of *A. gerardii* across the natural precipitation gradient of the Great Plains has resulted in ecotypes that are genetically adapted to their local environments. Some evidence suggests that plant adaptation to the environment is linked to the local soil processes mediated by the rhizosphere microbial communities. However, the interactive effects of plant genetic and environmental factors on the plant adaptation remain poorly understood. We aimed to evaluate the importance of the host genetic and local environmental factors on structuring the plant-associated soil-inhabiting microbiomes. **METHOD:** Three *A. gerardii* ecotypes (dry, mesic, wet) were planted in reciprocal gardens in Hays, KS, Manhattan, KS and Carbondale, IL with 580mm, 871mm and 1167mm of mean annual precipitation, respectively. After more than 10 years since the initiation of the experiment, we sampled soils associated with these ecotypes and Illumina MiSeq-sequenced bacterial metabarcoding PCR-amplicons. We evaluated the effect of the location and ecotype on bacterial communities. **RESULTS/FINDINGS:** Although, we observed only marginal ecotype effect ($R^2 = 0.013$, $P = 0.044$), the location ($R^2 = 0.130$, $P = 0.001$) and the location x ecotype interaction ($R^2 = 0.023$, $P = 0.022$) were strong drivers of the microbial community structures. **CONCLUSION:** Our study has the potential to facilitate predicting ecosystem responses to climate change and the impact of management on restoration practices.

SUSTAINABLE RECOVERY OF VOLATILE FATTY ACIDS FROM SWINE WASTEWATER

Priyasha Fernando and Prathap Parameswaran
Department of Civil Engineering, College of Engineering

BACKGROUND AND PURPOSE: Volatile fatty acids (VFAs) are short-chain organic acids naturally generated from complex organic compounds through intermediate fermentation reactions during anaerobic digestion. These organic acids are produced as byproducts of petrochemical reactions. VFA production is highly demanding since they are the building blocks of many valuable commercial and cosmetic chemical products. This study aims to develop a modified fermentation biotechnology platform from swine wastewater coupled with membrane filtration further aided by microbial electrochemistry. **METHOD:** Controlled and efficient swine wastewater fermentation experiments were conducted with two different inocula (wastewater sludge and cattle rumen fluid) with or without a microbial bioanode. Temperature, pH, Solids Retention Time (SRT)/Hydraulic Retention Time (HRT), and the anode potential were the main requirements for enhancing the anaerobic fermentation reactions. A series of experiments have been performed at different SRT conditions. Performance was characterized by electric current production, VFA quantification through High-Performance Liquid Chromatography (HPLC), and gas composition through Gas Chromatography (GC). **RESULTS/FINDINGS:** At the 20-day SRT operation, sludge and rumen inocular showed distinct predominances of organic acid production with propionate/acetate and butyrate/acetate, respectively. The rumen inoculum suffered a faster washout of the fermentative microbial communities. The microbial biofilm anode displayed a different fermentation product profile than the non-electrode reactor. The anode area was observed as a rate-limiting step for kinetics and extent of swine wastewater fermentation. **CONCLUSION:** The recovery of VFAs from wastewater based on microbial reactions is becoming a promising research and development portfolio in the future due to its favorable life cycle and techno-economic footprint.

MULTIAGENT WIRELESS DATA COMMUNICATION FOR PRECISION AGRICULTURE

Ketan Shende and Ajay Sharda
Department of Biological and Agricultural Engineering, College of Engineering

BACKGROUND AND PURPOSE: Currently available agricultural machinery lacks features such as collecting data using innovative techniques for real-time data handling, processing, and analysis. Due to lack of wireless connectivity in the rural areas where majority of the farming land exists, the farmers still have to follow traditional methods. Growers have to store the farming session data on the platform itself, physically transfer it on a storage device, and upload it to an online portal or software for further analysis. Hence, there is a need for a system that would provide instantaneous access to the data and overcome limitations set by dynamic farming environment which can lead to data loss and safety concerns. **METHOD:** The goal of this research is to provide a proof-of-concept real-time wireless communication system for autonomous multiagent platforms that performs farming operations by replacing a single machinery. 900 MHz Radios having a line-of-sight range of 52 km were selected for continuous transmission and reception of data from the platforms to central hub. **RESULTS/FINDINGS:** The communication system set up in a mesh topology included four agents, each acting as a slave, were sourcing the data with time stamp & identifiers. A central hub operating as a master collected all the data along with repeaters which help in extending the network. The lab and field dry runs resulted in seamless operation, without any loss or any deterioration in data packet content. **CONCLUSION:** This sets a foundation for systems that require collecting data from multiple nodes especially in a farming environment.

CORN PLANT STAND RESPONSE TO GAUGE WHEEL LOAD AND GROUND SPEED COMBINATION ON NO-TILL SYSTEM

José Peiretti¹, Sylvester Badua², and Ajay Sharda¹

¹*Department of Biological and Agricultural Engineering, College of Engineering;* ²*College of Engineering,
Central Luzon State University*

BACKGROUND AND PURPOSE: Field factors determines that there is a better combination of a target gauge wheel load and ground speed to achieve a uniform plant stand in the row, herein understood as an outcome of plant spacing and seeding-depth uniformity. The objective of this study was to evaluate corn plant stand response to gauge wheel load and ground speed in three different positions of the same planter. **METHOD:** The experiment was designed in three full randomized blocks. Within each block, three different gauge wheel load were used: D1 (120 lbf), D2 (220 lbf) and D3 (320 lbf) combined with three ground speeds: S1 (6 mph), S2 (7.5 mph) and S3 (10 mph). Experimental strips were located in one of the three different sectors of the seeder: wing (W), track (T) and no track (N), to know the effect of the differential distribution of weight of the machine on the ground and how this affects the corn plant stand. Seed depth, emergence speed, plant spacing and yield evaluations were taken. **RESULTS:** D2 x S3 registered the lowest values of standard deviation on plant spacing: 2.95, with an average of 8.4 inches. D2 x S2 obtained the best values of uniformity in planting depth with an average of 2.07 inches and a standard deviation of 0.307 for this experiment. **CONCLUSION:** The best plant stand parameters were observed with the D2 treatment. The coefficients of variation of all the parameters within the plant stand increase with increases in the ground speed for all the treatments.

PREDICTING THE FROST DURABILITY FROM FRESH PROPERTIES

Ragini Krishna Nikumbh and Christopher Jones

Department of Civil Engineering, College of Engineering

BACKGROUND AND PURPOSE: Freeze-thaw damage in portland cement concrete pavements has been a major concern for regions experiencing cold climatic conditions. The severity of this damage, can be minimized by ensuring a well-entrained air-void system (comprising of equally spaced, small air bubbles) spread throughout the cementitious paste. Traditionally, ASTM C231-17a method measures the total volumetric air content in fresh concrete while ASTM C457-16 method quantifies the air-void parameters in hardened concrete (28 days after casting). Thus, making it difficult to assess the air-void distribution in real time on-site. Since 1950s, industrial practices have changed vastly, but hardly any new suitable quality control/assurance (QC/QA) tools/recommendations have been made. **METHOD:** With this objective in mind, we seek to enrich the predictive capability of traditional methods, by developing complimentary models for predicting spacing factor. These models have been statistically evaluated and correlated to the spacing factor (ASTM C457-16 method). Initially, three preliminary models were developed using a combination of mixture design and fresh concrete parameters such as SAM number, paste content, total air content and so on, to distinguish between an air-void system with a spacing factor < and > 0.2mm; additionally optimized by calibration using multiple statistical and data reshuffling methods. **RESULTS/FINDINGS:** These models showed higher accuracy than the current fresh concrete testing methods in identifying the quality of the air-void distribution. **CONCLUSION:** The enhanced predictive performance of these models over a single test while retaining the sufficient speed required for QC/QA, will assure a durable mixture is placed on-site in real-time.

PLASMON-INDUCED EXCITATION ENERGY TRANSFER IN SILVER NANOPARTICLE DIMERS: A REAL-TIME TDDFTB INVESTIGATION

Zhen Liu¹, M. Belen Oviedo^{2,3}, Bryan M. Wong², and Christine M. Aikens¹

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BACKGROUND AND PURPOSE: The noble-metal nanoparticles have many applications in chemistry, physics, and biology, due to their high physical and chemical stability. The localized surface plasmon resonance (LSPR) will occur, when the nanoparticles are excited by specified wavelength of light. The nanoparticle dimer is the simplest model to study plasmonic coupling. Investigations of electronic excitation transfer mechanisms in nanoparticles at a quantum dynamical level of detail can provide insights for future applications in directing and controlling excitation energy in even more complex systems. **METHOD:** The DFTB+ and SQUIRRELS code was used to calculate the ground-state properties and electronic dynamics. Two identical Ag₁₄ were placed with different interparticle distance. After the first nanoparticle are excited, dipole moments are induced in the second nanoparticle. **RESULTS/FINDINGS:** At long interparticle distances, EET from NP1 to NP2 is not efficient. As this distance decreases, the dipole moment in NP2 changes significantly. At a 20 Å interparticle distance, the efficiency of the Ag₁₄ dimer for gaining energy from the incident electric field is optimal. For shorter interparticle distances, back transfer can be observed. **CONCLUSION:** The dipole moment of a dimer with a large interparticle distance arises mainly from NP1. The dipole moment fluctuations in the Ag₁₄ nanoparticle dimer are affected by the laser acting on NP1, the energy transfer from NP1 to NP2, and the back transfer from NP2 to NP1.

FINDING CHILDCARE IN AMERICA (PHASE I): PRELIMINARY RESULTS FROM AN ASSESSMENT OF INTERNATIONAL STUDENTS AND SCHOLARS JOURNEYS.

Adelaide Klutse

Department of Applied Human Sciences, College of Health and Human Sciences

BACKGROUND: Transitioning to a new country comes with varied experiences. For International Students and Scholars (ISS) who double as parents, navigating the childcare space may be an added layer to the myriad of activities they need to navigate in order to be successful. Quality early care and education is not only beneficial to the child but also to the parent in several ways thus the need for informed decision making when navigating the childcare space. Many Universities in the US provide ISS with resources aimed at facilitating their success. However, little is documented on how ISS who have children in the US find childcare services or the best way of communicating such information to them. **PURPOSE:** This first phase of the project sought to gather information that will inform the development of a resource that meets the needs of ISS who want to find childcare for their children aged 0-5. **METHOD:** A Qualtrics Survey with related questions was distributed via listservs that target ISS. **RESULTS:** Majority of the respondents rated their search for childcare as difficult. Additionally, majority rated cost as the most important factor they look out for when trying to find childcare. Most respondents also stated that a State-specific tailor-made website is the most preferred medium for accessing information related to navigating the childcare space. **CONCLUSION:** Preliminary findings suggest that accessibility and cost are of primary importance to the respondents. Additionally, a website that provides State-specific information on navigating the childcare space will be beneficial to ISS.

PARENTING STYLE AND FAMILY FACTORS CONNECTED TO CHILD EMOTIONAL AWARENESS: A LONGITUDINAL STUDY

Lindsay Howard¹, Glade Topham¹, Jared Durtschi¹, Amanda W. Harrist², Laura Hubbs-Tait², Taren Swindle³, and Lenka H. Shriver⁴

¹Department of Applied Human Sciences, College of Health and Human Sciences; ²Department of Human Development and Family Science, Oklahoma State University; ³Department of Family and Preventive Medicine, University of Arkansas for Medical Sciences; ⁴Department of Nutrition, University of North Carolina Greensboro

BACKGROUND AND PURPOSE: Research has indicated the significant role that parents and family relationships play in the emotional development of a child. Parenting and family relationships influence emotional awareness in children through observation, modeling, and emotion coaching. Research has not yet examined the longitudinal relationship between early parenting and family relationships and child emotion awareness during advanced adolescence. The purpose of this study is to examine this association. Increased emotional awareness has been linked to increased relationship quality and success. **METHOD:** Participants included 112 mother-child dyads. Data was collected as part of the Families and Schools for Health project. Mothers' self-reported parenting style (Parenting Styles and Dimensions Questionnaire) and family dynamics (McMaster Family Assessment Device) when children were in 1st grade. When the same children were in 12th grade, they completed a self-report assessment that measured emotional awareness (Difficulties in Emotional Regulation Scale). **RESULTS/FINDINGS:** Higher scores on authoritarian parenting (harsh, critical, yelling) and lower scores on family communication (1st grade) were significantly associated with poorer teen emotion awareness (12th grade). **CONCLUSION:** This study increases our knowledge of the long-term effects of parenting and family dynamics on child emotional awareness. The findings indicate the importance of targeting parenting and family communication in early prevention and intervention programming in promoting child long-term emotional awareness. The findings also help parents better understand the importance of positive parenting and family communication in influencing children's long-term emotional competence.

WHERE WERE THEY WHEN THE WATER RAN OUT? IN A WORD, ABSENT

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BACKGROUND AND PURPOSE: The Ogallala Aquifer supports \$35 billion in annual crop production. Thirty percent of wells are completely dried up, and by 2070 it is expected to jump to seventy percent. Irrigation beyond natural recharge rates persists despite decades of personal, political, and community efforts. Previous literature shows that the greater absentee ownership of farmland results in fewer conservation efforts, as owners often care more about yielding the largest check instead of the best management practice. But is this true for water-right ownership? We think yes. **METHOD:** We studied the degree of emplacement of well owners and their water right correspondents for irrigation wells ($N = 599,330$) in 52 Kansas counties overlying the Ogallala Aquifer, and how it affected water use (in acre/feet pumped) from 2000-2019. We utilized a mixed effects longitudinal regression model controlling for saturated thickness. **RESULTS/FINDINGS:** Absentee owners and emplaced correspondents pumped the most of any group ($p < .001$). In the areas where they were away, the most water went away. We confirmed our hypothesis. Compared to emplaced owners, absentees pumped nearly thirteen billion more gallons ($B = 0.067$), or one-eighth of Tuttle Creek Lake. **CONCLUSION:** Two policy alterations can reduce absentee owners' wasted water. First, farmers receive deductions for declining groundwater levels and can write off depreciation on irrigation equipment. Replace these perks with a tax credit for stabilizing groundwater. Second, we must stop corporate and foreign land and water right grabs. Kansas' Corporate Farming Law has been watered down since its 1931 inception and the original statute needs restored.

RHETORICAL DECEPTION AND THE COVID-19 CURE: ARE ALL EXPERTS THE RIGHT AUTHORITY?

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BACKGROUND AND PURPOSE: In the early stages of the COVID-19 outbreak, Ghana, a country in West Africa, was fraught with numerous COVID-19 cures, which dominated discussions on traditional and digital media platforms. The media cautioned against most of the false cures. However, an exception to the rule was the recommendation of Hydrogen Peroxide (H₂O₂) by Prof. Andrew Seth Ayettey, a retired professor at the University of Ghana Medical School. In this paper, I argue that an individual with an already established credibility (*ethos*) can apply pathos (appeal to an audience's emotions) in the absence of logos (factual evidence) to fuel the perceived legitimacy of a conspiracy. **METHOD:** To support this claim, I analyze the rhetorical content of an interview of Prof. Andrew Seth Ayettey, shared widely on Facebook and Twitter. Using the framework of rhetorical deception (Hallsby, 2015, p.355), I show how an individual's strategic application of pathos-centered rhetoric can conceal their actions and motives. **RESULTS/FINDINGS:** I identified mental shortcuts or heuristics as the missing link between credibility and persuasion. Most people with limited resources for decision-making about complex issues especially relating to science, often rely on a range of mental shortcuts ("experts can be trusted") to make decisions "without effortful scrutiny of the message content" (Miller, 2008, p.133). **CONCLUSION:** These unproven COVID-19 remedies recommended by individuals in positions of power often fuel conspiracies, set internet trends, and have dire consequences on public health; thus, the public must be circumspect of the authenticity of science-related information that convincingly masquerades as valid.

ARTS-BASED AND ARTS-INFORMED RESEARCH: DESCRIPTIONS, DISTINCTIONS, AND DESIGNS FOR RESEARCH IN EQUITABLE ADULT EDUCATION

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INTRODUCTION: Arts-based and arts-informed research studies are rapidly increasing as viable structures for educational and social science research platforms. Because of this rapid growth, the distinction between the two has been misunderstood. The terms arts-based and arts-informed have been used interchangeably even by the researchers leading the way. **LITERATURE REVIEW:** This presentation builds on the work of current arts-based experts, Tom Barone and Elliot Eisner, who have termed the term *arts-based* and have led the way in legitimizing art platforms in rigorous academic qualitative research. **JUSTIFICATION:** Although these terms have some similarities, they also have very important distinctions that can affect the methods and findings of a research. Art is a representation of social existence. It is for the masses and is an ideal speech situation for difficult topics. Art provides a tacit awareness that conveys a deeper understanding more efficiently than conversational words alone. **DESCRIPTIONS, DIFFERENCES, AND DESIGNS:** This presentation provides a description of each term, points out distinguishing differences, and explores designs based on research intent. Art has the freedom and the responsibility to represent, and influence, reality.

DISPELLING DISABILITY STEREOTYPES: A CONTENT ANALYSIS OF AVATAR: THE LAST AIRBENDER

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BACKGROUND AND PURPOSE: People with disabilities are increasingly represented in television; however, we do not yet know if these representations depict common stereotypes. In this study, I evaluate the popular animated children's cartoon, *Avatar: The Last Airbender*, for the presence of disability stereotypes found in previous scholarship. The stereotypes are as follows: the villain, the supercrip, weakness and vulnerability, and the imagery of madness. **METHODS:** I performed a content analysis of *Avatar: The Last Airbender* assessing the presence of disability stereotypes. **RESULTS/FINDINGS:** Preliminary analysis results suggest characters with disabilities appear often, in more than half of the total episodes. While they are depicted at times in line with stereotypes found in prior literature, they are often portrayed as what I call "neutrally" in scenes. **CONCLUSION:** These preliminary results suggest a need to further investigate the presence of the stereotypes in children's animation and the need to reevaluate their applicability.

UNDERSTANDING MENTAL HEALTH AWARENESS AND COUNSELING-SEEKING BEHAVIORS OF INTERNATIONAL STUDENTS AT KANSAS STATE UNIVERSITY

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BACKGROUND AND PURPOSE: University students suffer from mental health diseases like depression and anxiety that are often overlooked and undiagnosed. Among the student population, international students are the least likely to seek help due to stigmatized barriers associated with mental health diseases. This research study utilized constructs of the Health Belief Model to gain insight into international students' perceptions about mental health and their help-seeking behaviors. The study aimed to understand and investigate the mental health counseling behaviors in international students. It further identified social media usage for mental health information-seeking, intending to inform international students' mental health information-seeking behaviors. **METHOD:** Data were gathered through a self-administered survey using Qualtrics at a Kansas State University University following research ethics approval by the Institutional Review Board. **RESULTS/FINDINGS:** Findings have shown that students who perceive more barriers to counseling are less likely to seek mental health information. Additionally, a higher level of perceived susceptibility implicated lower chances of help or counseling seeking among international students. Male international students perceive more barriers and fewer benefits to seeking mental health help than female students. **CONCLUSION:** Although this study is not generalizable, results provide insight that can inform communication interventions that focus on promoting mental health and counseling outreach for international students. This research is both timely and valuable, as international students continue to face isolation due to the COVID- 19 pandemic. Further research is required to determine motivational factors for the international students to seek help for mental health including risk perception and self-efficacy.

EVALUATING THE UTILITY OF A CO₂ SURGICAL LASER FOR PIGLET TAIL DOCKING TO REDUCE BEHAVIORAL AND PHYSIOLOGICAL INDICATORS OF PAIN AND TO IMPROVE WOUND HEALING: A PILOT STUDY

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BACKGROUND: In the U.S. millions of commercially raised piglets are routinely tail docked using side-cutting pliers to reduce the prevalence of tail biting. Tail docking has a negative impact on piglet welfare evidenced by piglets exhibiting an increase in vocalizations, pain-specific behaviors, and cortisol, which may be partially attributable to the plier technique. Human and veterinary patients experienced reduced inflammation, healing time, and post-procedural pain using a CO₂ surgical laser. A CO₂ surgical laser may improve piglet welfare as they may experience less post-procedural pain and reduced inflammation and improved wound healing at the surgical site. **METHODS:** Piglets were tail docked using side pliers (SP), a CO₂ surgical laser (LA), or non-tail docked (control; CON). The vocalizations, behavior, facial grimacing, wound healing and inflammation (IRT) of the surgical site, and blood and salivary cortisol concentrations were assessed for each piglet. **RESULTS:** The LA and CON groups elicited calls of higher energy than the SP group (P<0.0001). Pain behavior differences were not observed between the SP and LA piglets. The SP group had higher grimace scores than the LA group (P=0.03). Male piglets also grimaced more than female piglets (P=0.009). At 0 h the SP group had significantly higher wound scores and a greater temperature difference (i.e., between tail tip and surrounding tissue) compared to the LA group (P<0.0001 and P=0.02, respectively). **CONCLUSION:** The use of CO₂ surgical laser resulted in less tail damage immediately post-procedure and lower facial grimace scores throughout the assessment period, suggesting it may be a less painful alternative.

SEX DIFFERENCES IN SKELETAL MUSCLE OXYGENATION DURING EXERCISE IN PULMONARY HYPERTENSION

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INTRODUCTION: Pulmonary hypertension (PH) is a disease of elevated blood pressure in the vasculature within the lung resulting in skeletal muscle dysfunction, cardiac impairments, and eventually, death. Males and females display differences in disease severity and outcomes (i.e., mortality). Exercise intolerance is a cardinal manifestation of PH, but any potential differences between males and females regarding skeletal muscle function have not been studied. We hypothesized that PH would decrease skeletal muscle oxygenation (PO₂) to a greater extent in females than males at rest and during exercise. **METHODS:** Progressive PH was induced in adult rats via a one-time injection of monocrotaline. Rats were monitored via echocardiography. Once PH was confirmed, the spinotrapezius muscle was exposed and phosphorescence quenching was used to determine oxygenation (PO₂) in the resting and contracting spinotrapezius muscle. **RESULTS:** 3 weeks following injection, PH rats displayed pulmonary and cardiac characteristics consistent with moderate PH. Indicators of PH severity did not differ between males and females. Females displayed a greater reduction in resting muscle oxygenation in PH versus healthy rats when compared to male counterparts (-29 ± 3% vs. -18 ± 2%; P<0.05). During muscle contractions, females with PH reached a lower nadir in PO₂ than PH males (4.2 ± 0.3 vs. 7.4 ± 0.4 mmHg; P<0.05). **CONCLUSION:** These data support that skeletal muscle oxygenation is impaired to a greater degree in PH females, both at rest and during exercise. Elucidating the mechanistic bases for these findings and their consequences for exercise intolerance will enable more effective treatments for females with PH.

IMPROVING SKELETAL MUSCLE OXYGENATION IN HEART FAILURE

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BACKGROUND AND PURPOSE: Heart failure (HF) affects ~6 million adults in the United States and is associated with a high rate of morbidity, mortality, and decreased quality of life. HF patients are oxygen (O₂)-limited, which compromises performance of daily tasks and exercise. O₂ limitations in HF are largely attributed to soluble guanylyl cyclase (sGC) pathway dysfunction. sGC stimulators were synthesized to promote vasodilation, demonstrating the potential to improve skeletal muscle oxygenation in HF. Therefore, we hypothesized that chronic administration of sGC stimulator BAY 41-2272 would increase the pressure of O₂ in the skeletal muscle of HF rats, and thus decrease O₂-dependency. **METHOD:** HF was induced in adult rats via myocardial infarction. Following 5 weeks of HF progression, rats were treated with 1.0 mg/kg of BAY 41-2272 via oral gavage twice per day (HF+BAY; n=6) for 2 weeks. Control HF rats (HF; n=5) received vehicle only. Phosphorescence quenching determined the partial pressure of O₂ in the spinotrapezius muscle interstitial space (PO_{2is}) at rest and during twitch contractions. **RESULTS/FINDINGS:** As designed, the degree of HF was not different between groups, reflecting moderate cardiac decompensation. Following the onset of contractions, HF+BAY rats sustained a 5-7 mmHg higher PO_{2is} compared to HF rats receiving vehicle (P < 0.05). **CONCLUSION:** During the rest-contraction transient and throughout contracting steady-state, sGC stimulator BAY 41-2272 increased the PO_{2is} in rats with moderate HF. These findings support the therapeutic potential for sGC stimulators in treating O₂-limitations seen in HF, which may decrease the morbidity, mortality, and improve the quality of life in HF patients.

IMPACT OF CLIP SERINE PROTEASES AND THEIR NON-CATALYTIC HOMOLOGS IN ANOPHELES GAMBIAE ANTIMICROBIAL IMMUNITY

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BACKGROUND AND PURPOSE: To fight pathogens that invade their body cavity, mosquito activate humoral immune responses that are regulated by proteolytic activity through clip-domain containing serine proteases (cSPs) and their non-catalytic protease homologs (cSPHs). These processes have been studied in *Anopheles* mosquitoes, the principal vectors of human malaria parasites, by developing infection models using *Plasmodium sp.* parasites and a small set of Gram-positive and Gram-negative bacterial species. However, whether these proteases regulate immunity against a broader range of microbial pathogens remains largely unknown. **METHOD:** In this study, we addressed this question by establishing infection protocols in *Anopheles gambiae* adult female mosquitoes and generating expression profiles of cSP and cSPH genes 12 h after challenge with three Gram-positive bacteria, four Gram-negative bacteria, and two yeast species, respectively. **RESULTS/FINDINGS:** Our analyses identified 61 out of the 105 cSP and cSPHs annotated genes to be differentially expressed at 12h post infection in at least one of the nine challenges. Gene expression changes largely delineated across the pathogenicity scale rather than across bacterial vs. fungal or Gram-type challenges. One of the differentially expressed cSPs is CLIPB4, a cSP previously shown to play a role in *Plasmodium sp.* melanization. We evaluated the contribution of *CLIPB4* knockdown (kd) to (i) mosquito survival after microbial infections and on (ii) melanization. Our results show that *CLIPB4*kd significantly reduced (1) survival after *C. albicans* and *E. coli* challenge, and (2) melanotic tumor formation and melanotic excreta amounts induced by *SRPN2*kd. **CONCLUSION:** Together our data demonstrate that CLIPB4 affects key humoral responses involved in antimicrobial immunity.

MOSQUITO KILLER: A KANSAS FUNGUS FOR LOCAL MOSQUITO CONTROL

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BACKGROUND AND PURPOSE: Mosquito control to prevent vector-borne diseases relies primarily on the use of chemicals. However, insecticide resistance in mosquito populations requires alternative control measures, including biological control agents. The goal of our study was to assess the impact of the locally isolated fungus, *Beauveria bassiana*, on the survival and development of the Asian tiger mosquito, *Aedes albopictus* and the African malaria mosquito, *Anopheles gambiae*. **METHOD:** Local *B. bassiana* was isolated from field-collected *Ae. albopictus* mosquitoes and identified using sequencing. To determine the impact of the local *B. bassiana* on mosquito survival and development, second and third larval instars (n=72) of both mosquito species were reared in water control and water treatments containing 2.5×10^7 , 1.25×10^8 , and 2.5×10^8 fungal spores/mL of *B. bassiana*. Larvae were monitored daily. **RESULTS:** When exposed to the high fungal doses, the percentage of *An. gambiae* surviving larvae ranged from 0 to 2.8%, while survival increased to 39.4-65.3% when larvae were exposed to the lowest fungal dose. In addition, delays in development and adult survival were observed, further contributing to mosquito control. Interestingly, *Ae. albopictus* larval survival remained high (77.2%-88.9%), even when exposed to the highest fungal dose. However, higher fungal doses were observed to decrease adult survival in most cases and significantly delayed larval development, compared to the water control. **CONCLUSION:** This study identifies the locally isolated fungus, *B. bassiana*, as a biological control agent of two mosquito species of public health concern, therefore providing a possible alternative to insecticides for mosquito control.

INVESTIGATING A LOW RNAI RESPONSE IN LARVAE OF THE BITING MIDGE CULICOIDES SONORENSIS

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BACKGROUND AND PURPOSE: Broad-spectrum insecticides are not efficient at preventing livestock disease transmission by the biting midge *Culicoides sonorensis*. Off-target effects and the potential for insecticide resistance development are concerns for the continued use of these chemicals at scale. RNA interference (RNAi) is a potential new control strategy for targeting these insects specifically without affecting non-target species. Insect control by RNAi uses cellular mechanisms to degrade important mRNA transcripts, inducing insect mortality. The efficiency of RNAi can vary widely in insects, and little work has been done to evaluate this mechanism in *C. sonorensis*. **METHOD:** We treated both *C. sonorensis* cells and midge larvae with double-stranded RNA (dsRNA) and evaluated the responses in each. Dose-responses were examined quantitatively by qRT-PCR to show suppression of the relevant mRNA. **RESULTS:** Cells began responding to high doses (10 ug/ml) of dsRNA in as little as 24 h post-treatment, and cells showed a significant decrease in transcript levels with doses as small as 100 ng/ml at 48 h post-treatment. Larvae showed no significant response to comparable concentrations of dsRNA when compared to cells. **CONCLUSION:** The discrepancy in RNAi response between cells and larvae may be due to RNA-degrading nucleases (dsRNases) or inefficient uptake of dsRNA in the larval gut. We are examining these dsRNases and developing methods to overcome them as part of our ongoing work. The potential of RNAi as an insect control strategy is promising, but more work is required to fully elucidate the mechanisms that are hindering this strategy in *C. sonorensis* larvae.

HOST-MICROBIOME ASSOCIATIONS IN LIVEBEARING FISHES ADAPTED TO SULFIDIC ENVIRONMENTS

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BACKGROUND AND PURPOSE: Complex microbial communities associated with animal tissues influence the host's life history, physiology, and ecology, and they are also shaped by the host's environment and genetic background. Furthermore, the host's microbiome can mediate tolerance to environmental stress and facilitate adaptation. Despite the well-established functional importance of vertebrate microbiomes for host physiology and fitness, the role of symbionts mediating adaptation in vertebrate extremophiles remains unstudied. We are utilizing a system of livebearing fish that repeatedly colonized toxic sulfide springs in southern Mexico to explore what factors shape host microbiomes and how host microbiomes change upon colonization of extreme environments. **METHOD:** We analyzed the gut microbial community compositions of 23 lineages of livebearing fishes (8 of which have independently colonized sulfide streams) from 13 sites throughout the Río Grijalva basin in order to better understand how host-associated microbial communities are shaped by the environment and host evolutionary history. **RESULTS/FINDINGS:** We found that sulfidic populations have distinct microbial communities from nonsulfidic populations, and we established a core extremophile microbiome consisting of microbes that are unique to—and consistently present in—fish from sulfide springs. These shared microbial taxa serve as candidates for microbes potentially involved in adaptive symbiotic relationships with sulfide spring fishes. **CONCLUSION:** Our findings provide insight into the ecological and evolutionary dynamics shaping host-microbe interactions. Analyzing microbiomes within an evolutionary framework provides a foundation for understanding how host-microbe associations arise and what role they play in adaptation.