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

Program Booklet

March 31-April 1, 2021
Virtual Event

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PROGRAM SCHEDULE

MARCH 31

Oral Presentations

9:30 – 11:30 AM	Agricultural Sciences
1:00 – 3:15 PM	Biological Sciences
3:30 – 5:00 PM	Engineering, Math, and Physical Sciences

APRIL 1

Poster Sessions

9:30 – 11:15 AM	Poster Presentations

All presentations will be held virtually via Zoom.

Oral Session Schedules

Agricultural Sciences
March 31st
9:30 – 11:30 AM

9:30 **FUTURES PRICE VARIATION AND CASH MARKET EFFICIENCY FOR FEEDER CATTLE**
Andrew Anderson

9:45 **ANTIBACTERIAL ACTIVITY AND MICROBIAL INACTIVATION EFFICACY OF UV-C REACTOR TEST DEVICES**
Olivia Haley

10:00 **STORY OF A ZINC SOURCE THAT WON THE RACE**
Sevendeep Kaur

~1ST PLACE PRESENTATION~

10:15 **A METHOD OF ACCURATE VIRAL QUANTIFICATION AND VIABILITY DETERMINATION IN MECHANICAL INOCULATIONS OF WHEAT STREAK MOSAIC VIRUS**
Nar Ranabhat

10:30 **SENSING NUTRIENT DYNAMICS USING SOIL-BASED MICROBIAL FUEL CELLS**
Manjot Kaur Rekhi

10:45 **PLANT RESOURCES MEDIATE REPRODUCTION AND FLIGHT IN A SPECIALIZED APHID PREDATOR HIPPODAMIA CONVERGENS (COLEOPTERA: COCCINELLIDAE)**
Hannah Stowe

11:00 **SUPERIOR REDUCTION OF SOIL LEAD BIOACCESSIBILITY VIA PHOSPHORUS SOURCE AND RATE SELECTION**
Chandima Wekumbura

11:15 **COMPARATIVE ASSESSMENT OF MICROBIAL QUALITY OF AGRICULTURAL WATER IN KANSAS AND MISSOURI FRESH PRODUCE FARMS**
Yeqi Zhao

Biological Sciences
March 31st
1:00 – 3:15 PM

1:00 **EFFECT OF ACUTE AND CHRONIC EXERCISE ON RADIOSENSITIVITY IN PROSTATE TUMORS**
Dryden Baumfalk

1:15 **DETERMINING SWINE ENTERIC MICROBIOME FUNCTIONS FOR OPTIMIZED NUTRIENT UTILIZATION, GROWTH, AND HEALTH**
Brandi Feehan

1:30 **UNIVERSAL FLUORESCENT SENSORS FOR DETECTION AND QUANTIFICATION OF BACTERIAL SIDEROPHORES AND METAL COMPLEXES**
Ashish Kumar

1:45 **THE CANINE HOST APPEARS TO SERVE AS A SENTINEL SPECIES FOR TICK-BORNE DISEASES CAUSED BY ANAPLASMA, EHRLICHIA AND BORRELIA PATHOGENS IMPACTING HUMAN HEALTH IN THE USA**
Swetha Madesh

~1ST PLACE PRESENTATION~

2:00 **EFFECTS OF PULMONARY HYPERTENSION ON MICROCIRCULATORY HEMODYNAMICS IN RAT SKELETAL MUSCLE**
Kiana Schulze

2:15 **PEPTIDE DESIGN FOR CANCER IMMUNOTHERAPY**
Ravindra Thakkar

~2ND PLACE PRESENTATION~

2:30 **CAPILLARY HEMODYNAMICS IN HEART FAILURE: EFFECT OF SOLUBLE GUANYLYL CYCLASE ACTIVATOR**
Ramona Weber

2:45 **FUNCTION INVESTIGATION IN STREPTOCOCCAL β PROTEIN**
Xin Xu

3:00 **BEHAVIOR FEEDBACK AND NEED FOR COGNITION: FACTORS AFFECTING COFFEE BEVERAGE CONSUMPTION**
Nicholas Gallivan ***WITHDREW***

Engineering, Math, and Physical Sciences
March 31st
3:30 – 5:00 PM

3:30 **EVALUATING SPATIAL AND TEMPORAL VARIATIONS IN SUB-FIELD LEVEL CROP WATER DEMANDS**
Travis Wiederstein

3:45 **MODELING NEUTRONIC TRANSIENTS WITH GALERKIN PROJECTION ONTO A GREEDY-SAMPLED, POD SUBSPACE**
Rabab Elzohery

4:00 **AREA RADIATION GAMMA AND NEUTRON ORIGIN TELEMETRY (ARGANOT) DETECTOR SYSTEM**
Robyn Hutchins

~1ST PLACE PRESENTATION~

4:15 **IS SMARTPHONE USAGE PREDICTING FEAR OF MISSING OUT AND LONELINESS IN A SAMPLE FROM THE GENERATION Z?**
Cristiane Kauer Brazil

4:30 **TRIPLY ACTIVATED HALOGEN-BOND DONORS: NEW MOLECULES WITH EXCELLENT σ-HOLE POTENTIALS**
Vinu Panikkattu

4:45 **ENCAPSULATION OF NANOPARTICLES INTO SELF-ASSEMBLED RECOMBINANT PROTEIN CAGES IN COMPLEX MOHOPHOLOGIES**
Suna Jo

Poster Presentations
April 1st
9:30 – 11:00 AM

9:30 **PREDICT PLANT GROWTH REGULATOR TIMING IN TURF BASED ON AIR TEMPERATURES**
Manoj Chhetri

9:38 **DYEING POTENTIAL OF BICOLOR SORGHUM (L. MONECH) LEAF SHEATH ON HEMP FABRIC: EXTRACTION AND COLORFASTNESS.**
Taiwo Bamidele

~2ND PLACE PRESENTATION~

9:46 **ANALYSIS OF POPULATION STRUCTURE OF FUSARIUM GRAMINEARUM ISOLATES**
Upasana Dhakal

9:54 **MODELLING THE IMPACT OF CLIMATE CHANGE ON THE CROPPING SYSTEMS IN THE EASTERN KANSAS RIVER BASIN**
Anish Holla

10:02 **IMPROVING SAFETY OF YOUNGER DRIVERS AT INTERSECTIONS**
Abdulaziz Alshehri

10:10 **ASSESSING URBAN STRESS AND WELL-BEING IN HIGH CRIME NEIGHBORHOODS**
Kastasya Jackson

10:18 **COMPANY RESPONSES IN TIMES OF CRISIS: A CONTENT ANALYSIS OF COVID-19 EMAILS**
Ryan Urban

~1ST PLACE PRESENTATION~

10:26 **FLOWER PRINTS: A VALUE-ADDED APPLICATION FOR FLORAL WASTE**
Nadeeshani Ratnayaka

10:34 **FACTORS EFFECTING NET FARM INCOME ON LEASED LAND IN KANSA**
Chelsea Arnold

10:42 **UNDERSTANDING WOMEN IN LEADERSHIP FROM THE INSIDE: AN ICEBERG ANALOGY REPRESENTATION OF WOMEN IN LEADERSHIP POSITIONS FROM A PHENOMENOLOGICAL LENS**
Sakshi Bhati

Oral Presentation Abstracts

Agricultural Sciences

FUTURES PRICE VARIATION AND CASH MARKET EFFICIENCY

Andrew Anderson[1], Ted Schroeder[1], and Trevor Hefley[2]
[1]Department of Agricultural Economics; [2]Department of Statistics

MOTIVATION AND CONTRIBUTION: In recent years, agricultural commodity prices have experienced significant increases in volatility. In particular, feeder cattle futures markets have experienced considerable price variation. Feeder cattle futures attract relatively low trade volumes and prices strongly react to live cattle and feed grains markets. This has raised questions about the usefulness of the futures market and its impact on cash market efficiency. The objective of this study is to determine the extent to which feeder cattle futures price volatility impacts the efficiency of cash price discovery. However, theory does not clearly predict the direction of an impact. Previous research has not focused on the distribution of transactions to evaluate price discovery. This paper introduces a unique perspective of price discovery focused on individual transactions, where observed prices form a distribution clustered around the underlying value. In this light, distributional dispersion quantifies pricing efficiency. **DATA AND METHODS:** Data have been obtained from USDA-AMS for feeder cattle cash transactions and from Reuters Eikon for futures prices. This study uses the Generalized Additive Models for Location, Scale, and Shape (GAMLSS) modelling framework. This approach is proposed as an appropriate modelling method to estimate the effect of futures volatility on the standard deviation of the distribution of cash price transactions. **DISCUSSION AND RESULTS:** Concerns about potential detrimental impacts of feeder cattle futures volatility on cash markets motivated this study. Findings will help to address these concerns for cattle producers, stocker operators, and feeders. Results may also provide evidence for policy intervention or refraining therefrom.

ANTIBACTERIAL ACTIVITY AND MICROBIAL INACTIVATION EFFICACY OF UV-C REACTOR TEST DEVICES

Olivia C. Haley, Yeqi Zhao, and Manreet S. Bhullar
Department of Horticulture and Natural Resources

BACKGROUND AND PURPOSE: The airborne SARS-CoV-2 (COVID-19) pandemic sparked renewed interest in ultraviolet light technologies for air and surface disinfection. A variety of UV-C reactor geometries have been developed and optimized for surface and/or air disinfection in schools, medical practices, restaurants, HVAC units, etc. The purpose of the study was to investigate the antimicrobial efficacy of three different reactor geometries: a wall-mounted unit (Device A), a troffer unit (Device B), and an induction lamp unit (Device C). **METHOD:** The devices were installed within an enclosed tower constructed by the lab to prevent the transmission of UV-C radiation outside of the testing area. To determine the antimicrobial efficacy, plastic coupons inoculated with *Escherichia coli* or *Staphylococcus aureus* were irradiated at pre-determined time-distance treatments, and the surviving bacteria enumerated on tryptic soy agar plates. The inactivation efficacy of Device A was tested at a distance of 1m and 2m, and an exposure time of 30 and 45 minutes. Device B was tested at a distance of 2m, and an exposure time of 60 and 120 minutes. Device C was tested at a distance of 0.6m and 1m, and an exposure time of 1 and 5 minutes. **RESULTS/FINDINGS:** At most time-distance combinations, Device A, Device B and Device C reduced the population of *E. coli* and *S. aureus* by ~7 log CFU/mL (n = 4). **CONCLUSION:** The preliminary data shows potential application of Ultraviolet light to disinfect surfaces against human pathogens including emerging viral pathogens such as SARS-CoV-2 and other coronaviruses.

STORY OF A ZINC SOURCE THAT WON THE RACE

Sevendeep Kaur[1], Ganga M. Hettiarachchi[1], and Dinesh Adhikari[2]
[1]Department of Agronomy; [2]Compass minerals, Overland Park, KS

Zinc is an essential trace element that is usually deficient in plants, animals, and humans. Soil is the primary source of Zn for plants, and many soils are Zn deficient. These deficiencies can be overcome using proper fertilizer sources. **BACKGROUND AND PURPOSE:** Fertilizer Zn behaves differently in different soils depending on soil properties. Various sorption-desorption reactions control the Zn concentration in soil solution. The objectives were to compare the diffusion and potential availability of four Zn sources (ZnO, $ZnSO_4.H_2O$, Zn mix, and Zn-EDTA) in two calcareous soils against a control (No Zn). **METHOD:** Two 35-day long Incubation-Visualization studies were performed. Zn was added at 2.34 mg/petri dish. Zn movement was tracked by visualization studies and Zn distribution. Water-soluble Zn and soil pH were also measured to compare solubility and reaction pathways of Zn sources at the end of the study. **RESULTS:** The results showed that Zn-EDTA performed better in calcareous soils that are well known for Zn deficiency due to high Zn fixation. **CONCLUSIONS:** In calcareous soils, EDTA complexation helps Zn to diffuse more as compared to other treatments. Results from our studies suggest that the suitable Zn source should be carefully selected for efficient mitigation of Zn deficiencies in soils.

~1ST PLACE PRESENTATION~

A METHOD OF ACCURATE VIRAL QUANTIFICATION AND VIABILITY DETERMINATION IN MECHANICAL INOCULATIONS OF WHEAT STREAK MOSAIC VIRUS

Nar B. Ranabhat[1], Myron A. Bruce[1], John P. Fellers[2], and Jessica L. S. Rupp[1]
[1]Department of Plant Pathology; [2]Hard Winter Wheat Genetics Research Unit, USDA-ARS, Manhattan, KS

BACKGROUND AND PURPOSE: Wheat streak mosaic virus (WSMV) is a common wheat virus causing a significant loss in wheat production. Genetic resistance is the main method for the management of this wheat virus. Currently available WSMV resistant varieties are limited. Therefore, reliable identification and development of new WSMV resistant wheat varieties through the breeding program is essential. Wheat varieties screened for virus resistance are most often inoculated by the sap of infected plants and resistance level is evaluated based on symptoms expressed by inoculated plants. Information about how long the virus is active in sap and accurate measurements of the number of virus particles present are necessary steps to evaluate the resistance on wheat breeding plants accurately. **METHOD:** A time-course study was designed to determine the viability of WSMV in sap over time and to find out the relation of the virus copy number related to the symptoms. **RESULTS/FINDINGS:** The results showed that the virus was active in the saps for hours and the virus number can be measured accurately in sap and infected wheat plants. The symptoms expressed by infected plants and the number of virus particles didn't correlate perfectly. **CONCLUSION:** Thus, the measurement of virus copy numbers gives accurate results on viral resistance in wheat varieties and emphasizes the demand for accurate measurement of the virus along with symptom expression for unbiased viral disease assessment.

SENSING NUTRIENT DYNAMICS USING SOIL-BASED MICROBIAL FUEL CELLS

Manjot K. Rekhi[1], Ruwandi Kumarasinghe[1], Ganga M. Hettiarachchi[1], and Prathap Parameswaran[2]

[1]Department of Agronomy; [2]Department of Civil Engineering

BACKGROUND AND PURPOSE: A soil-based microbial fuel cell (MFC) is a bio-electric device that uses the soil microorganisms to convert an organic substrate into electricity. The energy generation potential of MFCs can be exploited to 'sense' the nutrient status of agricultural soils, which would be faster than traditional soil sampling methods and analysis in laboratories. It may provide real-time data on available soil nutrients. In this study, we hypothesized that change in the level of nutrients would give us a different microbial response, hence, a different electrical signal. **METHOD:** Soil-based MFCs were set up using natural and sterilized (no microorganisms) soil at field capacity with different fertilizer, and organic carbon treatments and *Geobacter* enriched inoculum. The voltage generated was measured by a data logger and recorded every 15 minutes. Soil solution was analyzed to estimate nutrient levels, and soil gas samples (CO_2) were collected periodically as a proxy for soil microbial activities. The data collected was then compared to develop relationships between nutrient transformations, microbial activity, and soil-based MFC electrical performance. **RESULTS AND CONCLUSION:** Although the electrical signals observed were different, yet they were not clearly separated between treatments because the soil contains more than one redox-sensitive compound and electrogenic bacteria. For future studies, we plan to improve the separation of MFC signals by using polymer-based anode coatings to protect the inoculum, and using selective inoculum of microorganisms for the nutrient in question. If we can successfully model these relationships, this research could help us monitor, manage nutrients better and improve crop production rates through 2050 demands.

PLANT RESOURCES MEDIATE REPRODUCTION AND FLIGHT IN A SPECIALIZED APHID PREDATOR HIPPODAMIA CONVERGENS (COLEOPTERA: COCCINELLIDAE)

Hannah Stowe[1], JP Michaud[2], and Tania Kim[1]

[1]Department of Entomology; [2]Kansas State University Agricultural Research Center, Hays, KS

BACKGROUND AND PURPOSE: *Hippodamia convergens* is an important aphid predator in agricultural systems, especially in winter wheat, and later follows pests into summer crops. Plant resources enhance *H. convergens* fitness and can increase survival during periods of low prey availability. Insect predators must disperse across the agricultural landscape to seek prey aggregations that are patchily distributed and temporally variable. Movement, especially flight, is energetically costly to adult beetles and likely limits metabolic resources that could be subsequently invested toward reproduction. Plant resources can augment individual performance and survival via effects on body size, fecundity, and adult dispersal capacity. **METHODS:** We tested how plant resources influence reproduction and flight, and how body size mediates this influence. Beetle size was manipulated by controlling access to larval food supply; 3hr/day to produce small beetles, *ad libitum* to produce large beetles. Adult reproduction was tracked for 18 days, and flight measured via 3h bouts of tethered beetle flight. **RESULTS:** Beetles fed *ad libitum* grew larger and developed faster than beetles on the restricted diet. Omnivorous diet treatments improved overall fecundity relative to prey-only diets, while fertility was unaffected by diet treatment. Adult size showed little to no effect on reproductive metrics. Body size and reproductive performance interacted with flight in adult beetles. **CONCLUSION:** Increasing access to plant resources like pollen and nectar can increase reproduction and alter flight capacity in *H. convergens*. Understanding the complex resource needs of these generalist insect predators can improve agricultural pest management and decrease both insect damage and input costs.

SUPERIOR REDUCTION OF SOIL LEAD BIOACCESSIBILITY VIA PHOSPHORUS SOURCE AND RATE SELECTION

Chandima Wekumbura[1], Ganga M. Hettiarachchi[1], William Hargrove[2], and Christina Sobin[3]
[1]Department of Agronomy; [2]Centre for Environment Resource, University of Texas at El Paso; [3]Department of Public Health Sciences, University of Texas at El Paso

BACKGROUND AND PURPOSE: The study of low-cost and environmentally safe inorganic and organic amendments for the in-situ reduction of the bioaccessible lead (BaPb) is timely. **METHOD:** Two organic (biosolids and compost) and two inorganic (triple superphosphate, TSP and monoammonium phosphate, MAP) phosphorus sources were the treatments. Alkaline soils with varying Pb concentrations (157, 328, 727, and 3200 mg kg^{-1}) were collected from four sites in El-Paso, Texas (EP1 through 4). Soils were mixed with 5 and 10% of biosolids and compost; Pb:P molar ratio (1:4 and 1:6) of TSP and MAP in triplicates and incubated at 25 °C up to 24 weeks at 40% of maximum water holding capacity. Changes of BaPb concentration using a modified physiologically based extraction test and soil pH were measured at 2, 4, 12, and 24 weeks after treating the soils. **FINDINGS:** Reduction of BaPb was observed in organic P treated all (EP1-4) soils over time. A significant treatment effect was observed in both compost and biosolids 10% followed by 5% treatments. The reduction of BaPb in EP1 and EP2 was nearly half of the control (33 to 16 % and 28 to 14 %, respectively), while EP3 and EP4 are 37% (53 to 33 %) in biosolid 10% treatment. A significant effect of inorganic P treatments was observed in highly Pb contaminated soils (EP3 and 4). **CONCLUSION:** These findings suggest that the possibility of using organic P sources, such as biosolids and compost, for superior mitigation of mildly to highly Pb contaminated residential alkaline soils.

COMPARATIVE ASSESSMENT OF MICROBIAL QUALITY OF AGRICULTURAL WATER IN KANSAS AND MISSOURI FRESH PRODUCE FARMS

Yeqi Zhao[1], Olivia C. Haley[1], Josha M. Maher[2], Sarah E. Gragg[3], Londa Nwadike[4,5], and Manreet S. Bhullar[1*]

[1]Department of Horticulture and Natural Resource Sciences; [2]Tennessee State University; [3]Department of Animal Sciences and Industry; [4]Kansas State Research and Extension; [5]University of Missouri Extension

BACKGROUND AND PURPOSE: In 2015, the Food and Drug Administration published the Produce Safety Rule (PSR) to minimize food safety risks from farm to fork. Many traceback investigations have attributed foodborne outbreaks to the use of contaminated source water, and the PSR designates surface water as 'high risk' and ground waters as 'low risk' of contamination. However, surface water is most common in agricultural operations in the United States due to the ease of access and use. The aim of this study is to determine the prevalence of agricultural water sources and compare the relative generic *Escherichia coli* contamination of said sources in Kansas and Missouri. **METHOD:** The databases of two microbial water quality testing laboratories in Kansas and Missouri were compiled and analyzed. Water samples were tested for total number of *E. coli* which is the indicator of fecal contamination, also record the sample sources, and growers' addresses as addition information. Microbial water quality results are separated and compared by area and sample sources. **RESULTS/FINDINGS:** In total data (n=760) 507 (66.71%) of the observations are valid. There were no statistically significant differences detected between the states ($p < 0.0840$) but the concentration of *E. coli* in surface water sources was significantly greater than that of ground water ($p < 0.0001$) and 'other' water ($p < 0.0004$) sources. **CONCLUSION:** As a result, surface water has a relatively higher contamination possibility than groundwater, requiring additional attention to avoid fecal contamination. More extension education is needed about water collecting protocol and PSR requirements.

Biological Sciences

EFFECT OF ACUTE AND CHRONIC EXERCISE ON RADIOSENSITIVITY IN PROSTATE TUMORS

Dryden R. Baumfalk[1], Alexander B. Opoku-Acheampong[1], Trenton Colburn[1] Andrew G. Horn[1], Olivia N. Kunkel[1], Timothy I. Musch[1,2], Dietmar W. Siemann, and Bradley J. Behnke[1,3]
[1]Department of Kinesiology; [2]Department of Anatomy and Physiology; [3]Johnson Cancer Research Center; [4]Department of Radiation Oncology, University of Florida

BACKGROUND: Solid tumors contain hypoxic regions that have long been known to be resistant to standard radiation therapy. Our prior research has shown that exercise training can decrease regions of hypoxia via enhanced oxygen delivery (via blood flow). Using a pre-clinical model of prostate cancer, we tested the hypothesis that either exercise training or a single exercise session will enhance radiotherapy outcomes via mitigation of hypoxia. **METHODS:** Prostate adenocarcinoma cells were injected in the prostate of 5-month-old male RNU rats (n=20). Animals were randomized into three groups, Tumor Bearing Sedentary (TBS), acute exercise (TBAEX), or Chronic Exercise (TBEX). TBEX animals exercised at a moderate-intensity (60-70% of max) on a motorized treadmill for 5-weeks, whereas TBAEX were exercised for one 30-minute bout at the same intensity 20-minutes before irradiation. Clonogenic cell survival was used to assess survival fraction after ionizing radiation. Assessment of aerobic capacity was assessed pre-injection and post-exercise training. **RESULTS:** The survival fraction after radiotherapy was lower for both acute and chronic exercise vs TBS (TBS 56.1±6.2; TBAEX 41.2±3.2; TBEX 48.7±6.9%, $p<0.05$). Following training, $\dot{V}o_{2max}$ (in $ml \cdot min^{-}1 \cdot kg^{-1}$) increased in TBEX by 6.4±1.3 and decreased by 5.6±2.0 ($P<0.05$) in TBS. **CONCLUSION:** This study suggests that both acute and chronic exercise have the potential to enhance radiotherapy compared to sedentary counterparts. Further, prostate cancer, independent of treatment significantly diminishes maximal aerobic capacity, but was maintained with moderate intensity exercise training. These findings suggest exercise as a novel method to improve both therapeutic outcomes and quality of life of cancer patients.

DETERMINING SWINE ENTERIC MICROBIOME FUNCTIONS FOR OPTIMIZED NUTRIENT UTILIZATION, GROWTH, AND HEALTH

Brandi Feehan[1], Megan Niederwerder[2], Bob Goodband[3], and Sonny T.M. Lee[1]

[1]Division of Biology; [2]Department of Diagnostic Medicine/Pathobiology; [3]Department of Animal Sciences and Industry

BACKGROUND AND PURPOSE: Animal health and production play critical roles in the sustainability and efficiency of agriculture. However, the underlying microbial communities and their associated functions, which harbor lifelong health and growth implications, are not fully understood. Improvements in swine production can be implemented through a better understanding of the critical biological and physiological mechanisms underlying nutrition, growth, and health. This study elucidated the functions of the swine enteric microbiome to build upon previous swine microbiome studies where functional and longitudinal, over swine stages of production (pre-weaning and nursery), analyses were lacking. **METHODS**: Fecal samples from seven pigs were collected during the pre-weaning and nursery stages. Microbial DNA was extracted followed by shotgun sequencing, microbial taxa assignment through Kaiju, and carbohydrate utilization genes annotation in Paladin. **RESULTS/FINDINGS**: There were distinct differences in both microbial community structure and function between the pre-weaning and nursery pigs. In pre-weaning pigs, Bacteroidetes was prevalent alongside starch digestion genes. Once the pigs were weaned, Firmicutes became the most prevalent taxa. Microbial function in nursery pigs also shifted towards DNA repair through a DNA glycosylase enzyme. **CONCLUSION**: Microbial population and functional distinctions were found between two production stages of swine. These shifts are likely the result of dietary changes and weaning stress. A greater understanding and application of microbiomes would improve swine host health, growth and welfare which impact overall profitability.

UNIVERSAL FLUORESCENT SENSORS FOR DETECTION AND QUANTIFICATION OF BACTERIAL SIDEROPHORES AND METAL COMPLEXES

Ashish Kumar, Salete M. Newton, and Phillip E. Klebba
Department of Biochemistry and Molecular Biophysics

BACKGROUND: To proliferate in the host environment during colonization or infection, bacteria acquire iron from eukaryotic tissues, fluids, cells and proteins. To do so, they secrete siderophores that chelate iron, and they express membrane transporters that recognize and internalize ferric siderophores. The production of siderophores and the acquisition of ferric siderophores are determinants of microbial pathogenesis. For example, the *E. coli* outer membrane protein FepA actively transports ferric enterobactin, a prototypic catecholate iron complex of the Enterobacteriaceae, whose utilization promotes colonization of the mouse gut. **METHOD:** We genetically engineered several fluorescent sensors to detect, discriminate and quantify ferric siderophores, in purified form or in complex mixtures of metabolites and other biochemicals. By substituting single Cys residues in TonB-dependent outer membrane transporters, and modifying them with maleimide fluorophores in living cells, we created sensors from different bacterial species e.g. *klebsiella, Pseudomonas, Acinetobacter* etc., that recognized different metal complexes: native, glucosylated, degraded ferric enterobactin; the hydroxamates ferric aerobactin, ferrichrome, ferric acinetobactin and ferrioxamine B: the porphyrins hemin and vitamin B_{12}. **RESULT AND DISCUSSION:** In spectroscopic assays these constructs sensitively detected and quantified the different metal chelates in solution. These sensors facilitate assays of biochemical specificity, affinity, and membrane transport. They may also detect the presence and activities of bacterial pathogens, that often show a particular profile of siderophore production or ferric siderophore utilization. The sensors are useful for both basic research and drug discovery, because they rapidly detect and identify siderophores in both clinical and food samples.

THE CANINE HOST APPEARS TO SERVE AS A SENTINEL SPECIES FOR TICK-BORNE DISEASES CAUSED BY *ANAPLASMA, EHRLICHIA* AND *BORRELIA* PATHOGENS IMPACTING HUMAN HEALTH IN THE USA

Swetha Madesh[1], Arathy D.S.Nair[2], and Roman R.Ganta[1*]
[1,2]*Department of Diagnostic Medicine/Pathobiology*

INTRODUCTION: Tick-borne diseases continue to threaten the health of people and dogs. In the USA, human Lyme disease cases, caused by *Borrelia burgdorferi*, are the highest followed by diseases resulting from *Ehrlichia* and *Anaplasma* species. We investigated the prevalence of these diseases in dogs and compared with human data. **METHODS:** Clinically suspected dog blood samples from across the US were assessed for pathogen-specific antibodies. An ELISA assay was performed for *B. burgdorferi*, while indirect immunofluorescence assay was used for *E. chaffeensis, E. canis* and *A. phagocytophilum.* **RESULTS/DISCUSSION:** A total of 1,340 samples were assessed for antibody analysis. A total of 286 (21.3%) samples tested positive for *A. phagocytophilum*, 228 (16.9%) for *E. chaffeensis*, 233 (17.3%) samples for *E. canis* and 366 samples (27.2%) for *B. burgdorferi*. Some of the *Ehrlichia* positives are likely the result of antigenic cross-reactions between the two species. Similarly, some *A. phagocytophilum* positives may represent *A. platys* positives. Co-infection with both *Anaplasma* and *E. chaffeensis* species was observed in 65 dogs; 64 dogs were positive for both *Anaplasma* and *E. canis*; 76 dogs were double-positive for *Anaplasma* and *Borrelia*; 34 for *Ehrlichia* and *Borrelia*; and 8 dogs positive for all three species. We observed a significant overlap in the geographical distribution of the observed disease prevalence in dogs with those reported for people. **CONCLUSION:** Our data suggest the occurrence of tick-borne diseases in dogs is very similar to documented human cases. Thus, monitoring canine infections has important implications for both human and companion animal health.

~1ST PLACE PRESENTATION~

EFFECTS OF PULMONARY HYPERTENSION ON MICROCIRCULATORY HEMODYNAMICS IN RAT SKELETAL MUSCLE

Kiana M. Schulze[1], Ramona E. Weber[1], Trenton D. Colburn[1], Andrew G. Horn[1], K. Sue Hageman[2], Carl J. Ade[1], David C. Poole[1,2], and Timothy I. Musch[1,2]

[1]Department of Kinesiology; [2]Department of Anatomy and Physiology

INTRODUCTION: Pulmonary hypertension (PH) is a disease of elevated blood pressure in the pulmonary vasculature resulting in cardiac dysfunction, reduced exercise capacity, and eventually, death. Because heart failure compromises skeletal muscle microvascular function, contributing to exercise intolerance, we tested the hypothesis that such changes might also be present in PH. Thus, we investigated skeletal muscle oxygen (O_2) transport in the rat model of PH to determine if O_2 delivery ($\dot{Q}O_2$) is impaired at the level of the microcirculation (capillary) as evidenced via reduced red blood cell (RBC) flux, velocity, and percentage of capillaries flowing at rest. **METHODS:** Progressive PH was induced in adult male rats via a one-time injection of monocrotaline. Rats were monitored via echocardiography and, once PH was evident, the spinotrapezius muscle was exposed and intravital light microscopy was performed in the resting muscle to visualize blood flow in the microvasculature. **RESULTS:** 3 weeks following injection, PH rats displayed pulmonary and cardiac characteristics consistent with moderate PH. PH rats presented with slower blood flow (RBC velocity) and a reduced proportion of capillaries supporting continuous blood flow in the muscle compared to healthy rats (61±11 vs 79±8%; $P<0.05$). Interestingly, no differences were observed in capillary RBC flux (cells/second) in PH. Despite this, overall $\dot{Q}O_2$ to resting skeletal muscle (% capillaries supporting flow x RBC Flux) was ~43% lower in PH rats ($P=0.036$). **CONCLUSIONS:** These data demonstrate that microcirculatory impairments (↓ $\dot{Q}O_2$) are present in the skeletal muscle of PH rats which may help provide a mechanistic basis for reduced exercise capacity in PH.

PEPTIDE DESIGN FOR CANCER IMMUNOTHERAPY

Ravindra Thakkar and Jeffrey Comer
Department of Anatomy and Physiology

BACKGROUND AND PURPOSE: Immunotherapy activates the patient's own immune system to treat cancer. Immune cells recognize a threat and get rid of it. But unfortunately, cancer cells often evolve to evade the immune system. An immune checkpoint protein, Cytotoxic T-Lymphocyte Associated protein-4 (CTLA-4) on T-cell surface makes a friendly bond with cancer cell by connecting with B-7 family proteins presents on cancer cells. This prevents T-cell activation against the cancer cell. Hence, the blocking of this friendly bond helps to trigger the immune response against cancer cells. **METHOD:** We investigated the X-ray crystal structure of the CTLA-4 and B7-2 protein complex using VMD and identified key residues on CTLA-4 protein where the B7-2 protein binds. From this, we designed *de novo* cyclic inhibitor peptides that bind to the CTLA-4 protein exactly where the B7-2 protein binds, using the FlexPepDock module of the Rosetta molecular modeling suite. **RESULTS/FINDINGS:** These *de novo* cyclic peptides showed the ability to stay bound with the CTLA-4 protein for microseconds of molecular dynamics simulation, which is longer than the B7-2 protein stays bound to CTLA-4. Additionally, the binding free energy calculated for these peptides (–33 kcal/mol and –26 kcal/mol) to CTLA-4 was more favorable than that of the B7-2 protein to CTLA-4 (–24 kcal/mol). **CONCLUSION:** In conclusion, the results from the computational experiments suggest that the peptides that we developed are potential candidates to inhibit complex formation between CTLA-4 and B-7 family proteins and, consequently, may reactivate the immune response against cancer cells.

~2ND PLACE PRESENTATION~

CAPILLARY HEMODYNAMICS IN HEART FAILURE: EFFECT OF SOLUBLE GUANYLYL CYCLASE ACTIVATOR

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BACKGROUND AND PURPOSE: Heart failure (HF) following a myocardial infarction (MI) is a disease of poor prognoses and diminished exercise capacity. Despite many established therapies, reduced skeletal muscle blood flow remains a large contributor to exercise intolerance in this population. Decreased skeletal muscle blood flow is due, in part to, vascular dysfunction via impairments in the nitric oxide-soluble guanylyl cyclase (sGC) pathway. Therefore, novel pharmacological interventions are critical to promote sGC signaling allowing for improved skeletal muscle blood flow. We hypothesized that by using a drug to selectively target sGC (sGC activator), there would be an increased red blood cell (RBC) velocity and percentage of capillaries supporting blood flow. **METHOD:** HF was induced in rats via surgically induced MI. Following ~3 weeks of HF progression, sGC activator was administered via oral gavage for 5 days. The control HF group received vehicle only. High resolution intravital microscopy recorded RBC velocity and percentage of capillaries supporting flow in the skeletal muscle. **RESULTS/FINDINGS:** Moderate HF was achieved in both groups. Rats receiving sGC activator resulted in increased RBC velocity by 36% and percentage of capillaries supporting flow by 10% ($P < 0.05$). **CONCLUSION:** Administration of the sGC activator increases resting skeletal muscle capillary hemodynamics therefore improving skeletal muscle blood flow. This suggests a strong therapeutic potential for sGC activators in cardiovascular disease by improving oxygen delivery and potentially exercise capacity.

FUNCTION INVESTIGATION IN STREPTOCOCCAL β PROTEIN

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BACKGROUND AND PURPOSE: Group B Streptococcus (GBS) colonizes the gastrointestinal and vaginal epithelia of a large population of healthy women. GBS may cause ascending intrauterine infection during childbirth and poses a risk for serious disease in newborns. As a cornerstone of innate immunity, the complement system plays an essential a role in defense against invasive GBS infection. Complement factor H (fH) is a complement regulatory protein, whose principal function is to inhibit activity of the complement system. Interestingly, many GBS strains express a cell surface protein, called β, which has been shown to bind fH. How β binds to fH at the molecular level remains unclear. **METHOD:** We used a combination of proteomics, site directed mutagenesis, and direct binding assays to define the fH binding domain of the β protein. Following this, we used X-ray crystallography to determine a three-dimensional structure for the β protein fH binding domain. **RESULTS:** We mapped the fH binding region to residues 688-789 of the β protein. A 2.36 Å resolution crystal structure of this region revealed a three alpha-helix bundle fold, variations of which are common among bacterial immune evasion proteins. Finally, site directed mutagenesis of a prominently disordered loop within this domain reveled that these residues are required for fH binding. **CONCLUSION:** Our studies define the fH binding site within β and strongly suggest that molecules which target this site may interfere with fH recruitment to the GBS cell surface. In this future, our work could support development of both vaccines and therapeutics.

WITHDREW

BEHAVIOR FEEDBACK AND NEED FOR COGNITION: FACTORS AFFECTING COFFEE BEVERAGE CONSUMPTION

Nicholas P. Gallivan and Laura A. Brannon
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BACKGROUND AND PURPOSE: The purpose of this study was to investigate whether one's tendency to engage in and enjoy cognitive activity (i.e., Need for Cognition) affects both individuals' intention to consume high-cost, high calorie "specialty" coffee drinks and their likelihood to reduce consumption of these drinks after reading a persuasive Behavior Feedback health message. **METHOD**: Through an online survey, participants were randomized to receive one of four messages: a "personalized" behavior feedback message, a "generic" feedback message that contained a memory prompt, a "generic" feedback message that did not contain a memory prompt, or no message. Pre- and post-intervention measures of specialty coffee drink consumption and participants' likelihood to reduce their consumption were recorded, and participants' levels of Need for Cognition were also assessed. **RESULTS**: Although each of the three behavior feedback messages were successful at reducing intention to consume specialty coffee drink compared to the no message control, an interaction effect between Need for Cognition and behavior feedback message condition was not established. Furthermore, Need for Cognition predicted both post-intervention specialty coffee consumption intention and likelihood of reducing consumption "in the next few days," but in a surprising manner. **CONCLUSIONS**: While both personalized and general behavior feedback were effective at reducing intention to consume specialty coffee drinks, further investigation into the effective elements of behavior feedback message interventions and the moderating effects Need for Cognition are warranted.

Engineering, Math, and Physical Sciences

EVALUATING SPATIAL AND TEMPORAL VARIATIONS IN SUB-FIELD LEVEL CROP WATER DEMANDS

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[1]Department of Biological and Agricultural Engineering; [2]Department of Statistics; [3]Department of Agronomy

BACKGROUND: Extrapolation of previous depletion rates of the High Plains Aquifer suggests that 35% of its Southern region will be unable to support irrigation within the next 30 years. More efficient irrigation practices have the potential to extend the useful life of the High Plains Aquifer in Western Kansas, but these practices often require accurate knowledge of crop water demands at the sub-field level. Crop coefficients are widely used to help estimate evapotranspiration, a measure of crop water demand, at different stages of a crop's growth cycle. Past research has shown how remotely sensed data can be used to estimate crop coefficients at regional and field levels. However, the amount of spatial and temporal variation in crop coefficients at the sub-field level has not been widely researched. **PURPOSE:** This study aims to quantify spatial and temporal variations in sub-field level crop coefficients and determine if maps of these coefficients can be used to develop more efficient irrigation schedules. **METHODS:** Canopy temperatures, vegetation indices, reference evapotranspiration, and weather data were gathered at two research plots and two Water Technology Farms in Southwest Kansas during the 2020 corn growing season. This information was used to create maps of the crop coefficients to estimate actual evapotranspiration at the sub-field level and determine the appropriate irrigation amounts for variable rate zones. **CONCLUSION:** This research will reveal differences in crop evapotranspiration at high spatial and temporal resolutions, allowing producers to make more informed management decisions and ultimately reduce their water consumption.

MODELING NEUTRONIC TRANSIENTS WITH GALERKIN PROJECTION ONTO A GREEDY-SAMPLED, POD SUBSPACE

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BACKGROUND AND PURPOSE: Computer simulations play a crucial role in studying complex dynamic systems. Real-world problems like design optimization and uncertainty quantification require repetitive evaluation of the simulation, which makes use of detailed, full-order models (FOMs) computationally prohibitive. Such models typically employ numerical schemes that cast the problem onto a discretized domain, which, for large applications, leads to high dimensional parameter (or input) and response (or output) spaces. Consequently, simplified (or surrogate) models that are computationally cheaper and reasonably accurate are often sought to carry out such calculations. In this contest, this work develops a ROM to approximate transients in nuclear reactors. **METHOD:** The POD-Galerkin projection technique was used to develop a (ROM) that approximates the solution of the time-dependent, diffusion equation with a lower computational cost.To construct the ROM efficiently, greedy sampling was used to generate a reduced subspace that represents the entire parameter domain. **RESULTS/FINDINGS:** A ROM constructed with a POD basis of rank 10 was able to reproduce the core power with a maximum RMS error on the order of10^{-6}. Moreover, the statistical moments obtained from the ROM were in good agreement with those of the full-order-model. The mean relative error of the power sample mean prediction was about10^{-6}. **CONCLUSION:** Overall, the developed ROM is reliable to be used for propagating the system parameters uncertainties to these of the responses of interest. In terms of computational cost, the total time consumed by the ROM was approximately 25\% of the time required for the full-order model.

WEARABLE MOBILE RADIATION DETECTOR SYSTEM

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BACKGROUND AND PURPOSE: In a post 9/11 world where counter-proliferation of nuclear weapons is a priority, the alerting, locating, and identifying of Special Nuclear Material (SNM) is especially important from a national security perspective. Researchers from Kansas State University (KSU), in conjunction with Radiation Detection Technology and the Electronics Design Laboratory, have developed a wearable mobile radiation detector system to aid the warfighter in search of SNM. The wearable modules, which are the size of a common cell phone, utilize CapeSym Strontium Iodide (SrI_2) detectors to detect gamma rays, which are prevalent in everyday enviroments, and then also perform isotope identification. Neutrons, which rarely occur naturally and are fairly unique to SNM, are detected with Dual Sided-Microstructured Semiconducting Neutron Detectors (DS-MSND) that are fabricated at KSU. All data is then communicated real time to an Android application for the operator to review. **METHOD:** To measure the weable mobile radiation detector system's performace, the modules were tested in static, kinetic, and angular scenarios while exposed to a Cf-252 neutron source and/or a Cs-137 gamma-ray source. **RESULTS/FINDINGS:** Results show that the weable mobile radiation detector system exhibits superior responses compared to previous generations of wearable radiation detection systems. **CONCLUSION:** The weable mobile radiation detector system allows an operator in the field to aquire real-time results of their radiation environment and locate suspected SNM. Future work will perfect radiation dose information, directional algorithms, source identification methods, and include more efficient neutron detectors.

~1ST PLACE PRESENTATION~

IS SMARTPHONE USAGE PREDICTING FEAR OF MISSING OUT AND LONELINESS IN A SAMPLE FROM THE GENERATION Z?

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BACKGROUND AND PURPOSE: Despite being an extremely connected society, new phenomena are stemming from this new tech-era, such as Fear of Missing Out (FOMO) and loneliness. In this project, data was collected from around 150 Generation Z engineering students to analyze possible individual predictors of FOMO and loneliness, and their link with objective measurements of smartphone and social media usage. **METHOD:** An initial survey collected the demographics and behavior data, along with assessing personality traits, FOMO, self-esteem, and loneliness with validated scales. To evaluate possible correlations between perceived and effective smartphone usage, individuals were instructed to download or activate a screen time monitor app on their smartphones in order to collect objective data. **RESULTS:** The results show that more than half of subjects underestimated their usage time, and there was no direct correlation between overall smartphone use and FOMO. When analyzing individual differences in personality traits, FOMO was linked to Agreeableness, Neuroticism and Extraversion. Loneliness was found to be related with subject's feelings after using social media, with more than 40% of them having negative or mixed feelings after visiting social media platforms. **CONCLUSION:** This study gives insights of behavioral decisions of younger adults and how individual differences might impact the outcomes of social media use.

TRIPLY ACTIVATED HALOGEN-BOND DONORS:
NEW MOLECULES WITH EXCELLENT σ-HOLE POTENTIALS

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BACKGROUND AND PURPOSE: Halogen bonding is a non-covalent σ-hole interaction used in a wide range of applications, from the design and synthesis of phosphorescent materials to pharmaceutical property modulation through co-crystallization. These applications are achieved as a direct result of the high directionality and tunability of these interactions, where the magnitude of the σ-hole potential on a halogen-bond donor is used as a yardstick to predict the strength of the resulting interaction. A strong interaction facilitates molecular recognition, structural prediction and self-assembly. One way to strengthen these interactions is by the addition of electron withdrawing groups, also known as activation. A double activation strategy can be realized by combining electron-with drawing groups with *sp*-hybridized carbon atoms to produce effective halogen-bond donors with very high σ-hole potentials. In this work, we attempt to establish if the boundaries of activation be pushed even further by a triply activated halogen atom? **METHOD:** A series of new triply activated molecules containing an iodine atom were designed and synthesized, and their crystal structures analyzed. Quantum chemical calculations were also carried out on these molecules to examine their σ-hole potentials and their resultant interaction energies. **RESULTS/FINDINGS:** Calculations show that these new molecules possess the highest known σ-hole potentials to date, which will facilitate the formation of very strong halogen bonds. **CONCLUSION:** This work provides a proof of concept that triple activation can be used as an effective strategy to form very strong halogen bonds which can also be extended to other σ-hole interactions.

ENCAPSULATION OF NANOPARTICLES INTO SELF-ASSEMBLED RECOMBINANT PROTEIN CAGES IN COMPLEX MOHOPHOLOGIES

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Tim Taylor Department of Chemical Engineering

BACKGROUND AND PURPOSE: Protein engineering have been promising in the biotechnology research because of the applications in various areas such as biosensors, biocatalysts and drug delivery. Especially, protein-based hybrid systems have the advantage of synergetic effects from combination of material properties of proteins and non-protein components. When proteins are combined to inorganics or polymers, chemical and physical properties can be improved. Also, manipulation of morphologies enables controlling the hybrid material properties. Protein cages, which are hollow with a cavity, are attractive for nanoparticle encapsulation for therapeutic applications. In this study, we demonstrate self-assembly of vesicle-like protein cages using recombinant proteins (mCherry-Z_E/Z_R-ELP) that encapsulate nanoparticles into complex morphologies. **METHOD:** We premixed polystyrene nanoparticles with the mCherry-Z_E/Z_R-ELP proteins that undergo temperature-triggered inverse phase transition. The protein-nanoparticle mixtures were incubated at an elevated temperature to induce protein cage formation and nanoparticle encapsulation. We monitored the self-assembly and encapsulation kinetics and analyzed the resulting morphologies using UV-Vis spectroscopy and fluorescent microscope. **RESULTS:** We observed formation of "pomegranate-like" hybrid materials where nanoparticles were spatially arranged within self-assembled protein envelopes. The correlation between cage size and number of nanoparticles indicated that more encapsulated nanoparticles resulted in growth in cage sizes and that nanoparticle encapsulation and protein self-assembly were cooperative. This was further supported by cage formation kinetics. **CONCLUSIONS:** Our platform is capable of encapsulating nanoparticles while modulating cage size and morphology, incorporating biological functions. It will provide a great potential for a wide range of biomedical application by extending it with various nanoparticle and recombinant proteins.

Poster Presentations

PREDICT PLANT GROWTH REGULATOR TIMING IN TURF BASED ON AIR TEMPERATURES

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BACKGROUND AND PURPOSE: Zoysiagrass is widely used on golf courses and is recognized for requirements for low maintenance. However, it produces seedheads in late spring, which deteriorates aesthetic quality. Recent research showed that using a plant growth regulator, ethephon, can suppress seedheads when applied in autumn. However, details on how to best determine ethephon timing needs more research. The objective was to determine if a growing degree day model could be used to identify the optimum application timing of ethephon. **METHOD:** To develop a model, a field study was conducted in 2018 at four locations: Manhattan, KS; West Lafayette, IN; Rogers, AR; and Knoxville, TN. The treatments consisted of 12 ethephon application timings and an untreated control. Seedhead suppression was determined by visual ratings of seedhead suppression on a 0-100% scale in which 100% = no visible seedheads. Cumulative growing degree days (GDD) were calculated starting August 1 using an equation, GDD = $[(T_{max} + T_{min})/2 - 5]$ where T is air temperature in ^{0}C. **RESULTS/FINDINGS:** A polynomial regression model provided the best estimate for determining ethephon application timing. The equation follows: Visual Seedhead Suppression (%) = $25 - 0.24\ (GDD) + 0.00075\ (GDD)^2 - 4.5e^{-07}\ (GDD)^3$; R^2= 0.78 and SE= +/- 16%. The model is presently under evaluation using results from separate validation experiments conducted in 2019 and 2020 in Manhattan, KS. **CONCLUSION:** The results will be useful to golf course superintendents and turf researchers for determining the optimum application date of ethephon to suppress seedheads in Meyer zoysiagrass.

DYEING POTENTIAL OF BICOLOR SORGHUM (*L. MONECH*) LEAF SHEATH ON HEMP FABRIC

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BACKGROUND AND PURPOSE: Interest for natural dyes has led researchers to grain produce and its by-products as colorant for textiles. Sorghum is a cereal grain grown for food and as feed for livestock in several countries. Its leaf sheath and husks constitute potential waste and disposal problems, despite its potential as a colorant. Prior research has examined colorfastness of sorghum husks on wool and silk. The purpose of this study was to evaluate the colorfastness and staining of sorghum leaf sheath on hemp fabric. **METHOD:** Hemp fabric was pre-treated (i.e., mordanted) with three solutions: gallnut and alum acetate, pomegranate and alum acetate, and alum acetate. Dye was extracted from bicolor sorghum leaf sheath in a heated aqueous solution. Hemp samples were dyed in heated dye solutions, rinsed, and air dried. Specimens were hand laundered using a neutral detergent according to the American Association of Textile Chemists and Colorists-6 (AATCC) for hand laundering. Colorfastness was evaluated for color change and staining according to AATCC gray scale. **RESULTS:** Results of color difference in colorimetric values of the control and laundered specimens were rated 1 indicating poor colorfastness across all pretreatments. Staining assessment showed slight staining on plant fibers, and noticeable/considerable staining on nylon polyamide and silk. **CONCLUSION:** Hemp fabric dyed with bicolor leaf sheaf was not colorfast to hand laundering, even with tannin pretreatments. Evaluation of other fibers and lightfastness are recommended.

~2ND PLACE PRESENTATION~

ANALYSIS OF POPULATION STRUCTURE OF *FUSARIUM GRAMINEARUM* ISOLATES

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Department of Plant Pathology

BACKGROUND AND PURPOSE: Fusarium head blight (FHB) is a serious disease of wheat and barley worldwide as it causes yield loss and contaminates grains with mycotoxins. FHB is mainly caused by the filamentous fungus *Fusarium graminearum* (*Fg*). *Fg* exists in populations correlated with variants of mycotoxins (chemotypes, e.g.: 3ADON, 15ADON, NX2, and NIV). However, large-scale population genomics studies critical for understanding population structure are limited. Population structure refers to the presence of groups of individuals (populations) that are genetically more similar within groups than between groups. **METHOD:** We sequenced 454 *Fg* isolates, aligned sequences against an *Fg* reference genome, and identified variants. Principal component and structure analyses were performed to infer the number of *Fg* populations. **RESULTS:** Based on these analyses, our isolates belong to at least three different populations. Across the Americas, population structure appears due to both chemotype and geographic origin. Population1 is mostly composed of US 3ADON and South American 15ADON isolates. Population2 is mainly composed of NIV, 3ADON and 15ADON isolates from Louisiana and population3 predominantly includes US 15ADON and NX2 isolates. Correlation between populations and chemotype is not perfect, however. For example, some 15ADON isolates clustered tightly with 3ADON isolates in population1 suggesting admixture (isolates with ancestry shared among populations). Louisiana isolates break into two populations as we increase the possible populations from three to four, suggesting further structure within population2. **CONCLUSIONS:** In conclusion, though *Fg* populations have diverged over time, ongoing gene flow between populations continues to shape *Fg* population structure. Understanding these population dynamics is critical to FHB management.

MODELLING THE IMPACT OF CLIMATE CHANGE ON THE CROPPING SYSTEMS IN THE EASTERN KANSAS RIVER BASIN

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BACKGROUND AND PURPOSE: In recent times, reports indicate increasing frequencies of extreme climate scenarios such as droughts and floods in Kansas. The study area selected is Eastern Kansas River basin (EKSRB) spread across seventeen counties that over several decades has seen numerous droughts and floods resulting in loss of income and livelihood related to agriculture. These scenarios will continue to occur with climate change; and it is uncertainties like these that put stress on livelihood associated with agriculture sector. This study focusses on modelling the cropping system to capture impact and variability associated with climate change scenarios in agriculture. **METHOD:** Crop simulation modelling tool, Decision Support System for Agrotechnology Transfer (DSSAT), is used to simulate and model the cropping system of corn-soybean in the study area. The crop model is calibrated for the study area. Furthermore, the crop yields and associated parameters are modelled for future climate scenarios using climate data from downscaled global climate model for RCP 4.5 (moderate greenhouse concentration) and 8.5 (high greenhouse concentration). **RESULTS/FINDINGS:** Currently, the DSSAT cropping model has been calibrated to the existing cropping systems for the study region. Projected climate data up to the year 2099 from eighteen different climate models for seventeen counties has been prepared.
CONCLUSION: Results from this study will help determine the vulnerability of food production systems in EKSRB region. This research will help policy makers to make informed policy decisions regarding risk mitigation for food production systems.

IMPROVING SAFETY OF YOUNGER DRIVERS AT INTERSECTIONS

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BACKGROUND AND PURPOSE: Due to increasing number of fatal motor vehicle crashes on roadways in the United States, it is essential to understand the risk factors leading to involvement in fatal crashes and propose countermeasure ideas to minimize the risk and enhance safety. The study aimed to determine factors associated with intersection-related fatal crashes involving drivers younger than 65 years old in the Midwestern states. A five-year fatal crash dataset from 2014 to 2018, from the Fatality Analysis Reporting System (FARS), was utilized for this study. In this part of the study, single-vehicle fatal crashes were taken into consideration, where multi-vehicle and older driver fatal crashes will be considered separately. **METHOD:** The logistic backward elimination procedure was applied to identify statistically significant predictor variables that increase the chance of having fatal crashes at intersections. **RESULTS/FINDINGS:** The predictors that increase middle and younger drivers single-vehicle related fatal crashes at intersections are: daytime, urban roadway, passenger car body type, driving under the influence of alcohol or using drugs, speeding related, controlled intersection, posted speed limit less than 55 mph, negotiating curve, if the most harmful event is a rollover, fire, or hitting animals, crash occurrences on roadway with level profile, and two way not divided highway. **CONCLUSION:** These identified factors could increase the risk of drivers being involved in single-vehicle fatal crashes at intersections. Based on the identified risk factors, countermeasure ideas are proposed to improve safety at intersections. Implementation of these countermeasures will improve safety of not only younger drivers, but also overall road user population.

ASSESSING URBAN STRESS AND WELL-BEING IN HIGH-CRIME NEIGHBORHOODS

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BACKGROUND AND PURPOSE: A poor connection to one's environment may negatively impact cognitive functions, in turn also impacting well-being. Previous studies have shown that blighted neighborhoods impact health in the short- and long-term influences such as behavior, attitude and even mortality (Ellen et al., 2001). The impact is a result of stress, and people normally seek out nature in times of stress (Berg et al., 2010). Blighted neighborhoods harbor lack of safety, inaccessible greenspace, and social tension; the cause of stress. The critical link between blighted neighborhoods and health is safety. This study finds ways for improving life quality through enhancing safety, access to greenspace and social connectedness in high-crime, blighted neighborhoods. **METHOD:** Areas of stress stimulants will be analyzed to set forth aid in the rejuvenation of mental health. Through urban acupuncture, small-scale architectural interventions will be the catalysts to bring about positive change to the larger urban field (Deyong, 2011). The Brush Creek neighborhoods in Kansas City, MO is the study area where enhancement of life quality for future urban neighborhood development is explored. **RESULTS/FINDINGS:** Through residents' perceptions and preferences, design guidelines and policies can be modified and created. A photo questionnaire given to approximately 140 people indicate what residents specify as stress, lack of suitable greenspace, and communal negligence. **CONCLUSION:** A transformation of abandoned spaces into restorative spaces is critical for urban health. The new guidelines serve as a model for high-crime neighborhoods to counter the negative impacts of urban stress.

COMPANY RESPONSES IN TIMES OF CRISIS: A CONTENT ANALYSIS OF COVID-19 EMAILS

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BACKGROUND AND PURPOSE: In early March of 2020, the coronavirus (COVID-19) epidemic began to have a significant impact on the United States as many communities began to adopt lockdown measures to slow the spread of the virus. In addition to impacting livelihoods and day-to-day activities, the virus also had an impact in an unexpected place: people's email inboxes. This study searches for recurring themes appearing in the many emails sent during the COVID-19 pandemic from companies all over the world to their clients. The goal is to identify themes and if companies employed use of Corporate Social Responsibility (CSR) between national companies and local businesses. **METHOD:** Through use of a content analysis, results indicate that many companies employed a corrective action approach to help mitigate the spread of the coronavirus, with national companies more likely to employ CSR than local businesses, if at all. **RESULTS/FINDINGS:** Results indicate that there is no difference between national and local businesses in marketing messages during the pandemic, CSR was not common but more likely to have a larger corporation to perform a CSR related action, emails were overwhelmingly anticipatory rather than reactionary, and the most commonly used response type was corrective action. **CONCLUSION:** These findings dictate consistencies and some differences between businesses at a national and local level in their responses to the COVID-19 pandemic. This denotes a response at either level would most likely not include marketing messages, and that national businesses were more likely to contain a message constituting CSR than local businesses, if at all.

~1ST PLACE PRESENTATION~

FLOWER PRINTS: A VALUE-ADDED APPLICATION FOR FLORAL WASTE

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Department of Interior Design and Fashion Studies

BACKGROUND: Each year significant numbers of flowers from temples of worship and special occasions are disposed after a single use. Such flower waste has created land and water pollution, invertebrate influx, and foul odor. At the same time eco-printing and plant pounding are gaining popularity as sustainable methods to color and print textiles. Pounding plants is the transfer of plant pigment onto textiles through the mechanical force of hammering. **PURPOSE:** To explore techniques of pounding flora onto fabric to produce prints as a value-added use for floral waste. In addition, design a zero-waste garment from the printed textile. **METHOD:** Various plants were hammered onto a range of fabrics to explore hammering techniques, print quality, and colorfastness. Zero waste garment designs were developed through draping and patternmaking. The selected bamboo fabrics were pre-treated to improve colorfastness. Based on experimentation, flower parts were separated, arranged for best pigment transfer, and directly pounded onto the garment design using a flat rubber edged hammer and a ball peen hammer. Fabric was steamed and washed. **RESULTS:** Flowers and leaves produced a defined and realistic print on tightly woven bamboo fabric, with less definition on the looser woven fabric. Heat setting darkened the plant pigments as did pre-soaking the flora in iron water solution. A ball peen hammer was most effective for pounding fine petal veins and edges. A zero-waste top and skirt were the final garment outcomes. **CONCLUSION:** Flower pounding is an inexpensive and easily taught method for adding value to the world-wide problem of floral waste.

FACTORS EFFECTING NET FARM INCOME ON LEASED LAND IN KANSAS

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BACKGROUND AND PURPOSE: Recently, leasing farmland has become increasingly popular due to increased farmland value. American agriculture is shifting from producers operating on owned farmland to operating on leased land as a means to better attain economies of scale without the long-term financial investment of purchasing land. Common economic theory may suggest that producers who operate on land they own are more profitable instead of those who lease the majority of the land on which they produce. However, leasing can offer multiple incentives that could contradict this intuitive economic theory. Currently, there is limited research in relation to this shift. Therefore, it is beneficial to properly study current farms that operate on both owned and leased land and determine what farm characteristics affect profitability on leased land. **METHOD AND RESULTS:** Using farm-level data, a Heckman Two-Step Model was implemented. Preliminary results show that leasing land assists farms in achieving economies of scale when controlling for farm type, region, and year. In addition, non-irrigated crop farms and mixed crop, cattle operations had overall lower net farm income per acre when deciding to operate majorily on leased land. **CONCLUSION:** This study aids producers in Kansas by providing information to those who may be considering the decision to purchase more land to operate on or to rent. Results suggest that non-irrigated crop farms that operated on majority leased land were not as profitable as those on majority owned land. This result may be driven by the years considered in the analysis and warrants further study of a longer time period.

UNDERSTANDING WOMEN IN LEADERSHIP FROM THE INSIDE: AN ICEBERG ANALOGY REPRESENTATION OF WOMEN IN LEADERSHIP POSITIONS FROM A PHENOMENOLOGICAL LENS

Sakshi Bhati

Leadership Communication Doctoral Program

BACKGROUND: Women in leadership positions around the world face personal and professional obstacles which distinguish their leadership practices, exerted through social interactions since their phenomenological experiences are unique. **PURPOSE**: The research aims to build a connection between the phenomenological experiences and social interaction to promote the importance of efficient leadership development and prevent barriers from transpiring, further empowering engaged and effective leadership practices. **METHOD:** In this conceptual research, I offer an iceberg illustration to understand how the experiences of women in leadership positions affect their leadership styles and communication. Utilizing a phenomenological lens, I will explore how experiences shape social interactions and leadership practices. The surface above the iceberg (physical place) is being illustrated as a woman's outer world where she interacts and exerts leadership practices and the bottom (phenomenological space) as her mental state which is filled with subjective experiences built by personal and societal barriers created in the outside world**.** **RESULTS/FINDINGS:** The relationship established between the surfaces of the iceberg is correlational, meaning that phenomenological experiences exert distinguished leadership practices in the physical world where women face barriers, which in turn, shape their mental state, making their experiences diverse. **CONCLUSION:** Addressing gendered workplace discrimination which contributes toward experiences that create barriers. Urging organizations to take measures in becoming more gender-neutral and elimination of the "glass ceiling." Establishing leadership efficacy in higher education institutions to engage students in women in leadership scholarship.