

Research and the State

GRADUATE STUDENT POSTER SESSION

Program Booklet

Tuesday, October 27, 2015
K-State Student Union

Sponsored by:
Graduate Student Council
Graduate School
Offices of the President and Provost

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Program Schedule

POSTER PRESENTATIONS AND JUDGING

9:00 am to 11:00 am
K and S Ballrooms

Research posters will be presented by approximately 50 K-State graduate students representing four academic colleges and 20 graduate programs. The top 10 presenters will be selected by K-State faculty judges to participate in the Capitol Graduate Research Summit (CGRS) being held in Topeka in February.

AWARDS CEREMONY

1:00 pm
Big 12 Room

The top 10 graduate student poster presenters selected to represent K-State by presenting their posters at the 13th annual Capitol Graduate Research Summit (CGRS) in February 2016 will be announced at the awards ceremony. These 10 students will be presented with a monetary award to recognize their achievement.

About the GRS

The CGRS is an annual showcase of research conducted by graduate students from Kansas State University, Wichita State University, the University of Kansas, the University of Kansas Medical Center, Fort Hays State University, and Pittsburg State University. Participants have the opportunity to present their research posters and discuss the important implications their research has for issues in the state of Kansas with state legislators, the governor, and the Board of Regents. Academic and industry representatives serve as judges to select the top presenters from each institution to receive scholarship awards.

Poster Titles and Presenters

GROUP 1

- 1. EVALUATING THE IMPACT OF SCHOOL FOODSERVICE COOLING TECHNIQUES ON ESCHERICHIA COLI POPULATIONS IN A COMMERCIALY AVAILABLE PRE-COOKED TACO MEAT PRODUCT**
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- 2. ACCELERATED SHELF LIFE TESTING OF NOVEL SORGHUM-BASED FORTIFIED BLENDED FOODS**
Sirichat Chanadang
- 3. PROTEIN QUALITY AND MICRONUTRIENT AVAILABILITY OF EXTRUDED CORN, SOY, SORGHUM, AND COWPEA FORTIFIED-BLENDED FOODS**
Nicole Delimont
- 4. A SENSORY COMPARISON OF PECAN CULTIVARS OF KANSAS IN RAW, ROASTED, AND CANDIED FORMS**
Brendan Kelly
- 5. EFFICACY OF A WASHING SYSTEM AND COMMERCIAL PRODUCE WASHES TO REDUCE ESCHERICHIA COLI SURROGATES ON GREEN LEAF LETTUCE SURFACE**
Keyla Lopez
- 6. EXTENDED AGING IMPROVES TENDERNESS OF THE SEMITENDINOSUS BY INCREASED MYOFIBRILLAR PROTEOLYSIS**
Kelsey Phelps

GROUP 2

- 7. RNA-SEQ ELUCIDATES THE MOLECULAR BASIS OF CHARCOAL ROT RESISTANCE IN GRAIN SORGHUM**
Ananda Bandara
- 8. CORN RESPONSE TO STARTER PHOSPHORUS IN ADDITION TO FERTILIZER BANDED WITH STRIP-TILLAGE**
Cristie Edwards
- 9. EFFECTS OF VARYING METHODOLOGIES ON GRAIN PARTICLE SIZE ANALYSIS**
Julie Kalivoda
- 10. DO CORN HYBRIDS WITH DIFFERENT DROUGHT TOLERANT TRAITS RESPOND DIFFERENTLY TO IRRIGATED AND RAIN-FED ENVIRONMENTS?**
Trenton Newell
- 11. GENOMIC DISSECTION OF LEAF AND PANICLE ARCHITECTURE TRAITS IN SORGHUM USING NESTED ASSOCIATION MAPPING.**
Olalere Olatoye

12. ROOT SYSTEM OF COMMERCIAL DROUGHT TOLERANT AND CONVENTIONAL CORN

Alexandre Tonon Rosa

13. TRANSCRIPTIONAL PROFILING OF ALS HERBICIDE RESISTANT SORGHUMS WITH EARLY SEASON LEAF YELLOWING

Dilooshi Weerasooriya

14. KANSAS WHEAT YIELD RESPONSES TO MULTIPLE DROUGHT INDICES OVER 1970 TO 2007

Zachary Zambreski

GROUP 3

15. EVALUATING THE EFFECTS OF SIMULATED GOLF CART TRAFFIC ON DORMANT BUFFALOGRASS AND TURFGRASS COLORANTS

Evan Alderman

16. PHENOTYPIC DISTRIBUTION MODELS INCORPORATE ECOTYPIC VARIATION OF THE DOMINANT PRAIRIE GRASS ANDROPOGON GERARDII IN RESPONSE TO CLIMATE CHANGE IN MIDWEST GRASSLANDS

Jacob Alsdurf

17. NITROUS OXIDE EMISSIONS AND CARBON SEQUESTRATION IN TURFGRASS: EFFECTS OF IRRIGATION AND N FERTILIZATION

Ross Braun

18. ADAPTIVE ECOTYPIC VARIATION AND GENETIC DIVERGENCE OF A WIDESPREAD GRASS ANDROPOGON GERARDII ACROSS A GREAT PLAINS' CLIMATE GRADIENT

Matthew Galliard

19. THE EFFECT OF RESIDUE MANAGEMENT, ROW SPACING, AND SEEDING RATE ON WINTER CANOLA ESTABLISHMENT AND SURVIVAL

Baylee Showalter

GROUP 4

20. EFFECT OF THERMAL REDUCTION ON PORCINE EPIDEMIC DIARRHEA VIRUS (PEDV) CONTAMINATED FEED

Roger Cochrane

21. PROTEASE ASSAYS FOR MASTITIS DIAGNOSTICS IN DAIRY CATTLE

Madumali Kalubowilage

22. EFFECT OF RACTOPAMINE-HCL ON MUSCLE FIBER TYPE AND EXHAUSTION IN FINISHING BARROWS

Jere Noel

23. THE INFLUENCE OF NUCLEAR SIZE ON CELLULAR KINETICS OF PROLIFERATING PORCINE FETAL MYOBLASTS

Mathew Vaughn

24. SPINNING STRAW INTO MILK: CAN AN ALL-BYPRODUCT DIET SUPPORT MILK PRODUCTION?

Caroline Ylioja

GROUP 5

25. CROSSFIT AND HEART HEALTH: CROSSFIT PARTICIPATION IMPROVES RESTING SYSTOLIC BLOOD PRESSURE FOR KANSAS ADULTS

Katelyn Gilmore

26. USING LATENT TRANSITION MODELS TO MONITOR THE PROGRESSION OF ALZHEIMER'S DISEASE

Jiena Gu

27. MECHANISM OF FERRIC ENTEROBACTIN TRANSPORT THROUGH FEPA IN GRAM NEGATIVE BACTERIA

Aritri Majumdar

28. DETECTION OF EARLY BREAST CANCERS: NANOPLATFORMS FOR HIGHLY SENSITIVE FLUORESCENCE DETECTION OF CANCER-RELATED PROTEASES

Aruni Malalasekera

29. ENGINEERING BIOMIMETIC NANOABSORBENT FOR DETOXIFICATION OF CHEMOTHERAPEUTICS

Tuyen Nguyen

30. THE EFFECT OF N-ACETYLCYSTEINE ON PERIPHERAL HEMODYNAMICS AND FATIGUE DURING EXERCISE

Joshua R. Smith

31. BISPHOSPHONATE FUNCTIONALIZED NANOMEDICINE FOR TARGETING BONE MICROENVIRONMENT

Soma Sekhar Sriadibhatla

32. EFFORTS TOWARDS THE TOTAL SYNTHESIS AND ELUCIDATION OF LAGUNAMIDE C

Chelsea Weese

GROUP 6

33. MODEL STUDY ON EXTRACTION OF FERMENTABLE SUGARS AND NONSTRUCTURAL CARBOHYDRATE FROM SWEET SORGHUM USING DIFFUSION PROCESS

Nana Baah Appiah-Nkansah

34. HIGHWAY SAFETY MANUAL CALIBRATION AND CRASH PREDICTION FOR RURAL MULTILANE HIGHWAYS IN KANSAS

Syeda Rubaiyat Aziz

35. CHARACTERIZING A MISSISSIPPIAN CARBONATE RESERVOIR FOR CO₂-EOR AND CARBON GEOSEQUESTRATION: APPLICABILITY OF EXISTING ROCK PHYSICS MODELS AND IMPLICATIONS FOR FEASIBILITY OF A TIME LAPSE MONITORING PROGRAM IN THE WELLINGTON OIL FIELD, SUMNER COUNTY KANSAS

Anthony Lueck

36. MICROWAVE SYNTHESIS OF DIFFERENT SIZES OF EMISSIVE INDIUM PHOSPHIDE NANOCRYSTALS

Raghavender Siramdas

37. EFFECTS OF PUMPING ON THE QUALITY OF THE CONCRETE AIR VOID SYSTEM

Jan Vosahlik

38. CLUSTER FREE SYNTHESIS OF MANGANESE-DOPED ZINC SELENIDE NANOCRYSTALS

Mohammad Sadegh Yazdanparast

GROUP 7

39. A NEW PROFIT STREAM FOR GRAIN SORGHUM: SENSORY PROFILES AND CONSUMER ACCEPTANCE OF DRY DOG FOOD

Brizio Di Donfrancesco

40. CONSUMER ACCEPTANCE OF DRY DOG FOOD VISUAL CHARACTERISTICS IN THE U.S.

David Gomez

41. INVESTIGATING DINING EXPERIENCES AT CHINESE RESTAURANTS USING USER-GENERATED CONTENT AND TOPIC MODELING

Xiaoye Li

42. THE MISTREATED SERVICE SABOTEUR: PLAUSIBLE SOLUTIONS IN THE RESTAURANT CONTEXT

Chen-Wei Tao

43. RURAL PRISONS & THEIR COMMUNITIES: A REVIEW OF ECONOMIC DEVELOPMENT

April Terry

44. STUDENTS' WRITING REFLECTS VARIED SOLUTION SCHEMATA ON TRADITIONAL MECHANICS PROBLEMS

Nandana Weliweriya

GROUP 8

45. FEMALE FIREFIGHTERS' PERCEPTIONS, ATTITUDES, AND EXPERIENCES WITH INJURY

Brittany Hollerbach

46. UNDERSTANDING THE DETERMINANTS OF WEIGHT BIAS AMONG DIETETICS AND NUTRITION STUDENTS AT KANSAS STATE UNIVERSITY

Mutiara Kusuma

47. A POPULATION-BASED STUDY OF COUPLING AND PHYSICAL ACTIVITY BY SEXUAL ORIENTATION FOR MEN

Joseph Lightner

48. FACTORS INFLUENCING BARRIERS TO STUDENTS REPORTING SEXUAL ASSAULT TO UNIVERSITY OFFICIALS

Allen Mallory

49. WHAT WE CAN LEARN ABOUT HEALTH FROM KANSAS TEENS: RESULTS OF THE KANSAS ADOLESCENT HEALTH NEEDS ASSESSMENT

Bryant Miller

50. BARRIERS TO REPORTING SEXUAL ASSAULTS TO UNIVERSITY OFFICIALS

Chelsea Spencer

Poster Abstracts

GROUP 1

1

EVALUATING THE IMPACT OF SCHOOL FOODSERVICE COOLING TECHNIQUES ON *ESCHERICHIA COLI* POPULATIONS IN A COMMERCIALY AVAILABLE PRE-COOKED TACO MEAT PRODUCT

Lindsay Beardall¹, Ellen Thomas², Randall K Phebus¹, Bryan Severns³, Paola Paez², Tracee Watkins², and Sara E. Gragg¹

¹*Department of Animal Sciences and Industry, College of Agriculture;* ²*Department of Hospitality Management, College of Human Ecology;* ³*Kansas State University Olathe*

BACKGROUND AND PURPOSE: Proper commercial food preparation practices are critical for preventing outbreaks of foodborne illness. Improper or “slow” cooling is the third leading factor in school associated foodborne illness outbreaks. Thus, research to scientifically characterize and validate cooling methods that are both effective and feasible for preventing pathogen growth during school foodservice preparation is critical to public health. **METHOD:** Commercially available pre-cooked taco meat was re-heated to 165°F, measured to 2 and 3 inch depths in commercial serving pans and allowed to cool to 135-140°F before inoculation with *Escherichia coli* (target population of 10⁴ CFU/g). Pans were placed in a commercial walk-in freezer (-20°C) or situated in ice water baths in a commercial walk-in refrigerator (4°C). All pans were either uncovered or covered with or without a gap to allow for air exposure. At 0, 4, 8, 12, and 24 hours, samples were plated onto MacConkey agar and incubated for 18-24 hours to quantify *E. coli* populations. **RESULTS:** No statistically significant difference (P=0.9335) in *E. coli* population level was observed for the cooling technique combinations evaluated in this study. However, sampling time was significant (P=0.0001). A time by cooling treatment interaction was not observed (P=0.1462); thus, data were evaluated by time alone. *E. coli* populations declined slightly from 4.5 log₁₀ CFU/g at 0 hours to 4.2 log₁₀ CFU/g at 24 hours. **CONCLUSIONS:** The lack of a cooling treatment effect combined with a small but statistically significant decline in target microbial population indicates that all foodservice cooling treatments evaluated were effective at controlling *E. coli* populations in cooked taco meat.

Relevance of Research to State-Related Topic(s)

This project directly pertains to food safety specifically as it relates to cooling practices in school foodservice settings. Variability related to food preparation facilities and chilling capacity, as well as variability in specific chilling protocols, exist in school foodservice operations across the state. Research into cooling methods that are effective at controlling foodborne pathogens in school lunch programs will directly benefit public health by reducing the risk of foodborne illness and by allowing a degree of necessary flexibility for foodservice operations. Children, particularly young children, are an at-risk population for severe illness and life-threatening complications from foodborne pathogens. Thus, by translating these data into educational materials and trainings for school foodservice personnel, this research will directly impact the health of children in a positive and meaningful way. While this study is targeted specifically for school foodservice, these data can be used to inform cooling protocols used in other commercial foodservice settings.

ACCELERATED SHELF LIFE TESTING OF NOVEL SORGHUM-BASED FORTIFIED BLENDED FOODS

Sirichat Chanadang and Edgar Chambers IV

Department of Human Nutrition, College of Human Ecology

BACKGROUND AND PURPOSE: Fortified blended foods (FBFs) have been used for more than four decades as food supplements in developing countries. Novel sorghum-based fortified blended foods have been developed for nutritional aid programs. These blends require lower energy to prepare into porridge and provide higher levels of nutrition compared to FBFs currently used in feeding programs. These type of products must maintain their desired characteristics for long period of storage due to uncertainties of shipping, distribution and consumption. This study aimed to estimate the shelf life of 14 novel blends. **METHOD:** Fourteen possible FBFs that varied in processing method and ingredients were stored under accelerated environmental conditions higher than those found in some tropical countries such as Tanzania that provided the equivalent of 24 months of standard tropical temperature and humidity storage. The blends were made into porridge and evaluated by a highly trained descriptive panel for seven time points. Rancid/painty odor and flavor attributes were the key determinants of the shelf life of the products. **RESULTS AND CONCLUSION:** Ten out of fourteen products could have shelf life longer than 24 months with no detection of rancid and painty attributes. Product with antioxidant added *before* extrusion had the shortest shelf life with less than 15 months. Product contained full fat soy was estimated to have shelf life less than 18 months and products contained sorghum variety 3 were estimated to have shelf life less than 24 months. Processing method and ingredients must be taken into account when developing products that expected to have long shelf life.

Relevance of Research to State-Related Topic(s)

Sorghum, which is widely grown in Kansas, is viewed as a potential alternative to wheat and corn based products that currently are used as FBFs. Sorghum generally is not a genetically modified organism (GMO), which allows it to be used in many countries around the world that have banned the use of GMO products. FBFs are a major potential use of sorghum by the United States Department of Agriculture and other groups who provide food aid around the world. These results show variations in processing and in cultivar that can be used for producing sorghum-based FBFs that meet the requirements for extended shelf life. That can increase the demand for a key Kansas grown commodity (sorghum) for value-added food application. This blend also provides good nutrition and requires lower fuel to prepare the porridge products, which can increase its cost competitiveness compared to FBFs currently used in feedings programs.

**PROTEIN QUALITY AND MICRONUTRIENT AVAILABILITY OF EXTRUDED CORN, SOY,
SORGHUM, AND COWPEA FORTIFIED-BLENDED FOODS**

Nicole Delimont¹ Alexander B. Opoku-Achempong¹, Nicole Fiorentino¹, Sajid Alavi², and Brian L. Lindshield¹
*¹Department of Human Nutrition, College of Human Ecology; ²Department of Grain Science and Industry,
College of Agriculture*

BACKGROUND: Corn and soybean micronutrient fortified-blended foods (FBFs) are commonly used for food aid. Sorghum may be a beneficial alternative to corn for food aid because of its global acceptability, drought-tolerance, local availability, and lack of genetic modification. Extrusion, which applies heat and pressure to precook commodities, may enhance nutritional quality of sorghum, and improve its utilization in FBFs. **OBJECTIVE:** Our objective was to compare nutritional quality of new extruded FBFs with a current non-extruded USAID corn and soy blend FBF, CSB+. **METHODS:** Two white and one red sorghum-cowpea, white sorghum-soy, corn-soy extruded FBFs, and CSB+ were fed ad libitum to 21-23 day old male weanling Sprague-Dawley rats (n=10) for 4 weeks. Anthropomorphic outcomes and iron status were analyzed post hoc. **RESULTS:** There were no significant differences in outcomes between extruded sorghum FBFs and extruded corn-soybean FBF consuming groups. CSB+ consumption resulted in significantly lower weight gain, caloric efficiency, protein efficiency, length, and food intake, compared to all groups. **CONCLUSION:** Compared with new FBFs, CSB+ intake resulted in growth suppression. Our findings suggest that newly formulated FBFs using extrusion processing are superior to CSB+, and that sorghum may have potential for use in FBFs.

Relevance of Research to State-Related Topic(s)

Kansas is the top producer of sorghum in the US, and thus, enhancing its utilization worldwide stands to increase demand for this grain. Enhanced use of sorghum may benefit the state environment and economy. This “farm to fork” research focuses on improving the nutritional quality, and utilization of a locally grown, drought-tolerant crop for global food aid. Projected demand for sorghum globally continues to grow in part because it is not genetically modified, and competitive pricing of sorghum may allow Kansas farmers to grow an alternative crop to corn in the future when water may be more restricted or limited. Additionally, by utilizing extrusion processing, our project may help to expand the global value added market for sorghum use for human consumption.

A SENSORY COMPARISON OF PECAN CULTIVARS OF KANSAS IN RAW, ROASTED, AND CANDIED FORMS

Brendan Kelly, Kadri Koppel, William Reid, and Edgar Chambers IV

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BACKGROUND AND PURPOSE: With the large variety of cultivars grown at Kansas State University's pecan research fields, understanding their sensory attributes in terms of food application is of particular interest. This objective of this research was to explore sensory differences among eight different pecan cultivars ('Pawnee', 'Witte', 'Kanza', 'Major', 'Lakota', 'Giles', 'Maramec', 'Chetopa') in raw, roasted, and candied forms. **METHOD:** A descriptive panel of six highly trained panelists evaluated each of the cultivars in raw, roasted, and candied forms in replicate to determine if any significant sensory differences existed between the cultivars. During two days of orientation, panelists familiarized themselves with the products and references. Panelists were given eight samples per session, completing two replicates of each sample in each form after six sessions. **RESULTS/FINDINGS:** Descriptive analysis showed several significant differences between the cultivars. The roasted pecans generally showed higher intensities of 'pecan ID' and 'overall nutty', while the candied pecans showed generally higher intensities of 'nutty-buttery,' 'caramelized,' 'overall sweet,' and 'salt' and lower intensities for 'nutty-woody,' 'brown,' 'musty/earthy,' and 'bitter' attributes when compared to other preparation methods. Chetopa, Giles, and Lakota cultivars had notable outlying attribute intensities. **CONCLUSION:** This data has shed light on attribute intensity differences, identifying each of the cultivars with a unique flavor profile. From this data, pecan growers can avoid cultivating pecans with higher intensities of undesirable attributes, namely bitterness and astringency of Lakota pecans and mustiness/earthy of Chetopa. This study also shows how candying pecans can mask certain attributes ('pecan ID,' 'nutty-woody,' 'brown,' 'musty/earthy,' and 'bitter').

Relevance of Research to State-Related Topic(s)

Southeast Kansas has the correct soil for growing pecan trees and is on the edge of the pecan growing region. KSU's Pecan Experiment Field in particular has made an impact on the pecan industry in the Midwest, helping to solve production and maintenance problems faced by pecan growers in the region. However, pecan growers in the state have not had data to market their pecan varieties in terms of flavor differences. This study will show which existing cultivars in the region have similar flavors, which have flavor defects, and which have unique flavors that can be valuable to manufacturers or consumers. Understanding the sensory profiles of the pecans will assist in the reduction of product waste, increase of consumer application, and economic growth of the pecan industry.

**EFFICACY OF A WASHING SYSTEM AND COMMERCIAL PRODUCE WASHES TO REDUCE
ESCHERICHIA COLI SURROGATES ON GREEN LEAF LETTUCE SURFACE**

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¹*Food Science Institute and Department of Animal Sciences and Industry, College of Agriculture;* ²*Department of Statistics, College of Arts and Sciences*

BACKGROUND AND PURPOSE: The increased number of foodborne outbreaks associated with fresh produce has emphasized the need to study new efficient, economical, and effective decontamination technologies to reduce the risk of foodborne illnesses. **METHOD:** Lettuce leaves were inoculated with a five-strain cocktail mix of rifampicin-resistant derivatives of *E. coli* surrogates and then washed with a commercial antimicrobial for fruits and vegetable treatment (CAFVT), 0.25% vinegar solution, or tap water (as control) for 120 s with or without agitation by using a continuous water motion system. *E. coli* populations were enumerated on day 0 after washing treatments and on days 1, 4, and 6 of storage (4°C). **RESULTS AND CONCLUSION:** On day 0, log reductions achieved by CAFVT (2.25 log CFU/g) were greater ($P=0.0145$) than those by water (1.34 log CFU/g), but similar to 0.25% vinegar (2.09 log CFU/g). Washing lettuce with continuous agitation achieved higher ($P=0.0072$) *E. coli* reductions (2.26 log CFU/g) than without agitation (1.53 log CFU/g). *E. coli* populations on lettuce leaves washed with CAFVT and water with agitation remained steady during storage, whereas *E. coli* populations on lettuce leaves washed with all other treatments slightly decreased over time. In conclusion, *E. coli* populations on day 0 were significantly affected by the wash solution and washing action (agitation), and storage of green leaf lettuce at refrigeration temperatures ($\leq 4^\circ\text{C}$) after washing reduced the risk of potential proliferation of *E. coli*.

Relevance of Research to State-related Topic(s)

Data from this study expands knowledge of wash treatments as an alternative for produce decontamination and its potential value for preventing cross-contamination during produce washing. Foodservice managers should be encouraged to use antimicrobial wash treatments for produce and should consider investing in a wash system to improve the microbial quality of produce and reduce the risk cross contamination between produce batches.

EXTENDED AGING IMPROVES TENDERNESS OF THE *SEMITENDINOSUS* BY INCREASED MYOFIBRILLAR PROTEOLYSIS

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BACKGROUND AND PURPOSE: Beef tenderness is the most important trait affecting consumer beef palatability satisfaction. More tender cuts can be sold at a greater price. The *Semitendinosus* is marketed at reduced prices due to its inherent toughness, but is typically aged only 17 days. The objective of this study was to examine effects of extended aging and intramuscular steak location on myofibrillar protein degradation and tenderness of *Semitendinosus* steaks. **METHOD:** Sixty *Semitendinosus* muscles were removed from the left side of beef carcasses produced under similar conditions. Extending from the proximal to distal end of the muscle, ten, 2.54-cm thick steaks were fabricated (**LOC**). Each steak pair was vacuumed-packaged and aged 7, 14, 21, 42, or 70 days (**DOA**). Following aging, steaks were assigned to Warner-Bratzler shear force (**WBSF**) or myofibrillar protein degradation analysis. **RESULTS:** Warner-Bratzler shear force values were reduced for steaks cut from the middle of the muscle compared to those cut from the ends of the muscle (closer to points of attachment); however, calpain activity and myofibrillar protein proteolysis were unaffected by LOC. Increasing DOA improved WBSF through d-70 to a level designated as guaranteed tender. Similarly, desmin and troponin-T continued to degrade through 70 DOA. Activity of intact calpain-1 decreased through d-70, but autolyzed calpain-1 and calpain-2 activity increased through d-42. **CONCLUSION:** Intramuscular WBSF differences are not due to calpain activity or myofibrillar degradation. Improvement of *Semitendinosus* steak WBSF through 70 DOA is partly due to degradation of desmin and troponin-T, possibly caused by activity of autolyzed calpain-1 and calpain-2 during extended aging.

Relevance of Research to State-Related Topic(s)

Kansas is home to 6 million beef animals, producing nearly 5.4 billion pounds of beef in 2013 and contributing \$12.9 billion to the state's agricultural revenue. According to the 2010 National Beef Tenderness Survey, tenderness is the most important palatability trait impacting consumer eating experiences. With record beef prices, consumers may be unable to afford steaks from the sirloin, loin, or rib, which are among the most tender cuts in the carcass, and therefore may seek alternatives from cuts commonly viewed as less tender. Muscles originating from the round or chuck are priced at reduced values because they are typically tougher than muscles from the rib or loin. The *Semitendinosus* was utilized to evaluate tenderization within the muscle and at longer aging periods. Understanding how tenderization occurs may lead to better marketing strategies for steaks or roasts from the *Semitendinosus* that may be applied to other inherently tough muscles.

RNA-SEQ ELUCIDATES THE MOLECULAR BASIS OF CHARCOAL ROT RESISTANCE IN GRAIN SORGHUM

Ananda Y. Bandara¹, Dilooshi K. Weerasooriya², Sanzhen Liu¹, and Christopher R. Little¹

¹Department of Plant Pathology, College of Agriculture; ²Department of Agronomy, College of Agriculture

BACKGROUND AND PURPOSE: Charcoal rot caused by *Macrophomina phaseolina* (MP) is one of the most destructive fungal diseases in sorghum. Although host resistance is the key management strategy, field screening for resistance is tedious. The objectives of this study were to: i) discover differentially expressed genes (DEG) between resistant and susceptible genotypes in response to MP inoculation and ii) understand their contribution to resistance, in order to select potential DEG to be deployed as molecular tags in resistance screening. **METHOD:** SC599 (resistant) and TX7000 (susceptible) sorghum genotypes were grown in the greenhouse and inoculated with MP. Control plants were mock-inoculated with phosphate buffered saline. RNA was extracted from 3 biological replicates at 2, 7, and 30 d (3 stages) post-inoculation (d.p.i.) from stem tissues and subjected to RNA-Seq. Analysis for DEG was performed with DESeq2 and pathway analysis was performed to explore DEG. **RESULTS/FINDINGS:** 8530 annotated genes were identified across 3 stages as significantly differentially expressed between 2 genotypes, out of which 2053 were components of 197 known metabolic pathways. 1722 DEGs were observed at 7 dpi, indicating the importance of MP-mediated host expression profile changes as early as 7 dpi. Of those, 945 genes were constituents of 21 pathways involved in stress responses, nitrous oxide-mediate oxidative burst, basal immunity, hormonal regulation, and nutrition. Most metabolic pathways including nitrate reduction, ethylene, jasmonic acid, and trehalose biosynthesis and homogalacturonan, triacylglycerol and glycerol degradation were significantly upregulated in TX7000, while those of SC599 were non-significantly changed. **CONCLUSION:** Results revealed the involvement of non-upregulated susceptibility genes for manifestation of the resistant phenotype.

Relevance of Research to State-Related Topic(s)

Charcoal rot disease in sorghum has been an unresolved mystery for decades, causing tremendous yield losses around the world. Although the top sorghum producer in the nation, Kansas undergoes a 4% average grain yield loss due to stalk rot diseases, resulting \$15 million annual economic loss. Inability to achieve a complete control of the disease through host resistance has been partly attributed to lack of comprehensive understanding on the molecular basis of resistance. Understanding the complexity of plant pathogen interaction at molecular level is instrumental in developing sorghum hybrids with durable resistance to charcoal rot disease. Here, for the first time, we have uncovered the global gene expression pattern differences and differentially expressed metabolic pathways between known resistant and susceptible sorghum parental genotypes in response to causal organism's infection. Findings can be directly deployed to accurately and rapidly screen sorghum germplasm for charcoal rot resistance, hence enhance Kansas sorghum productivity.

CORN RESPONSE TO STARTER PHOSPHORUS IN ADDITION TO FERTILIZER BANDED WITH STRIP-TILLAGE

Cristie Edwards and Dorivar Ruiz Diaz

Department of Agronomy, College of Agriculture

BACKGROUND AND PURPOSE: Producers often question the need for starter application in addition to deep band with strip-tillage. The objectives of this paper were to evaluate the long term effects of phosphorus (P) starter on corn (*Zea mays*). **METHOD:** A study was conducted at two locations, one under supplemental irrigation and one dry land, with a corn-soybean crop rotation established spring 2006. Strip-tillage was conducted before corn and soybean was planted without previous tillage. Treatment included a control, starter only (ST) at 20lb P₂O₅ ac⁻¹, and two total P rates of 40 and 80lb P₂O₅ ac⁻¹ with placements broadcast, broadcast with ST, deep band, and deep band with ST, applied before corn. This paper focuses on crop response to starter application. **RESULTS/FINDINGS:** Results show the effect of P rate and placement on early V-6 P uptake, Ear leaf and grain P, and yield became more significant over 9 years. Starter placement increased early P uptake when compared to both broadcast and deep band. In Scandia, starter increased yields by 10 and 6 bushel at the 40 and 80lb P₂O₅ ac⁻¹ rates with broadcast. Even with the deep band application below the seed, starter increased yield by 6 bushel in Scandia. However in Ottawa, starter decreased yields by 7 bushel compared to deep band. **CONCLUSION:** There is value in long term studies in evaluating P placement as greater influence is put on economical returns and issues with environmental P losses.

Relevance of Research to State-Related Topic(s)

As the practice of strip-tillage continues to be adopted in Kansas, producers need to be aware of what the long term implications of fertilizer placement are on their economics. By monitoring changes in tissue testing and soil test values, we have attempted to show the value of a long term study on these changes to inform producers on the superior fertilizer placements. In working with research and extension, we are able to communicate with farmers what resources, whether tissue testing or soil sample processing, producers have available through Kansas State University.

EFFECTS OF VARYING METHODOLOGIES ON GRAIN PARTICLE SIZE ANALYSIS

Julie Kalivoda, Cassandra Jones, and Charles Stark

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BACKGROUND AND PURPOSE: The current method for determining the geometric mean diameter (dgw) and geometric standard deviation (Sgw) of grains has been published in the ANSI/ASAE S319.4 Standard. This method controls many variables, including the material quantity, number, and size of sieves. However, the method allows for variation in shake time, sieve agitators, and use of sieving agent. The objective of this experiment was to determine which method of analysis best estimates the particle size of various cereal grains. **METHOD:** Corn, sorghum, or wheat were analyzed using different particle size analysis methods. Treatments were arranged in a 5×3 factorial design with 5 sieving methods: 1) 10 minute shake time with sieve agitators and no agent, 2) 10 minute shake time with sieve agitators and agent, 3) 15 minute shake time with no sieve agitators or agent, 4) 15 minute shake time with sieve agitators and no agent, or 5) 15 minute shake time with sieve agitators and agent conducted in 3 grains (corn, sorghum, or wheat). The dgw and Sgw were calculated according to both standard methods S319.2 and S319.4. **RESULTS:** There was no analytical method \times grain type interaction ($P=0.1720$) for dgw. Analytical method affected ($P<0.0001$) dgw and Sgw calculated by both standards. Inclusion of sieving agent reduced ($P<0.05$) the mean particle size by 32 or 36 μm when shaken for 10 or 15 minutes, respectively. **CONCLUSION:** Both sieve agitators and sieving agent should be included when conducting particle size analysis, but only 10 minutes of shake time is required.

Relevance of Research to State-Related Topic(s)

Kansas ranks tenth in the nation for swine production with about 3 million head marketed annually. About 50 farms located in the state, rely on swine production as their primary or secondary source of income. Feed cost accounts for 65-75% of the cost of production in swine. Economically and environmentally to finish a pig, swine feed cost decreases about \$1 and reduces the amount of feed required by seven pounds for every 100 micron reduction in the diameter of a corn particle. Particle size affects the rate and amount of digestion by increasing the surface area and access to nutrients. Particle size analysis is used a tool of measurement in the management of swine.

DO CORN HYBRIDS WITH DIFFERENT DROUGHT TOLERANT TRAITS RESPOND DIFFERENTLY TO IRRIGATED AND RAIN-FED ENVIRONMENTS?

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BACKGROUND AND PURPOSE: With decreased availability of irrigation water in central and western Kansas, producers are looking for more efficient ways to use available irrigation water. Drought-tolerant (DT) technologies have become popular in hybrids for low-yielding environments across central and western. **METHOD:** This study took place in North Central Kansas, at the Scandia experiment field. The objective of this study was to compare water use, yield, and water use efficiency (WUE) of two types of drought-tolerant corn hybrids and a high-yielding non-DT hybrid. Throughout the growing season soil moisture content, canopy temperature, ear leaf temperature, and chlorophyll content was measured at vegetative and reproductive stages. **RESULTS AND CONCLUSION:** The average yield (normalized to 15.5% moisture) for Pioneer 1151 AQUAmax™ (AM) was 129 bu/ac⁻¹ while Croplan 6000 DroughtGard™ (DG) was 134 bu/ac⁻¹, showing the DroughtGard™ hybrid had a slightly greater yield in the rain-fed environment. In the irrigated environment Pioneer 1151AM averaged 229 bu/ac⁻¹, while Croplan 6000DG averaged 205 bu/ac⁻¹, showing that this DroughtGard™ hybrid does not have as high of a yield response to water as the AQUAmax™ hybrid. The irrigated corn used a mean of 20.85 in. of water, and the rain-fed corn used a mean of 11.66 in of water. In the rain-fed environment the WUE for Pioneer 1151AM was 10.63 bu/in while Croplan 6000DG was 11.07 bu/in. Similar WUE was observed in the irrigated environment, with Pioneer 1151AM only slightly increasing, and Croplan 6000DG decreasing. Overall, Croplan 6000 DroughtGard™ showed more stable yields in the rain-fed environment than Pioneer 1151 AQUAmax™, and Croplan 6274.

Relevance of Research to State-Related Topic(s)

This study will provide a better understanding of DT corn hybrids, and their response to water availability for producers who are trying to maximize productivity in water-stressed environments. This will facilitate better estimates of corn production in various water-availability scenarios that take into account the latest in corn genetics, an important input for policy and cropping system decisions. As we continue to see tightening water restrictions across the state, producers will need to produce grain with less water. This research is of particular interest to the Kansas House Agriculture and Natural Resources Committee, the Senate Agriculture Committee, the Senate Natural Resources Committee, and is of relevance to Kansas 50 year water vision.

GENOMIC DISSECTION OF LEAF AND PANICLE ARCHITECTURE TRAITS IN SORGHUM USING NESTED ASSOCIATION MAPPING

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BACKGROUND AND PURPOSE: Sorghum is an important crop in many agroclimatic regions worldwide, and has adapted to a wide range of conditions. Accordingly, global sorghum germplasm exhibits substantial variation in agroclimatic traits—traits that differ in germplasm from different agroclimatic zones—including many aspects of leaf and panicle architecture. Currently, our ability to improve sorghum adaptation and transfer useful alleles across different genetic backgrounds is constrained by our limited knowledge of the genomic regions that underlie agroclimatic traits. Nested Association Mapping (NAM), which uses multiple biparental families linked by a common parent, can improve dissection of agroclimatic traits by reducing the confounding effects of population structure and increasing the frequency of rare alleles. **METHOD:** A sorghum NAM population comprised of 10 families and almost 2,500 recombinant inbred lines (RILs) has been developed and genotyped at approximately 100,000 SNPs with Genotyping-by-Sequencing (GBS). The population was phenotyped for leaf angle, leaf width, panicle compactness and primary rachis branch length in two contrasting environments (locations) in Kansas, semi arid (Hays) and humid continental (Manhattan). **RESULTS/FINDINGS:** Significant genotypic variation for these traits was observed. Association mapping confirmed several previously identified quantitative trait loci (QTL) and revealed many new QTL for leaf and panicle architecture. QTLs were found for leaf angle around the *Dw3* region in chromosome 7. Likewise, for lower rachis branch length, we identified Sb07g023640 a flavin monooxygenase gene close to the *Dw3* region on chromosome 7. **CONCLUSION:** The QTL identified will be helpful in marker-assisted selection for better adaptation and yield.

Relevance of Research to State-Related Topic(s)

Kansas state ranks second after Texas in grain sorghum production in the United States. In 2013, Kansas farmers produced 1,540,000 tons from 110,000 acres of cultivated sorghum. With the recent increase in US sorghum export to China production is anticipated to increase. In addition, with the recent drought experienced by corn farmers in the state which led to significant reduction in yield, sorghum which is a drought tolerant crop stands out as an important alternative to rescue our famers from such losses. In view of this, our research is focused on understanding the genomic basis underlying the adaptive traits the enable sorghum to survive under harsh environmental conditions such as drought. This will facilitate the development of markers that can help facilitate effective breeding of better adapted sorghum varities.

ROOT SYSTEM OF COMMERCIAL DROUGHT TOLERANT AND CONVENTIONAL CORN

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BACKGROUND AND PURPOSE: Plants with vigorous root system can potentially explore a larger soil volume for water and nutrients. The objective of this study was to compare two hybrids of corn (*Zea mays*) with contrasting root systems using image analysis. **METHOD:** The study was conducted in large columns in a greenhouse. Two hybrids of corn were used, one drought tolerant (DT), and the other a conventional hybrid (CT). Plant shoots and roots samples were collected at the V6, V10 and VT growth stages. Shoot and root dry weight and nutrient content were analyzed. Roots were scanned and processed with the WinRHIZO software to collect information about root length, surface area, average diameter and root volume. The experimental design was a completely randomized design with three replications. **RESULTS:** DT hybrid has higher shoot and root biomass than CT hybrids affecting the uptake of some nutrients. DT hybrid showed a significantly higher uptake of N, Mn and Zn in the shoot. DT hybrid roots had higher values for length, surface area and volume than CT hybrid. **CONCLUSION:** DT hybrids should have the potential to explore more soil volume for water and nutrients. This can benefit DT hybrids under drought prone regions.

Relevance of Research to State-related Topic(s)

Projections of future precipitation and water supply from the aquifer for crop irrigation suggest that water availability may be a limitation. Several studies conducted in US concluded that drought events will likely be more frequent in the Midwest part of the country. Those projections and also the pressure to reduce water consumption by agriculture are leading companies to develop drought tolerant crops to support these extreme conditions. Therefore, my research objective is to determine if some plant characteristics, such as root system can contribute to the performance of drought tolerant crops.

TRANSCRIPTIONAL PROFILING OF ALS HERBICIDE RESISTANT SORGHUMS WITH EARLY SEASON LEAF YELLOWING

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BACKGROUND AND PURPOSE: Sorghum (*Sorghum bicolor* (L.) Moench) acreage in the U.S. has shown a sharp decline in the past few decades. Among the many factors responsible were better weed control options that competing crops have offered. Sorghum farmers craved for years for an effective post-emergence weed control option. The discovery of the ALS resistance trait in wild sorghum was received with much optimism for improving management of grass weeds in sorghum. The trait was incorporated in to cultivated sorghum and released to the industry. While the trait offers resistance to a wide range of ALS herbicide chemistries, most resistant plants tend to show interveinal chlorosis and reduced seedling vigor. While this phenotype persists only for a short duration, it may be of concern to some growers and industries may like to deploy resistant hybrids without such an awkward phenotype. Thus, the objective of this study was to understand the genetic basis of this bizarre phenotype. **METHODS:** Two ALS resistant genotypes expressing yellow and normal phenotypes were grown in the field and leaf tissues were harvested at four time points until the yellowing symptom disappeared. RNA extracted from leaf tissue samples were subjected to RNA sequencing. Differential gene expression analysis was performed using DESeq2 followed by Gene Ontology enrichment, SorghumCyc pathway analysis and gene clustering using "mclust". **RESULTS AND CONCLUSION:** Results revealed significant regulatory activity in genes related to chlorophyll degradation, plant defense responses and hormonal networks. Further investigations on identified associated genes would provide future directions towards overcoming the interveinal yellowing issue.

Relevance of Research to State-related Topic(s)

The United States is the world's largest producer of grain sorghum and historically Kansas remained as one of the leading grain sorghum producing states. However, developments in weed control strategies in sorghum have not kept pace with other competing crops. Thus control of post-emergence weeds has become the number one issue in sorghum production. Though ALS herbicide resistant technology emerged as the most viable weed control option, the interveinal chlorosis often observed in most resistant plants has been a concern. The major focus of this research was to determine plant metabolic pathways leading to this chlorotic leaf phenotype and thus to facilitate the development of ALS resistant sorghum hybrids without undesirable seedling phenotypes.

KANSAS WHEAT YIELD RESPONSES TO MULTIPLE DROUGHT INDICES OVER 1970 TO 2007**Zachary Zambreski, Xiaomao Lin, and Gerard Kluitenberg***Department of Agronomy, College of Agriculture*

BACKGROUND AND PURPOSE: Historical droughts have significantly impacted agricultural productions in Kansas especially for non-irrigated wheat yields. In this study, four drought indices: Palmer Drought Severity Index (PDSI), and 3-, 6-, and 12-month Standardized Precipitation-Evapotranspiration Index (SPEI), were included to determine the most appropriate drought index for predicting non-irrigated wheat yields in Kansas. **METHOD:** High spatial resolution drought data was developed and averaged for eastern, central, and western Kansas. A total of four indices were used to generate twelve regression-based candidate models for each region, using multiple regression of monthly indexes from October to April, the mean winter index, and a single variable representing the summation of each index at the beginning and end of the growing season. Models were evaluated using three goodness-of-fit measures: the adjusted coefficient of determination, the root mean square error, and the mean absolute error. **RESULTS:** Model evaluation indicated that the stepwise regression model with a reduced set of monthly PDSI values is the most appropriate model in western and central Kansas followed closely by monthly values of SPEI-6. The strength of the statistically significant relationships is weaker in eastern Kansas with the SPEI-6 outperforming the PDSI. **CONCLUSION:** Regression-based models including a reduced set of monthly index values were overall better predictors of wheat yield than both mean winter values and the summation of indices at the beginning and end of growing season across all indices. These indices can allow for farmers to take appropriate measures to minimize losses earlier in the season.

Relevance of Research to State-Related Topic(s)

Kansas during the last century experienced persistent, widespread droughts that caused major economic damages. The estimated cost of the 2012 drought in Kansas was more than \$3 billion in crop losses. Non-irrigated wheat yields are sensitive to conditions throughout the entire growing season, and given the multitude of drought indices available to farmers, it is critical to know which indices perform best when modeling wheat yield in Kansas, which is a top producer of wheat in the United States. Indices that can predict end-of-season wheat yield before harvest provide opportunities for farmers to mitigate impacts and take appropriate measures to minimize losses at the regional and county-level given the spatial resolution of the drought datasets. Continued systematic analysis of drought can lead to better understanding of their impacts.

EVALUATING THE EFFECTS OF SIMULATED GOLF CART TRAFFIC ON DORMANT BUFFALOGRASS AND TURFGRASS COLORANTS

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BACKGROUND AND PURPOSE: Buffalograss [*Buchloe dactyloides* (Nutt.) Engelm] is a drought tolerant warm-season turfgrass species, lacking green color during dormancy. Colorants have been used to paint warm-season grasses green during winter dormancy to maintain color. Also, during dormancy, fairway turf is susceptible to injury from golf cart traffic. Limited research has been conducted to explore the interaction of golf cart traffic on turfgrass colorants and dormant buffalograss recovery. The objective of this study was to investigate turfgrass colorant longevity and buffalograss recovery when subjected to simulated golf cart traffic. **METHOD:** A research trial was initiated in 2014 at the Rocky Ford Research Center in Manhattan, KS on a buffalograss fairway. Treatments were arranged into a 4×5 factorial, randomized complete block design with four replications. Factors consisted of traffic rates: 0, 2, 4, and 8 passes/week and winter color: no colorant, Green Lawngr (GL), Endurant (E), Endurant Premium (EP), and Perennial Ryegrass (PR). Digital image analysis was conducted to determine percent green cover throughout the experiment. **RESULTS:** Colorant longevity decreased as traffic rate increased. Four weeks after initiation 8 passes/week for no paint, GL, E, EP, and PR resulted in 1.60%, 8.87%, 9.47%, 64.26%, and 61.20%, green cover, respectively. No colorant, GL, E, EP, and PR treatments resulted in 58.41%, 57.76%, 56.30%, 58.61%, and 16.27% green cover, respectively, 34 weeks after treatment when subjected to 8 passes/week. **CONCLUSION:** Endurant Premium maintained the highest green cover percentage throughout the study regardless of traffic level. All treatments excluding PR, recovered after winter traffic.

Relevance of Research to State-Related Topic

Both cool- and warm-season turfgrass species can be grown in Kansas. Cool-season species sustain green color during the winter months, but require substantial amounts of water during the summer months to survive. Warm-season turfgrass species, specifically buffalograss, use considerably less water than all other cool- and warm-season turfgrass species. Adversely, warm-season turfgrass species lack green color during winter dormancy and are susceptible to traffic injury. Using turfgrass colorants on warm-season grasses in Kansas allows superintendents to maintain winter color, while reducing irrigation needs during the summer months.

**PHENOTYPIC DISTRIBUTION MODELS INCORPORATE ECOTYPIC VARIATION OF THE
DOMINANT PRAIRIE GRASS *ANDROPOGON GERARDII* IN RESPONSE TO CLIMATE CHANGE
IN MIDWEST GRASSLANDS**

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BACKGROUND AND PURPOSE: *Andropogon gerardii* is an ecologically dominant grass in the Midwest. With wide distribution across a precipitation gradient (40 -119cm/yr), we expect ecotypic variation in drought tolerance and local adaptation. Understanding ecotypic variation will help predict how a dominant prairie grass may respond to current and predicted future climate change. Current practice uses species distribution modeling to predict an organism's response to climate change but fails to incorporate ecotypic variation within a species. Based on results from reciprocal gardens, we have shown evidence of local adaptation in big bluestem ecotypes as well as genetically-based adaptive divergence. **METHODS:** Our study characterizes phenotypes of 37 geographically distributed populations across the Midwest to incorporate intraspecific variation into maximum entropy models of current and predicted distribution under climate change. For each of the 37 populations, we grew plants from seed under greenhouse conditions and measured phenotypes (blade width, height, biomass, and chlorophyll absorbance). **RESULTS AND CONCLUSION:** PCA analyses show a phenotypic cline across populations that can be partially explained by longitude, mean annual precipitation, and vegetation type at the source collection site. We fed PCA scores into a phenotypic distribution model to predict current and future phenotypes across the Midwest. Using climate projected for 2070, phenotypes from dry areas (short stature, low biomass, narrow leaves) were predicted to expand through the Midwest, eclipsing phenotypes from wet areas (robust, wide leaves), provided adequate migration. This novel phenotypic distribution model greatly refines current species distribution models that assume no ecotypic variation and may more accurately predict species' response to climate change.

Relevance of Research to State-related Topic(s)

Andropogon gerardii (big bluestem) is the ecologically dominant C4, warm season grass of the tallgrass prairies making up 70% of Great Plains grasslands. Its wide distribution covers both a west/east precipitation gradient and south/north temperature gradient of the Great Plains. Climatic selection pressures, in existence for the past 10,000 years, may have caused extensive natural variation and diversity of the big bluestem phenotypes and genotypes across the Great Plains. Our research is significant because it will identify drought tolerant ecotypes of big bluestem that can be used in restoration and management of drought stressed prairies of the Great Plains. The benefits of grassland restoration are implemented in the USDA's Conservation Reserve Program (CRP), where marginal agricultural land is restored with native grass plantings on 4.8 million acres in a 10-state region. Native prairie grasses, especially big bluestem, are a major forage grass accounting for 6 billion dollars per year in Kansas's cattle production alone.

NITROUS OXIDE EMISSIONS AND CARBON SEQUESTRATION IN TURFGRASS: EFFECTS OF IRRIGATION AND N FERTILIZATION

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BACKGROUND AND PURPOSE: Nitrous oxide (N₂O) and carbon dioxide (CO₂) are important greenhouse gases that have been implicated in global climate change. Furthermore, N₂O is the most important ozone-depleting substance in the atmosphere. Turfgrass systems are typically fertilized with nitrogen (N) and irrigated, which may result in significant N₂O emissions. Turfgrass also has the capacity to sequester or emit CO₂ from/into the atmosphere via photosynthesis and respiration. Management practices such as slow-release N fertilizer and/or deficit irrigation may mitigate N₂O emissions, but also affect carbon sequestration in turf soils. Our objective was to quantify the magnitude and patterns of N₂O emissions in turfgrass and determine how irrigation and N fertilization may be managed to reduce N₂O emissions and enhance carbon sequestration. **METHOD:** A field study under a automated rainout shelter was conducted in Manhattan, KS from October 2014 to September 2015 on ‘Meyer’ zoysiagrass (*Zoysia japonica* Steud.) maintained at 2.54 cm height. Two irrigation levels were implemented, a medium (75% evapotranspiration [ET] replacement) and a medium-low (50% ET replacement). The N-fertilization treatments included urea and a polymer-coated N, total application was 97.6 kg N ha⁻¹. N₂O emissions were measured periodically by static chambers and gas chromatography. Ancillary measurements of soil moisture, temperature, and ammonium and nitrate were collected at each sampling event. **RESULTS/CONCLUSION:** There were minimal differences in N₂O-N fluxes (ug N m⁻²/h⁻¹) from October through May. Responses of N₂O fluxes to N fertilization and irrigation during the summer and fall periods, and cumulative N₂O fluxes during the entire study period will be reported.

Relevance of Research to State-Related Topic(s)

In a 2006 Kansas survey, there were over 750,000 acres of turfgrass in Kansas, employing more than 25,000 workers in the industry, and with golf courses specifically generating 94.1 million dollars in revenue. Because turfgrass covers ~50 million acres in the USA, turfgrass may have significant impacts on regional and global atmospheric N₂O and CO₂ inventories. Therefore it is vital to have research focused on trace gas fluxes in turfgrass. This relates to climate action and water sustainability, which is not only relevant to the state of Kansas but also on a global scale. The development of management practices that reduce N₂O emissions and enhance carbon sequestration in turf soils may help to mitigate climate change and atmospheric ozone destruction. The results of this research are important given the current emphasis on climate change, which may eventually have implications for the turfgrass industry in the form of regulations or incentives.

**ADAPTIVE ECOTYPIC VARIATION AND GENETIC DIVERGENCE OF A WIDESPREAD GRASS,
BIG BLUESTEM, ACROSS A GREAT PLAINS' CLIMATE GRADIENT**

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BACKGROUND AND PURPOSE: Local adaptation is fundamental to evolution, conservation, and climate change. *Andropogon gerardii* represents as much as 70% of prairie biomass and has a wide geographic distribution across a precipitation gradient (500-1200 mm/yr, western KS to IL), we expect variation in *A. gerardii* in response to climate. Objectives are to use reciprocal gardens to investigate ecotype differences in vegetative and reproductive traits and characterize genetic divergence among ecotypes. Ecotypes (CKS, EKS, and SIL) were reciprocally planted in Colby, Hays, and Manhattan, KS, and Carbondale, IL. **METHOD:** We evaluated ecotypic differences in vegetative and reproductive traits and utilized Genotyping-by-Sequencing to investigate genetic divergence, predicting locally adapted ecotypes. **RESULTS AND CONCLUSION:** Canopy area and height increased from west to east, with no evidence for ecotype differences in western KS. In Carbondale, SIL ecotype showed local adaptation. In Carbondale and Manhattan, CKS ecotype flowered 20 days earlier than other ecotypes with greater probability of seed in western sites relative to other ecotypes. Morphology was primarily correlated with seasonal mean temperature. Genotyping-by-Sequencing identified 4,641 Single Nucleotide Polymorphisms and showed evidence for three genetic groups. SIL ecotype existed as a distinct group. Outlier analysis identified 373 SNPs showing divergent selection. SNPs were primarily associated with seasonal diurnal temperature variation and seasonal precipitation. SNPs were mapped to *Sorghum bicolor* genome, the closest relative of bluestem. Selected genes identified in genotype-to-phenotype association include: nitrogen content-glutamate synthase (nitrogen assimilation), height-GA1 (internode length), and emergence-WUSCHEL transcription factor (development). Results provide insight into candidate genes responsible for adaptive divergence and inform restoration in future climates.

Relevance of Research to State-Related Topic(s)

Andropogon gerardii, big bluestem, is the ecologically dominant C4, warm season grass that dominates the Great Plains with bluestem representing as much as 70% of prairie biomass. Our garden sites across the Great Plains precipitation gradient allows for tests of varying climates ranging from dry in western Kansas to wet in Illinois. It is crucial to understand bluestem response to climate, particularly with the recent drought in 2012 being the worst the state has seen in ~50 years. Ultimately, this research will inform land managers as to what ecotypes are best suited for conservation and restoration for drying climates. This information is crucial for programs such as USDA Conservation Reserve Program with ~ 5 million acres of restored marginal agriculture land across the Great Plains. As well as playing a major role as a cattle forage with accounts for ~6 billion dollars for Kansas alone.

THE EFFECT OF RESIDUE MANAGEMENT, ROW SPACING, AND SEEDING RATE ON WINTER CANOLA ESTABLISHMENT AND SURVIVAL

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BACKGROUND AND PURPOSE: Winter survival of canola (*Brassica napus* L.) is a major challenge for producers using high-residue, no-tillage systems. The objective of this study is to determine the effect of residue management and seeding density on stand establishment, winter survival, and yield. An innovative residue management system being developed by AGCO Corp. was assessed in 0.5 and 0.76-meter row spacing against six cooperating canola producer's no-till residue management and planting methods. **METHOD:** This on-farm experiment was conducted at six locations in Kansas in either corn or wheat residue. AGCO treatments were 0.5 or 0.76-m row spacing and three seeding rates for a total of six treatments. **RESULTS AND CONCLUSION:** During the 2014-15 growing season, Kansas experienced dramatic lows in early winter with temperatures dropping precipitously during mid-November. Five of the six locations were abandoned due to un-acceptable winter survival. In the remaining location at Andale, the number of plants present in the spring was greater in AGCO 0.5-m row spacing treatments. Winter survival in 0.5-m rows was nearly twice that observed in the 0.76-m row spacing. Winter survival decreased with increasing seeding rates, perhaps due to greater plant-to-plant competition with wider row spacing. Although yields were variable across the experiment due to non-uniform stand losses, treatment factors did influence yield. Yield in 0.5-m rows increased as seeding rate decreased. Results indicate that narrower row spacing and reduced seeding rates in high residue no-till systems are beneficial for winter survival and yield if residue can be adequately removed from the seed row.

Relevance of Research to State-related Topic(s)

No-tillage cropping systems are an important tool for conserving soil moisture, conserving productive topsoil, and improving overall system profitability and productivity in many situations. Diverse rotations containing an array of crop types are foundational for the success of no-tillage cropping systems. Perfecting no-tillage planting methods for crops that facilitate diversification of wheat dominated rotations is important to the success of these rotations. The direct seeding of winter canola into un-disturbed residue has proven to be a particular challenge due to its effects on winter survival and ultimately yield. My research examines the growth and production of canola planted in high residue no-tillage systems. Overcoming this challenge will allow producers to diversify their no-tillage cropping systems with an oilseed crop having strong domestic demand.

EFFECT OF THERMAL REDUCTION ON PORCINE EPIDEMIC DIARRHEA VIRUS (PEDV) CONTAMINATED FEED

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BACKGROUND AND PURPOSE: Since it is known that PEDV is a heat-sensitive virus, we hypothesized that a conditioner and pellet mill mimicking commercial thermal processing would mitigate PEDV infectivity. **METHOD:** For the first study, a 3×3×2 factorial was utilized using 3 pelleting temperatures (155, 175, or 195°F), 3 conditioning times (45, 90, or 180 s), and 2 levels of virus (low: 20Ct or high: 13Ct). A second experiment was then developed to determine the impact of lower processing temperatures (100, 115, 130, 145, or 160°F) and a single conditioning time of 30s on PEDV infectivity. **RESULTS/FINDINGS:** In the first study, the low dose PEDV-infected mash was 6.8±1.8Ct greater (P<0.01) than the high dose mash. Regardless of time or temperature, feed processing increased (P<0.01) the Ct compared to the PEDV-inoculated unprocessed mash. Fecal swabs from pigs fed the any of the PEDV- pelleted treatment, regardless of dose, were PEDV-negative from 2 to 7 days post-inoculation at which time the pigs were sacrificed. In the second study, the five increasing temperatures led to feed with respective mean Ct values of 32.5, 34.6, 37.0, 36.5, and 36.7. Even though all samples had detectable PEDV RNA in the feed, infectivity was only detected by bioassay in pigs from the 100 and 115°F conditioning treatments. **CONCLUSION:** Our results suggest that processing feed through a conditioner and pellet mill similar to those used in commercial feed mills will be effective as a point-in-time mitigation step for PEDV as long as conditioning temperatures remain above 130°F.

Relevance of Research to State-Related Topic(s)

In Kansas, there have been over 250 farms afflicted with Porcine Epidemic Diarrhea virus (PEDV). The virus has a mortality rate of nearly 100% in sucking pigs because of their mature digestive tracts, as well as a reduction in health and performance in growing pigs. Some farms in Kansas have lost 8,000 pigs due to a single occurrence of PEDV. Fortunately, the disease is not transmissible to other species, and pork is safe to consume. However, poor animal health and performance has led to a low pork supply, which is the source of record U.S. pork prices for consumers. This research is a part of the National Pork Board's short term emergency program to keep animal feed safe. It is unique because it affects animal health, food safety, and is a farm to fork issue.

PROTEASE ASSAYS FOR MASTITIS DIAGNOSTICS IN DAIRY CATTLE

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BACKGROUND AND PURPOSE: Mastitis is a potentially fatal continuous inflammation of the udder of cows. There are major cost implications in mastitis associated with cattle health, quality and quantity of milk production, and the shelf life of pasteurized milk products. For the purpose of detecting mastitis, we have focused on enzymes such as Matrix metalloproteinases 8, 9 and 12, and Neutrophil Elastase that signify inflammation. The goal of this experiment is to detect mastitis in its early stages, when the disease is treatable.

METHOD: Matrix metalloproteinases 8, 9 and 12, and Neutrophil Elastase protease assays were developed and tested for the milk samples from mastitis positive and negative cattle. The assay contains dopamine coated iron/iron oxide nanoparticles, cyanine 5.5 and a tetrakis-carboxyphenyl-porphyrin (TCPP) tethered enzyme-selective peptide sequence. Upon the cleavage of oligopeptide by the enzyme, TCPP is released and the signal is monitored by fluorescence spectroscopy. Fluorescence measurements were compared with the bacteria culture results and the medical conditions of cattle. **RESULTS/FINDINGS:** Milk samples from healthy cattle showed high fluorescence signals compared to the milk samples from mastitis infected cattle. **CONCLUSION:** Matrix metalloproteinases 8, 9, 12 and Neutrophil Elastase assays can be used to identify the milk samples with mastitis infected cattle. The results lead to identify the bacteria species responsible for early mastitis disease. These assays were successfully employed to identify early mastitis infection in dairy cattle.

Relevance of Research to State-Related Topic(s)

Mastitis in dairy cattle is a continuous, inflammatory reaction of the udder tissue, caused by bacteria. Due to the absence of visible indications, subclinical mastitis is difficult to detect. Mastitis can be categorized into clinical, subclinical and chronic forms. Mastitis has a huge impact on the economy due to several factors, so it is essential to monitor the disease continuously to minimize the impact. Due to mastitis, it is estimated that, a loss of more than 2 billion dollars per year occurs in the U.S. To avoid substantial financial losses, mastitis has to be detected and treated at the subclinical stage. The dairy industry in Kansas is very important to the state's agricultural industry and overall economic growth. Kansas is home to approximately 150,000 dairy cows. Since there are various locations in Kansas that process milk, the early detection of mastitis has a positive impact on the Kansas dairy industry.

EFFECT OF RACTOPAMINE-HCL ON MUSCLE FIBER TYPE AND EXHAUSTION IN FINISHING BARROWS

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BACKGROUND AND PURPOSE: Pigs fed ractopamine-HCl (RAC) are more prone to fatigue when improperly handled. Muscle motor unit recruitment and action potential conduction velocity are measured via electromyography (EMG) derived root mean square (RMS) and median power frequency (MdPF), respectively. The objective of this study was to determine the effect of RAC on exhaustion, EMG measures, and muscle fiber type. **METHOD:** Thirty-four barrows were assigned to one of two treatments; basal diet containing 0 ppm (CON) or basal diet containing 10 ppm RAC (RAC+). After 32 d of feeding, barrows were walked briskly around a circular track until subjectively exhausted. Time, distance, and speed were measured. Wireless surface EMG sensors were affixed to the *Deltoideus* (DT), *Triceps brachii lateral head* (TLH), *Tensor fasciae latae* (TFL), and *Semitendinosus* (ST) muscles. Muscle fiber type distribution was measured. **RESULTS:** Speed was not different between treatments, but RAC+ barrows reached subjective exhaustion quicker and covered less distance than CON barrows. Ractopamine did not change fiber recruitment in the DT, TLH, or TFL; however, RAC decreased recruitment in the ST. Ractopamine did not affect conduction velocity. There was no change in the percentage of type IIA fibers in the DT, TLH, and ST; however, the RAC+ group had a decreased percentage of IIA in the TFL. Over all muscles, there was a tendency for the RAC+ group to have a decreased percentage of type I fibers. **CONCLUSION:** Ractopamine-HCl contributes to increased onset of subjective exhaustion, possibly due to rapid loss of active muscle fibers and chronic loss of oxidative muscle fibers.

Relevance of Research to State-related Topic(s)

Over \$46 million are lost annually from transport losses at processing plants due to non-ambulatory pigs. Part of these losses include fatigued animals. It is estimated that over 70% of swine in the United States are fed RAC during production to promote lean muscle growth. Although growth promotants such as RAC improve average daily gain and feed efficiency, they also increase incidence of fatigue. This is not only a welfare and image issue, but an economic problem as well. This study focuses on understanding the biological changes occurring at a cellular level when animals are exposed to growth promotants. With this knowledge, different management techniques such as refined management, handling, and transportation practices can be established to preserve muscle strength and prevent fatigue. Though the industry has made improvements in these areas, implementing further preventative techniques can help counteract fatigue and increase animal welfare and meat production in the future.

THE INFLUENCE OF NUCLEAR SIZE ON CELLULAR KINETICS OF PROLIFERATING PORCINE FETAL MYOBLASTS

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BACKGROUND AND PURPOSE: Fetal myoblasts are derived from a subset of mesenchymal stem cells committed to muscle development. Cellular activity of fetal myoblasts will determine the ultimate development of muscle available for postnatal growth. Characterization of myoblast activity *in vitro* provides a valuable tool for testing the actions of pharmaceutical agents on muscle development. Currently, myoblast characterization is limited to the identification of transcription factor expression and proliferation rates. The current research establishes the relationship of nuclear area between myogenic transcription factor expression and proliferation rate. **METHOD:** Porcine fetal myoblasts were collected from fetuses at day 60 of gestation. Once myoblasts were isolated, identical plates were cultured and immunostained every 24 hours for presence of myogenic transcription factors. Photomicrographs were captured and nuclear areas of fetal myoblasts were divided into 6 categories (range = 31-981 μm^2) and tested for presence of cellular activity criteria. **RESULTS:** The two smallest categories of fetal myoblasts had a greater proportion of cells that were proliferating than the four larger categories. The smallest category had the greatest expression of paired-box transcription factor-7 (**Pax7**). Myogenic factor-5 expression was greatest in the large categories of fetal myoblasts with nuclear areas between 300 and 500 μm^2 . **CONCLUSION:** This research illustrates smaller myoblasts are more proliferative and express Pax7 more often than larger myoblasts, which suggests smaller myoblasts retain properties more similar to stem cells. Ultimately, the relationship between fetal myoblast nuclear area and cellular activity will allow for a comprehensive analysis of direct effects of pharmaceutical agents on muscle growth and development *in utero*.

Relevance of Research to State-Related Topic(s)

In both pigs and humans, inadequate nutrient availability *in utero* results in developmental deficiencies in skeletal muscle that have lasting negative effects throughout postnatal life. In pigs, those born less than 1.1 kg have up to 83.8% mortality rate before weaning. In humans, those with inadequate nutrition during digestion are more prone to health conditions such as obesity and diabetes. Since pigs are the best biomedical model for humans, this model can serve a dual purpose of advancing the production of pork while also exploring questions important to human health. The current research demonstrates the relationship between nuclear size and cellular activity. Incorporating nuclear area as response criteria to evaluate the effects of pharmaceutical agents on muscle development *in utero* will maximize the impact of individual experiments. Thus expediting progress towards alleviating mortality and health conditions associated with inadequate nutrient availability.

SPINNING STRAW INTO MILK: CAN AN ALL-BYPRODUCT DIET SUPPORT MILK PRODUCTION?

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BACKGROUND AND PURPOSE: The resource efficiency of animal agriculture can be improved by better harnessing the ability of ruminants to turn waste products into nutrient-dense foods for human consumption. Dairy rations typically contain 20 – 30% byproducts, and we are unaware of lactation diets that have used more than 80% byproducts. Our objective was to compare milk production of cows fed a traditional diet with that of cows fed a diet comprised of byproducts of human food/fuel/fiber production, and not grown on arable land that could be used for human food production. We predicted that such a diet could support 35 kg/day of milk production. **METHODS:** Twelve dairy cows from the KSU Dairy herd were individually fed 2 different diets in a crossover design: a conventional lactation diet and a diet comprised entirely of byproduct feeds. Milk yield, milk composition, and feed intake were measured. **RESULTS/FINDINGS:** Feed intake did not differ by treatment, but milk production averaged 2 kg/d less for the byproduct diet than for the control diet ($P = 0.04$). Milk fat content also decreased with the byproduct diet ($P = 0.002$). Although the byproduct diet decreased milk production, it nevertheless supported production of 39 ± 1.6 kg milk/day. **CONCLUSION:** It is possible to support a high level of milk production on a diet largely composed of unconventional feeds that do not compete with production of other human foodstuffs. Although it is unlikely that commercial farms will adopt such an unusual diet, these findings will encourage more creative solutions to dairy cattle diet formulation.

Relevance of Research to State-Related Topic(s)

Reducing waste and increasing the global food supply to sustain a growing population are hot topics for today's consumers. Considering that Kansas has over 28 million acres of cropland available, which is second only to Texas, our state has great potential to make a big impact on the overall efficiency of land used to support the human food supply. The volume and diversity of locally grown feed commodities coupled with the growing dairy industry in Kansas points to great opportunities to utilize ruminants to capture otherwise unusable nutrients from byproducts of food, fuel, and fiber production. Capitalizing on unconventional nutrient sources will prove mutually beneficial for both animal and crop production sectors, as well as allow existing cropland to more effectively support the increasing demands of human food consumption.

CROSSFIT AND HEART HEALTH: CROSSFIT PARTICIPATION IMPROVES RESTING SYSTOLIC BLOOD PRESSURE FOR KANSAS ADULTS

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BACKGROUND AND PURPOSE: Regular physical activity is recommended for overall cardiovascular health. To decrease blood pressure (BP), 40 minutes of moderate-to-vigorous activity for 3-4 days per week is recommended; which can be facilitated by regular participation in CrossFit. CrossFit is a form of high intensity functional training that can be adapted to each individual according to age and ability level, and has rapidly increased to >50 Kansas affiliates since 2005. The purpose of this study was to see if regular CrossFit participation would improve heart health. **METHOD:** Participants included 20 individuals (50% male, ages 18-66) who participated in a 12-month program evaluation study through K-State CrossFit. Health assessments were conducted at baseline, 2-, 6-, and 12-months and included measurements of resting blood pressure and resting heart rate after 5-minutes of rest. SPSS 20 was used to analyze changes in resting heart rate and BP over time with repeated measures ANOVA. **RESULTS/FINDINGS:** Mean values for systolic BP decreased from 123.8 ± 14.6 at baseline, to 119.4 ± 15.5 - 16.2 at 2- and 6-months, to 115.9 ± 17.4 at 12 months. These differences were statistically significant, $f(3,1)=4.585$, $p=.006$. Differences in diastolic BP were not significant. Mean values for resting heart rate showed change between 2 months (61.7 ± 8.2) and 12 months (65.8 ± 9.3), although this was not significant ($p=.13$). **CONCLUSION:** Results indicate that regular CrossFit participation can significantly decrease resting systolic blood pressure. CrossFit participation may benefit heart health for Kansas adults up to age 66. Future studies should examine effects of CrossFit participation on additional indicators of heart health such as blood cholesterol.

Relevance of Research to State-Related Topic(s)

Heart disease is a leading cause of death in Kansas. Typically individuals at risk for complications related to heart health have elevated resting heart rate, blood pressure, and cholesterol levels. Common recommendations are to alter diet, take medication, and/ or increase physical activity. Lack of physical activity is a common trend across the country, and Kansas as a state has room for improvement. In terms of access to places in Kansas in which adults can be physically active, CrossFit has become a more viable option. With an increase in the number of registered CrossFit gyms across the state (>50), more adults are regularly participating in high-intensity exercise. Physical activity programs, including CrossFit, should be promoted to continue to improve the health and welfare of Kansans.

USING LATENT TRANSITION MODELS TO MONITOR THE PROGRESSION OF ALZHEIMER'S DISEASE

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BACKGROUND AND PURPOSE: Alzheimer's disease is currently a neurodegenerative diseases without any effective treatments to slow or reverse the progression. To develop any potential treatments, the need of a good statistical model to assess the progression of Alzheimer's disease is becoming increasingly urgent. This study proposed a latent transition model to monitor the progression of Alzheimer's disease which can help the development of a given proposed treatment. **METHOD:** A latent transition model was used to assess the progression of Alzheimer's disease. The volume of Hippocampus, fluorodeoxyglucose (FDG)-PET and Mini-Mental State Examination Score (MMSE) were employed as biomarkers in this model. These biomarkers are very sensitive to the pathological signs of the Alzheimer's disease. The proposed latent transition model was performed with real data from Alzheimer's Disease Neuroimaging Initiative (ADNI), which contain 1,879 participants from 2005 to 2014. **RESULTS/FINDINGS:** The latent transition model suggested six states of disease progression and two different pathological profiles. One progression profile was mainly determined by the biomarker of FDG-PET and the other by the volume of Hippocampus. **CONCLUSION:** The results revealed the existence of various progression profiles of Alzheimer's disease, suggesting a new way to evaluate the disease progression.

Relevance of Research to State-Related Topic(s)

Alzheimer's disease is becoming a big health concern in Kansas. There are 53,000 people 65 years and older with Alzheimer's in Kansas in 2010. Also, the Alzheimer's disease has a significantly impact on economics of Kansas. In 2012, there are 148,508 caregivers in Kansas provided unpaid care valued at over \$2 billion. Since Alzheimer's disease is one of the costly chronic diseases in Kansas and a neurodegenerative diseases without any effective treatments to slow or reverse the progression. To develop any potential treatments, the need of a good statistical model to assess the progression of Alzheimer's disease is becoming increasingly urgent. This study proposed a latent transition model to monitor the progression of Alzheimer's disease which can help the development of a given proposed treatment. The results of this study revealed the existence of various progression profiles of Alzheimer's disease, suggesting a new way to assess the disease progression.

MECHANISM OF FERRIC ENTEROBACTIN TRANSPORT THROUGH FepA IN GRAM NEGATIVE BACTERIA

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BACKGROUND AND PURPOSE: Ligand-gated porin (LGP) receptors of Gram-negative bacterial outer membrane (OM), typified by FepA, FhuA, BtuB, possess a complex β -barrel transmembrane channel occluded by a globular N-terminal domain. The structure poses immediate questions on the mechanism of ligand transport through the receptor protein. Our previous results with in-vivo fluorescent labeling of engineered Cysteine residues on FepA indicated a ‘Ball and Chain’ mechanism of transport in which the N-domain is expelled into the inter-membrane periplasmic space during Ferric enterobactin (FeEnt) ligand passage. This study further investigates whether the N-domain exits the barrel as a unit or unfolds into the periplasm or forms a ‘transient pore’ within the barrel allowing ligand passage. **METHOD:** We constructed a series of double-cysteine mutants located i) in the N-domain such that disulphide bonds should not interfere with transport if it exits the channel as a unit ii) in the N-domain and the β -barrel such that the cysteines can come close and form double bonds only if the N-domain exists the channel during ligand uptake. We tested these mutants for ligand uptake capabilities in nutrition tests and conventional radiochemical assays in the presence and absence of a reductant (β -mercaptoethanol) of disulphide bonds. **RESULTS AND CONCLUSION:** Our results suggest that three double-cysteine mutations 27=126, 33=120 and 125=14 prevent transport of FeEnt in the absence of β -mercaptoethanol. The location of these residues on the N-domain point to a mechanism in which the globular N-domain undergoes conformational change allowing tight ligand passage.

Relevance of research to state related topics

The widespread rise of multidrug resistant bacterial infections in the past few decades necessitates the search for novel therapeutic strategies. Ability to successfully acquire iron (Fe^{3+}) through membrane transport proteins within the host is a key determinant of virulence. Hence, perturbation of iron uptake pathways in bacteria is an attractive target for development of new treatment methods. By studying the mechanism of iron transport through receptor proteins of the bacterial membrane, we can obtain deeper insight into the uptake pathway and exploit it better for the identification of new therapeutic drugs.

DETECTION OF EARLY BREAST CANCERS: NANOPLATFORMS FOR HIGHLY SENSITIVE FLUORESCENCE DETECTION OF CANCER-RELATED PROTEASES

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It is mandatory to detect all cancers at the earliest possible stages in order to save a maximum of lives. Numerous proteases are involved in cancer development and progression including Matrix Metalloproteinases (MMPs), Tissue Serine Proteases and Cathepsins. **BACKGROUND AND PURPOSE:** Goal of our research is to develop a Fe/Fe₃O₄ nanoparticle-based nanoplatform for early cancer diagnosis, which allows to measure the activity of cancer associated proteases in biospecimens. **METHOD:** We have designed nanoplatforms for protease detection consisting of two fluorescent dyes that are attached to water-dispersible Fe/Fe₃O₄ core/shell nanoparticles possess limits of detection in the (sub-)femtomolar range. Cyanine 5.5 is tethered directly to the dopamine ligands of the nanoparticle, and tetrakis-carboxyphenyl porphyrin (TCPP) is linked via established consensus sequences. The analyzed enzymes include Cathepsin B and L, MMP 1, 2, 3, 7, 9, 13 and urokinase plasminogen activator (uPA). The activities of the selected proteases in the serum of 46 breast cancer patients and 20 healthy human subjects were measured. **RESULTS/FINDINGS:** The consensus sequences are cleaved in the presence of the correct enzyme, thus releasing TCPP from the nanoplatform and increasing the fluorescence emission intensity of TCPP, which is identified by steady state fluorescence spectroscopy. **CONCLUSION:** Based on the expression pattern of analyzed enzymes, human breast cancer can be detected at stage I by means of a simple blood test. By monitoring CTS B and L stage 0 detection may be achieved. This study demonstrates the feasibility of minimally invasive successful early cancer diagnosis.

Relevance of Research to State-Related Topic(s)

Breast cancer is the most commonly diagnosed cause of cancer deaths among women in the United States, as well as worldwide. If it is identified at the earliest possible stage, survival rate is higher as it could be treated early. Therefore, our research focuses on developing diagnostic nanoplatforms for early breast cancer detection by means of a simple blood test. At the same time, diagnosing cancer early would significantly decrease the treatment costs for cancer in Kansas, as well as anywhere else in the US. Since the healthcare costs are increasing faster than average inflation, a decrease in cancer treatment costs would be a welcome relief for the citizens of Kansas. Furthermore, there is a shortage/absence of cancer treatment facilities in western Kansas. Blood can be drawn anywhere in the State and serum can be shipped to diagnostic laboratories anywhere in the State. This is possible, because the proteases that were selected as biomarkers are sufficiently stable. This technology will, therefore, significantly increase the cancer detection standard of care anywhere in the State of Kansas.

ENGINEERING BIOMIMETIC NANOABSORBENT FOR DETOXIFICATION OF CHEMOTHERAPEUTICS

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BACKGROUND: Detoxification is a pivotal treatment procedure for patients suffering from intoxication due to overdose and non-specificity of chemotherapeutics. Current methods of detoxification include administration of polymeric micelles, activated charcoal, gastric lavage, dialysis, and blood exchange transfusion, which are limited in their ability to remove excess drugs or toxic agents. Herein, we proposed an alternate strategy for reducing intoxications using injectable nanosized carriers called as nanoabsorbent that has an ability to soak-up toxin and selectively excrete from the circulatory system. **METHOD:** Biomimetic nanoabsorbent proposed herein is made up of biodegradable and biocompatible poly-l-lactic-co-glycolic acid (PLGA) and red blood cell (RBC) membrane. For the purpose, calculated amount of RBCs were hypotonically busted and purified by dialysis to remove hemoglobin resulting in the formation of RBC vesicles called as RBC ghosts. These ghosts were further fused with PLGA nanoparticles resulting in the formation of nanoabsorbents. Detoxification ability of nanoabsorbent was performed using B-16 melanoma as a model cell and doxorubicin as a model chemotherapeutic. **RESULTS/FINDINGS:** Nanoabsorbent showed the hydrodynamic diameter of 110 ± 15 nm with surface charge of -35 ± 2 mV. The retention of surface properties of RBC into the nanoabsorbent was further confirmed by SDS PAGE analysis, which confirms the presence of all major proteins in RBC. These nanoabsorbents were found to absorb doxorubicin within five minutes. When cells pretreated with nanoabsorbent were treated with doxorubicin, reduction of doxorubicin toxicity was observed. **Conclusion:** Results obtained pictures the detoxifying ability of nanoabsorbent and put it as a platform technology in the treatment for intoxication.

Relevance of Research to State-Related Topic(s)

Chemotherapy is an invasive and toxic treatment that designed to kill cancerous cells. However, due to lack of drug specificity at tumor site, administered chemotherapeutic drug kills not only cancerous cells but also normal cells at off-target sites. In fact, from 2009 to 2013, there were 1475 death cases reported for drugs poisonings at Kansas State (Kansas department of health and environment, Dec, 2014). Many researches at Kansas State University are being conducted to explore new ways to minimize toxicity of chemotherapeutics such as using nanomedicine for smart delivery and controlled drug release, modifying structure of conventional drug for targeting to site of interest, developing library of new molecules to open up a safer door for chemotherapy. Along with these ongoing researches, the proposed detoxification method herein can contribute and complete treatment routine for cancer and other toxin-related treatments.

THE EFFECT OF *N*-ACETYLCYSTEINE ON PERIPHERAL HEMODYNAMICS AND FATIGUE DURING EXERCISE

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BACKGROUND AND PURPOSE: *N*-acetylcysteine (NAC; antioxidant and thiol donor) supplementation improves exercise performance and delays fatigue, but the underlying mechanisms are unknown. One possibility is NAC increases blood flow and muscle oxygenation characteristics. We hypothesized that NAC leads to higher resting and exercising arm blood flow and muscle oxygenation characteristics. **METHODS:** 8 healthy men (21.8±1.2 yrs) were recruited and completed constant power handgrip exercise tests at 80% peak power to exhaustion. Subjects orally consumed either placebo (PLA; corn starch) or NAC (70mg/kg) 60 min prior to handgrip exercise. Brachial artery blood flow (BABF) was measured via Doppler ultrasound and flexor digitorum superficialis oxygenation characteristics were measured via near infrared spectroscopy. In a subset (n=5), peripheral and central fatigue were assessed via potentiated doublet twitch force (Q_{tw}), maximum voluntary contraction (MVC), and voluntary activation (%VA). **RESULTS:** Time to exhaustion was not significantly different between NAC (473.0±62.1s) or PLA (438.7±58.1s). Mean resting BABF was not different ($p>0.05$) with NAC (99.3±31.1mL/min) and PLA (108.3±46.0mL/min). BABF was not different ($p>0.05$) during exercise or at end exercise (NAC: 466.3±116.2mL/min; PLA: 469.5±146.6mL/min). Mean deoxy-[Hb+Mb] and total-[Hb+Mb] were not significantly different at rest or during exercise between conditions. In the subset, Q_{tw} , MVC, and %VA were not different ($p>0.05$) following exercise between NAC and PLA. **CONCLUSION:** We conclude that NAC supplementation does not influence resting or exercising blood flow in healthy men. Future research should examine if NAC supplementation increases exercising limb blood flow in populations with greater oxidative stress (e.g., COPD).

Relevance of Research to State-Related Topic(s)

N-acetylcysteine (NAC) is a non-specific antioxidant that reduces oxidative stress. NAC supplementation has been shown to delay fatigue and improve exercise tolerance in health and clinical populations (e.g., chronic obstructive pulmonary disease). We are interested in determining the underlying mechanisms responsible for the improved exercise tolerance and delayed fatigue because they will potentially lead to improving quality of life for clinical populations. Although unknown, one possible mechanism is increased oxygen delivery (blood flow) to the active limbs during exercise with NAC. Therefore, our research aim was to determine if NAC influences resting and exercising arm blood flow in health. Our study found that NAC supplementation does not influence resting or exercising arm blood flow in healthy men. However, healthy individuals have low oxidative stress so future studies should investigate if NAC influences resting and exercising limb blood flow in populations with greater oxidative stress (e.g., COPD).

BISPHOSPHONATE FUNCTIONALIZED NANOMEDICINE FOR TARGETING BONE MICROENVIRONMENT

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BACKGROUND AND PURPOSE: Every year thousands of bone cancer cases are diagnosed in United States. Moreover, development of bone metastasis occurs in over 80% to 90% of various cancers that metastasize and signals the entry of the disease into an incurable phase. Cancer in bones can cause pain, fractures, hypercalcaemia, and tumor compression of the spinal cord, due to cancer deposits that can erode into bone using bone-absorbing cells. Bisphosphonates are drugs that reduce the activity of bone-absorbing cells and target over expressed calcium. Herein, we engineered bone-homing polymeric nanomedicine for controlled delivery of therapeutics to bone. **METHOD:** In order to achieve our goal, a ring opening living polymerization of cyclic L-lactide initiated by alendronic acid, member of bisphosphonate, in presence of catalytic amount of stannousoctoate was adapted. Resulting polymers contains end functional hydrophilic alendronic acid, which self-assemble to form sub 100 nm sized nanoparticle in an aqueous solution. Thus, formed polymer and nanoparticles were characterized for their chemistry and physiochemical properties using various analytical tools. **RESULTS/FINDINGS:** Alendronic acid functionalized poly-l-lactide (Ale-PLA) was characterized by nuclear magnetic resonance (NMR) and Fourier Transfer Infrared Spectrometer (FTIR), which exhibits characteristics monomer conversion and the presence of amide and phosphate moiety in the polymer. These polymer self-assembled to form nanoparticle and in in-vitro results shows that it has an ability to accumulate and internalized into the bone cancer cells and delivery drugs. **Conclusion:** The results obtained from the nanoformulation and targeting efficiency of these nanoparticles demonstrates the tremendous potential for targeting bone microenvironment.

Relevance of Research to State-Related Topic(s)

Nanomedicine therapeutics have exhibited clear benefits over unmodified drugs, such as improved half-lives, cellular retention, targeting efficiency, and have fewer side effects. Herein, we have synthesized a polymer in which the end functional group moiety is alendronic acid (a member of bisphosphate), which targets calcium ions at the vicinity of bone lesion where bone resorption takes place. Thanks to Johnson Cancer Center at KSU, which promotes and involves a highly dedicated team of scientists in cancer research from more than 90 laboratories at KSU. Ampules of collaborative opportunities around these laboratories put KSU's cancer research in the froth front in the research community. Therefore, the study we are conducting for the synthesis of possible bone cancer targeting nanomedicine is highly relevance to ongoing cancer research at KSU.

EFFORTS TOWARDS THE TOTAL SYNTHESIS AND ELUCIDATION OF LAGUNAMIDE C

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BACKGROUND AND PURPOSE: Lagunamide C was isolated by Tan et al. from the cyanobacterium *Lyngbya majuscula* and was reported to have potent cytotoxicity ranging from 1.6 to 24 nM towards HCT8, A549, PC3, HCT8, and SK-OV3 cancerous cell lines. **METHOD:** It is envisioned that lagunamide C can be synthetically accessed from three modules: polyketide, pentapeptide, and commercially available sarcosine. While the absolute stereochemistry within the pentapeptide portion has been determined, three chiral centers within the polyketide module remain ambiguous. Eight diastereomers of the polyketide are required to accurately assign these centers, requiring a robust route and assembly of lagunamide C. **RESULTS/FINDINGS:** An analog of the first module, the synthesis, purification, and characterization of the polyketide, is nearly complete. This has been completed by promoting stereoselectivity through the usage of a chiral auxiliary, addition of an acyl group via acetylation, and forming the first stereocenter via a mixed aldol reaction. This stereocenter has been synthesized, but has yet to be determined. **CONCLUSION:** Completed work has led to a promising start for the total synthesis of lagunamide C. The initial proposed route has proven successful thus far for the synthesis of an analog of the polyketide module. Future work will include continuing the synthesis of the analog of the polyketide fragment, involving Wittig reactions, selective cyclopropanation with tandem ring opening, and chiral reductions. After the completion of the analog polyketide fragment, the methods will be repeated for the synthesis of the target polyketide fragment. Each completed structure will be submitted for SAR studies to investigate possible activity.

Relevance of Research to State-Related Topic(s)

Cancer is a disease that continues to plague citizens of Kansas and the United States. The cytotoxic properties of this compound may be useful in the treatment of specific cancer cell lines including colon, lung, and prostate cancer. The proposed route will produce seven analogs, each of which will undergo SAR studies to determine their activity. These studies may not only lead to possible cancer treatments, but help with understanding the mode of action and therapeutic effects of the compounds on cancer.

MODEL STUDY ON EXTRACTION OF FERMENTABLE SUGARS AND NONSTRUCTURAL CARBOHYDRATE FROM SWEET SORGHUM USING DIFFUSION**Nana Baah Appiah-Nkansah^{1,2}, Ke Zhang², William Rooney³, and Donghai Wang²**

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BACKGROUND AND PURPOSE: Sweet sorghum stores a high concentration of soluble sugars in its stalk and produces grain in the panicle. This grain represents a significant amount of starch. The ethanol industry currently uses sugarcane processing methods for sweet sorghum; however, sweet sorghum differs from sugarcane in that sweet sorghum produces significant quantities of grain which is predominantly starch. The objective of this research was to increase ethanol production from sweet sorghum by fully utilizing all fermentable sugars which include starch in the grain and nonstructural carbohydrates in the stalk. **METHOD:** The diffusion process was utilized to extract fermentable sugars and nonstructural carbohydrates from chopped sweet sorghum biomass and grains. Response surface methodology (RSM) was applied in order to optimize diffusion conditions and to explore effects of diffusion time, diffusion temperature, ratio of sweet sorghum biomass to grain on starch-to-sugar efficiency, and total sugar recovery from sweet sorghum. **RESULTS AND CONCLUSION:** RSM results showed that starch efficiency and sugar recovery efficiency of 96% and 98.5%, respectively, were achieved at an optimized time of 114.9 minutes, temperature of 95 °C, and 22% grain loading.

Relevance of Research to State-Related Topic(s)

Our work aims to solve the most critical problem in utilization of sweet sorghum for biofuel and addresses feedstock priority areas of sorghum (Biomass or Sweet), which are of great importance and interest to the state of Kansas. Success in this project will encourage the development of viable alternative bio-based energy sources and products that enhance economic opportunities in rural areas.

HIGHWAY SAFETY MANUAL CALIBRATION AND CRASH PREDICTION FOR RURAL MULTILANE HIGHWAYS IN KANSAS

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BACKGROUND AND PURPOSE: The Highway Safety Manual (HSM) provides models and methodologies for safety evaluation and prediction of safety performance of various types of roadways. Predictive methods in HSM are based on national trends using data from sample states throughout the United States. Therefore, these methodologies are of limited use if they are not calibrated for individual jurisdictions or local conditions. The objective of this study was to calibrate the rural multilane roadway segments, in Kansas using procedures given in HSM. **METHOD:** The rural multilane segments consist of four-lane divided and undivided roadways. Crash data from 283 rural four-lane divided segments and 83 rural four-lane undivided segments from years 2011 through 2013 were used in the analysis. A numerical tool was developed to obtain number of crashes at any highway segment. Safety performance function (SPF) and crash modification factors given in the HSM were used to obtain the total predicted crashes. **RESULTS/FINDINGS:** After performing the calibration using HSM methodology, calibration factors of 1.43 and 1.50 were obtained for total crashes and 0.52 and 0.36 for fatal and injury crashes occurring on divided and undivided segments, respectively. Results indicated that HSM overpredicts fatal and injury crashes and underpredicts total crashes on rural four-lane divided and undivided roadway segments in Kansas. **CONCLUSION:** As suggested by HSM, development of a jurisdiction-specific SPF is required in order to predict crashes with greater reliability than HSM-calibrated SPF.

Relevance of Research to State-Related Topic(s)

Rural roads in Kansas account for 90.7% of the 140,686 total roadway miles in the state. Fatal crashes in rural areas account for approximately 66% of total fatal crashes in Kansas, making rural roadways a critical safety issue. This research would not only benefit precise crash prediction, but also facilitate state and federal government agencies to identify possible factors that may influence rural crash occurrence and determine if any countermeasure can be applied to reduce rural fatalities. The calibration results will assist transportation practitioners in selecting the most beneficial highway safety projects. Finally, developing a reliable crash prediction methodology will ultimately provide safer highways in rural Kansas.

**CHARACTERIZING A MISSISSIPPIAN CARBONATE RESERVOIR FOR CO₂-EOR AND CARBON
GEOSEQUESTRATION: APPLICABILITY OF EXISTING ROCK PHYSICS MODELS AND
IMPLICATIONS FOR FEASIBILITY OF A TIME LAPSE MONITORING PROGRAM IN THE
WELLINGTON OIL FIELD, SUMNER COUNTY, KANSAS.**

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BACKGROUND AND PURPOSE: This study will characterize two subsurface rock formations of the Wellington Oil Field, in Sumner County, Kansas, for both geosequestration of carbon dioxide in the saline Arbuckle formation and enhanced oil recovery of a depleting Mississippian oil reservoir. **METHOD:** Multi-scale data including lithofacies core samples, thin sections, well log data, and three-dimensional seismic techniques will be integrated to establish and/or validate a new or existing rock physics model that best represents our reservoir rock characteristics. We have acquired compressional wave and shear wave velocity data from Mississippian and Arbuckle cores by running ultrasonic tests using an Ult 100 Ultrasonic System. Ultrasonic velocities have been compared to sonic and dipole sonic log data from the Wellington 1-32 well, and the elastic constants Young's Modulus, Bulk Modulus, Shear Modulus and Poisson's Ratio have been extracted. We will also be testing our rock physics model by predicting effects of changing effective fluid composition on seismic properties and the implications on feasibility of seismic monitoring. **RESULTS/FINDINGS:** These data will be integrated to validate a lithofacies classification statistical model which will be applied to the largely unknown saline Arbuckle formation with hopes for a connection, perhaps through Poisson's ratio, allowing a time-lapse seismic feasibility assessment and potentially developing a robust transformation of compressional wave sonic velocities to shear wave dipole sonic for all wells. **CONCLUSION:** Lessons learned from characterizing the Mississippian for enhanced oil recovery efforts is essential to understanding the potential of utilizing similar workflows for the less known underlying Arbuckle aquifer for carbon dioxide geosequestration.

Relevance of Research to State-Related Topic(s)

Energy and the environment are two large, important subjects which neither the state of Kansas nor the global population can ignore. The current exponential population growth demands a larger energy supply, yet also strains the environment; this study looks to address and help remediate both issues. We are applying subsurface formation characterization techniques to increase the efficiency of oil and gas extraction from conventional reservoirs, namely from within the Wellington Oil Field in south-central Kansas, helping supply energy needs within the state and worldwide until a substantial greener alternative is discovered. We are applying the same subsurface characterization techniques to better understand the feasibility of carbon dioxide geosequestration into the deep saline Arbuckle formation, helping not only clear the air of CO₂ here in the Midwest, but also worldwide, thus helping reduce global warming and its effects. If successful, our cost-effective study may be applied to other subsurface formations worldwide.

MICROWAVE SYNTHESIS OF DIFFERENT SIZES OF EMISSIVE INDIUM PHOSPHIDE NANOCRYSTALS

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BACKGROUND AND PURPOSE: Indium phosphide nanocrystals are important materials because of their optical and electrical properties and are considered as replacement for cadmium based semiconductor materials in biological and optoelectronic devices owing to their lower toxicity. But synthetic development of these nanocrystals has been limited by very high reactivity of indium phosphide precursor. There are only a few reports in the literature of how to control the size of InP nanocrystals in nanoscale dimensions and they still lack luminescence. Hence, we wanted to control the size in nanometers along with luminescence. To achieve this goal, a simple microwave-assisted method was used to prepare InP nanocrystals that glow. **METHOD:** Indium acetate is reacted with palmitic acid at 150 °C to give indium palmitate. It is treated with tris(trimethylsilyl)phosphine and heated to 65 ° to get orange colored InP precursor. After addition of an ionic liquid, the precursor is heated to temperatures ranging from 250-300 °C at 150 or 800 W in a microwave reactor. The above reaction is repeated with the addition of dodecylamine at 800 W. **RESULTS:** Nanocrystals synthesized with dodecylamine have yellow, orange, and red emission whereas without dodecylamine, nanocrystals have green, yellow, and orange emission which is confirmed by photoluminescence spectroscopy. TEM images confirm these nanocrystals have spherical shape. Size is proportional to reaction temperature, such that smaller InP nanocrystals are obtained at lower reaction temperature. **Conclusion:** These materials are promising for applications in LEDs and microwave synthetic method can be applied to other III-V semiconductor nanocrystals synthesis.

Relevance of Research to State-Related Topic(s)

Indium phosphide nanocrystals have energy-related applications concerning to state of Kansas. These materials have absorptions in the visible region of solar spectrum so, these materials can be used in solar cells, which are considered an alternative energy source to fossil fuels. III-Phosphide nanocrystals are used as photocathodes for production of hydrogen in solar-water splitting. More importantly, these materials have emission in the visible region and can be used to study for replacement of cadmium-based materials in light emitting devices (LEDs) since indium is known to have lower toxicity.

EFFECTS OF PUMPING ON THE QUALITY OF THE CONCRETE AIR VOID SYSTEM**Jan Vosahlik¹, Kyle A. Riding¹, and Dimitri Feys²***¹Department of Civil Engineering, College of Engineering, ²Department of Civil, Architectural and Environmental Engineering, Missouri University of Science and Technology*

BACKGROUND AND PURPOSE: Concrete pumping is a commonly utilized method of concrete placement on construction sites worldwide. During the pumping process, concrete is subjected to extensive pressures that are known to modify many of its properties. However, the majority of concrete pumping guidelines currently used in the industry are based on practical experience rather than on empirical scientific evidence. **METHOD:** An experimental field investigation is carried out to characterize the quantitative changes of the concrete air void system due to the pumping process. Several bridge construction projects in Kansas were visited during the summer of 2015 where concrete before and after pumping was tested. In addition to standard fresh concrete test methods, such as slump or the total air content by the pressure method, rheological and tribological measurements using a portable concrete rheometer were implemented in the study. Moreover, a large amount of hardened air void analysis samples were collected to further characterize changes in the air void system. The Super Air Meter was also used to help track changes in the size distribution of the air void system in fresh concrete. **RESULTS/FINDINGS:** Preliminary results have shown that pumping significantly modified both the total air content and the spacing factor of concrete, which can possibly lead to problems with frost durability of the structure. Changes in concrete rheological properties (i.e. yield stress and plastic viscosity) were also recorded. **CONCLUSION:** Future research will focus on finding a relationship between pumping parameters and rate of change in concrete properties.

Relevance of Research to State-Related Topic(s)

This research is part of a larger project funded by the Kansas Department of Transportation (KDOT). This program was developed to address workability issues of current mix designs used on transportation projects statewide. Current state specifications require concrete to perform well in terms of long-term frost durability, however, mixes that meet these specifications are typically difficult to work with on the site, resulting in increased construction costs. The ultimate goal of the research team is to relatively fast transfer results of this project into current state design provisions, which will eventually have a direct impact on both quality and cost of the state infrastructure.

CLUSTER FREE SYNTHESIS OF MANGANESE-DOPED ZINC SELENIDE NANOCRYSTALS**Mohammad Sadegh Yazdanparast** and Emily J McLaurin*Department of Chemistry, College of Arts and Sciences*

BACKGROUND AND PURPOSE: Although challenging, doping nanocrystals has attracted the attention of scientists recently because it helps to obtain nanocrystals with new electronic, magnetic and optical properties. Considering its unique electronic and optical properties, Mn-doped ZnSe has been studied not only in photo-electronic devices but also as nontoxic materials for cell imaging in biomedicine, however, the synthesis of Mn:ZnSe nanocrystals is complicated and in some cases includes more than one step. **METHOD:** In this study Mn:ZnSe nanocrystals are obtained in a one step reaction using diphenyl diselenide. Typically, a mixture of diphenyl diselenide, manganese stearate, zinc undecylenate and oleyelamine degassed under vacuum at 100 °C for 90 minutes and then nanocrystals were obtained from reaction of diphenyl diselenide, manganese stearate and zinc undecylenate under nitrogen atmosphere at 280 °C for 10-40 minutes. After adding methanol, the nanocrystals were separated by centrifuge and dispersed in toluene and precipitated by adding methanol again. **RESULTS/FINDINGS:** Depending on the reaction time, nanocrystals have different sizes which can be studied by UV-Visible absorption spectroscopy. All nanocrystals have orange emission and photoluminescence studies indicate that the emission is related to Mn(II) doped in the ZnSe structure. **CONCLUSION:** Mn:ZnSe nanocrystals were synthesized successfully using cheaper precursors in comparison with previous studies and in a one step reaction. The results shows that the size of nanocrystals can be controlled by controlling the reaction time.

Relevance of Research to State-Related Topic(s)

Manganese-doped zinc chalcogenides have a variety of applications in photoelectronic devices and biomedicine. It has been shown that they can be used as a very sensitive reagent for phosphate detection, which is a huge concern regarding lakes, reservoirs and rivers. Unfortunately, difficulty of synthesis and high cost of commercially available samples limit the studies on these materials. This study provides an easy way for synthesis of this materials using relatively cheap chemical precursors.

A NEW PROFIT STREAM FOR GRAIN SORGHUM: SENSORY PROFILES AND CONSUMER ACCEPTANCE OF DRY DOG FOOD

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BACKGROUND AND PURPOSE: Sorghum is a key world grain and Kansas is the top producer in the US. To increase the use of sorghum, industries such as pet food have been targeted. However, for success it is important to understand sorghum's characteristics such as the sensory properties and pet owners' acceptance of final products, the objectives of this study. **METHOD:** Three samples containing different sorghum fractions (bran, flour, and whole sorghum) and a control sample containing mixed grains were manufactured. A trained human descriptive sensory panel described the sensory characteristics of the samples. A total of 105 pet owners evaluated the samples for appearance, color, aroma, and overall liking in a Central Location Test. **RESULTS/FINDINGS:** Differences among samples were small and related to a few appearance and texture characteristics. The bran sample was the darkest in color while the control sample was lightest and the whole sorghum sample had the most grainy and fibrous appearance. The whole sorghum and the control samples were judged to be most liked overall, and in appearance, and color. **CONCLUSION:** The slight difference in liking scores seems to be caused by the different appearance of the samples. The whole sorghum diet was accepted at the same level as the control diet and the results suggest that improvement in appearance of other samples will improve consumer acceptance to that of the control. This study indicates the potential for use of sorghum in dry dog food.

Relevance of Research to State-Related Topic(s)

Sorghum is an important crop in Kansas because we are the major producer in the United States. Sorghum characteristics such as a low glycemic index and antioxidant properties make it a perfect fit for pet food industry, an industry worth more than 21 billion dollars in the United States alone. Processes such as extrusion technology, which also boasts a major equipment supplier in Kansas, may be combined with sorghum to produce products that meet pet food needs. Providing information on the sensory qualities and consumer acceptance of pet food products manufactured with different components of sorghum, helps to promote the use of sorghum as a novel carbohydrate source in the pet food market, which is constantly looking for new ingredients.

CONSUMER ACCEPTANCE OF DRY DOG FOOD VISUAL CHARACTERISTICS IN THE U.S.

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BACKGROUND AND PURPOSE: In the Pet Food Industry, the development of successful products depends on a wide variety of factors. From a sensory perspective, the products' success depends on the companion animal accepting the product as palatable. In addition, the owner's perception of the product is of great importance. The interaction that pet owners have with pet food is usually through the senses of olfaction and vision. In the case of dry dog food, previous research has shown that the visual aspect is more important than the olfactory one in driving the overall liking by consumers. The objective of this study is to determine if differences can be found in the consumers' acceptance of the appearance of dry dog food and which visual characteristics are preferred. **METHOD:** One hundred and twenty-two dog owners evaluated the appearance of thirty dry dog food samples from commercially available products with varying visual characteristics in color, size, shape and variety of kibbles. Consumers rated the degree of liking of the samples' visual characteristics and selected appropriate descriptors they associated with each of the products. **RESULTS AND CONCLUSIONS:** Significant differences were found between the thirty samples in terms of overall liking, size liking, shape liking and color liking by the consumers. In terms of kibbles, dog owners showed to have preference for medium sizes, symmetrical shapes, medium brown colors and single-kibble products. In contrast, consumers showed to have a low degree of liking for large or small sizes, flat and elongated shapes, and green colors.

Relevance of Research to State-Related Topic(s)

The world's largest concentration of animal health industry lies between the cities of Manhattan, Kansas, and Columbia, Missouri. More than 300 animal health companies are located in this area, representing 56% of the \$88 billion total animal health, diagnostics and pet food global sales, and 67% of the \$32 billion U.S. sales (2014 KC Animal Health Corridor Asset Survey). According to the same source, companies located in this area account for 49% of the \$63 billion global pet food sales and 61% of the \$23 billion U.S. pet food sales. Since 2006, 31 new animal health companies have located in this geographical area, creating over 1300 new jobs and providing industry growth and economic development to northeast Kansas. The results of this research are expected to help in the development of dry dog food products that meet the consumers' needs, with increasing benefits to the pet food industry in Kansas.

INVESTIGATING DINING EXPERIENCES AT CHINESE RESTAURANTS USING USER-GENERATED CONTENT AND TOPIC MODELING

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BACKGROUND AND PURPOSE: Online social networking sites (SNS) have become popular, and consumers seek information from SNS before making their purchasing decisions. Chinese food is one of the top ethnic cuisines around the world, and understanding consumer behaviors through online, user-generated content may benefit Chinese restaurateurs to improve their business performance. The purpose of this research was to identify the key business attributes of Chinese restaurants and relationships between/among attributes and star ratings. **METHOD:** A topic modeling tool, Latent Dirichlet Allocation (LDA) was utilized to explore the topics of 22,743 consumer reviews in Yelp. Rapidminer was used to count word frequencies in each topic and content analysis of 3% randomly selected reviews was conducted to identify the specific attributes in review content. Multiple regression analysis was performed between topics identified by LDA and star ratings in order to verify the ability of LDA-generated topics in predicting star ratings. **RESULTS:** Twenty topics emerged and specific business attributes influencing star ratings were identified. Variety, food taste, freshness, and service quality consistency positively influenced star ratings, while food inconsistency, service inefficiency, lack of flavor, location inconvenience, and a cash-only payment option negatively affected ratings. Unique attributes related to Chinese restaurants were also found, such as authenticity, lunch specials, and delivery. **CONCLUSION:** Chinese restaurateurs may use these findings when prioritizing their business practices to maximize the impact on ratings. Online SNS may create a consumer-driven business profiles, which will allow consumers to match their personal preferences with attribute-specific ratings.

Relevance of Research to State-related Topic(s)

The restaurant industry of Kansas has significant economic impacts as there are over 5,000 restaurants generating \$4.1 billion in sales and 133,300 jobs, which account for 9% of the workforce (National Restaurant Association [NRA], 2015). Online social networking sites (SNS) are important for the restaurant industry as they assist consumers with information search for local businesses including various restaurants. This research has explored topic areas and key attributes of Chinese restaurants and their relationships with star ratings through the analysis of online user-generated content in Yelp. The findings of topics and business attributes (e.g., service quality, food quality, authenticity, delivery, and consistency) of Chinese restaurants will help local Chinese restaurateurs improve their business performance, as well as enhance consumer dining experiences in the local communities.

THE MISTREATED SERVICE SABOTEUR: PLAUSIBLE SOLUTIONS IN THE RESTAURANT CONTEXT

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BACKGROUND AND PURPOSE: Restaurant employees who engage in service sabotage (SS) are often victims of customer mistreatment (CM) because they want to "get back" based on the conservation of resources theory. Despite significant relationships between CM and SS, few studies explored plausible mediating or moderating factors within the complex mechanism, where CM may increase employees' perceived job stress (JS) and emotional intelligence (EI) may buffer negative workplace behaviors. Therefore, the purpose of this study was to examine the process of CM leading to SS behaviors with JS as a mediator and EI as a moderator. **METHOD:** Frontline employees at full-service restaurants were recruited from an online panel, and the desired sample size was calculated using G*power analysis. We performed confirmatory factor analysis (CFA) to evaluate model fit, and utilized hierarchical multiple regression analysis to test the moderated mediation model. **RESULTS:** Of 501 qualified individuals who meet inclusion criteria, 210 provided usable data. CFA revealed a four-factor model that explained acceptable relationships among constructs ($\chi^2=762.81$ [df=395, $p<.001$], CFI=.93, GFI=.81, RMSEA=.07, and NFI=.86). There was a significant association between CM and SS. Moreover, JS mediated the CM–SS relationship, and EI moderated the JS–SS relationship for employees who possessed lower levels of EI. **CONCLUSION:** This study confirmed the moderated mediation model of CM–JS–SS, controlling for the effect of EI. Restaurateurs may manage SS by controlling and intervening CM early and reducing employees' JS. Human resource managers and hospitality management educators may provide training programs to improve EI in order to reduce the likelihood of SS.

Relevance of Research to State-Related Topic(s)

The revenue generated by the Kansas restaurant industry will reach \$4.1 billion in 2015 offering 133,300 jobs (i.e., 9% of employment). It is estimated that every \$1 spent in Kansas restaurants will create an extra \$.77 for the state economy (National Restaurant Association, 2015). However, the tremendous cost related to correcting and preventing employee service sabotage may erode the prosperity and stability of the Kansas restaurant industry. Our study addresses one of the Kansas key topics, "workforce development" by focusing on restaurant frontline employee's well-being and its relationship with workplace behaviors. Our study findings show that managing difficult customers early, reducing employees' job stress, and improving employees' level of EI may decrease the likelihood of employee service sabotage behaviors and benefit the Kansas restaurant industry. Hospitality educators in Kansas may consider incorporating EI training in the curriculum to prepare students for becoming high quality workforce in the competitive restaurant industry.

RURAL PRISONS & THEIR COMMUNITIES: A REVIEW OF ECONOMIC DEVELOPMENT

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BACKGROUND AND PURPOSE: This literature review will address the underlying role the government has in influencing the economic framework of correctional facilities, primarily in rural areas. The information obtained will be applied specifically towards review of: 1.) rural-located prisons (public and private) and their impact, if any, on their local employment and other economic benefits/costs to the host community; 2.) economic costs of rural prisons for the families of inmates, based on inmates pre-incarceration location; and 3.) what this means for economic development in Kansas both currently, and in future decision-making.

RESULTS/FINDINGS: There is mixed research on whether rural prison sitting serves to increase economic development and/or reduce unemployment (King, Mauer, & Huling, 2003). Currently, Kansas has eight adult facilities and two juvenile facilities. Four facilities are located in metro counties and the remaining six facilities are located in non-metro counties; thus, 60% of facilities are built in rural communities in Kansas.

CONCLUSIONS: There are stronger arguments for the idea that rural prison sitting is not good for rural development (Hooks et al., 2010). Given the current prison sitting in Kansas, facilities should focus on recruiting employees who will reside within the community while also considering secondary benefits (e.g. tuition assistance) as Hooks et al. (2010) suggest that employees with higher academic degrees increase employment opportunities and promote the economy. In looking forward, Kansas should review the metro/non-metro categorization of counties when making decisions on prison sitting.

Relevance of Research to State-Related Topic(s)

The current findings are important when studying rural prison sitting and economic development in Kansas. According to the Office of Management and Budget's (OMB) 2013 Rural-Urban Continuum Codes, counties are the standard unit of measurement in conducting research on population and economic trends (Economic Research Service). Kansas has 105 total counties; 19 metro (18% of total counties) and 86 non-metro (82% of total counties). There are currently eight adult facilities and two juvenile facilities in Kansas. Four facilities are located in metro counties and the remaining six facilities are located in non-metro counties; thus, 60% of facilities are built in rural communities in Kansas. Facilities should focus on recruiting employees who will reside within the community while also considering secondary benefits (e.g. tuition assistance) as Hooks et al. (2010) suggest that employees with higher academic degrees increase employment opportunities and promote the economy.

STUDENTS' WRITING REFLECTS VARIED SOLUTION SCHEMATA ON TRADITIONAL MECHANICS PROBLEMS

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BACKGROUND AND PURPOSE: The Mathematization project investigates students' use of mathematical tools across the undergraduate physics curriculum. As a part of that project, we investigate how intermediate mechanics students use those tools in traditional homework problems, and what evidence we have of their tool use in their written solutions. We use their homework solutions to build a "fingerprint" of students' mathematical tool use in intermediate mechanics. Most of the physics problems are represented by words may be along with a diagram. In order to start the solving process, it's required to convert the word problem into a mathematical representation. Then algebra, calculus, a calculator and/or a computer could be employed to solve the problem. We can use the term '*mathematization*' to represent this conversion associated with physics problems. **METHOD:** We use the modified version of the ACER framework to analyze student's solutions. We code their homework solutions as to which problem solving tool they use at each step, then generalize across students and problems to build patterns of mathematical tool use on traditional problems. To compare patterns, we use techniques borrowed from social network analysis. **RESULTS/FINDINGS:** In this poster, we present preliminary findings of patterns in students' problem solving. We found more frequently occurring codes and code pairs and mapped them to different pathways of solving the same problem using social network analysis. The most common codes and code pairs relate to students' evaluation of mathematical expressions, followed by their identification of which general cases to use. These results are highly dependent on the exact wording of the homework problems, and vary substantially across students. **CONCLUSION:** This kind of analysis is new in studies of students' problem solving, particularly at the university level and beyond. Our work shows that it is both possible and fruitful, and pushes theoretical and methodological developments in understanding students' problem solving.

Relevance of Research to State-Related Topic(s)

STEM – Science, Technology, Engineering and Mathematics – education is vital to the future of Kansas. A well-educated population is the key to economic growth; **STEM education** has been particularly cited as the most important growth area in **workforce development** for the US as a whole. To best educate STEM students, we need to first understand the fundamental processes of learning STEM subjects. In order to teach students to solve problems correctly, first we must study their problem-solving behaviors in STEM classes. Homework is a key part in every college-level physics courses; it represents the bulk of students' problem solving opportunities.

FEMALE FIREFIGHTERS' PERCEPTIONS, ATTITUDES, AND EXPERIENCES WITH INJURY**Brittany Hollerbach¹, Katie M. Heinrich¹, and Sara Jahnke²**¹*Department of Kinesiology, College of Human Ecology;* ²*NDRI, Center for Fire, Rescue & EMS Research*

BACKGROUND AND PURPOSE: Firefighting is an inherently dangerous occupation. National firefighter injury rates have been well documented for males, however there are little data regarding females, which represent 3-5% of the fire service. Despite increased attention to health and wellness, there remains little focus on how the demands of the occupation uniquely affect women. This systematic investigation sought to explore perceptions, attitudes, and experiences with injury for females on the fire ground. **METHODS:** A nationally representative sample of 68 current female firefighters and fire service leaders in Kansas were solicited for participation in focus groups and key informant interviews. The participants were asked about perceived threats to safety and standard operating procedures that might lead to injury with regards to gender differences in the fire service. A thematic qualitative analysis was conducted by two researchers. **RESULTS:** The following themes were identified: 1) males and females experienced the same rates/types of injury, 2) females were in a male-dominated field, 3) females lacked functional techniques/muscular endurance, 4) fire service training was inadequate for females, 5) females experienced ill-fitting gear, and 6) females experienced harassment on the job. **CONCLUSION:** Addressing the issues identified in this study will require policy change for injury prevention. The analysis suggests the fire service must include female-specific training for drills and fitness training, including strength training, with a consideration for female anatomy and musculature. Standard operating procedures must be reviewed for relevance to today's female fire service personnel.

Relevance of Research to State-Related Topic(s)

This research is imperative for health and human services. The participants represent volunteer and career fire departments in Kansas and across the United States. Firefighters are integral to our communities' safety and must be prepared to respond to emergencies of all types and magnitudes. Most emergency response activities require awkward positioning and significant exertion, increasing the likelihood of injury. In order to perform fire suppression and rescue duties safely and effectively it is necessary firefighters possess strength, stamina, and agility. The financial cost of injuries among firefighters is estimated to be between \$2.7 and \$7.8 billion dollars per year. This research seeks to close the gap in the literature. By better understanding female firefighter perceptions about injury risks we can change training and standard operating procedures to better prepare females for the strenuous task of firefighting. Better training for firefighters ensures a safer, better protected state.

UNDERSTANDING THE DETERMINANTS OF WEIGHT BIAS AMONG DIETETICS AND NUTRITION STUDENTS AT KANSAS STATE UNIVERSITY

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BACKGROUND AND PURPOSE: Despite the increasing prevalence of obesity in the United States, negative attitudes towards obese individuals are widespread. Overweight and obese individuals are perceived as undisciplined, inactive, and unappealing. Health care providers, including dietetics and nutritionist are not exempt from showing bias towards obese individuals, which may undermine treatment and lead to subsequent psychological and health problems. The purpose of this study was to measure the extent of weight bias among dietetics and nutrition students as well as investigate its determinants. **METHOD:** A cross-sectional survey (n=316) was conducted among undergraduate dietetics and nutrition students at Kansas State University to assess weight bias using the Fat Phobia Scale. Eating competence was measured using the ecSI 2.0 and body dissatisfaction using the Stunkard Figure Rating Scale. Other variables included experience with obesity, media exposure to health and nutrition information and demographic characteristics. **RESULTS/FINDINGS:** About 36% of the participants had weight bias, 64% were unsatisfied with their body image and none of the participants had eating competence. Media exposure on health information, body dissatisfaction and eating competence were related to fat phobia ($p < .05$). A linear regression with stepwise selection to determine factors predict weight bias showed significant relationship with eating competency, body dissatisfaction, and ethnicity at $p < .05$. **CONCLUSION:** These findings highlight that weight bias is an apparent issue among students enrolling in health related programs. Results are consistent with previous studies conducted in the United States. Considering their future role in clinical and community setting, this issue should be addressed properly.

Relevance of Research to State-Related Topic(s)

Obesity is a major health problem in the United States. It is reported that 1 out of 3 adults in the State of Kansas are obese (CDC, 2014). Obesity is a lifestyle-related problem and treatable, in which dietitians and nutritionists plays important roles in its management. However, previous studies found that some of them still hold bias against obese individuals (Berryman et al, 2006). Weight bias could severely undermine the treatment. This study investigated the extent of weight bias and its determinants among nutrition and dietetics students at Kansas State University. Existing research tends to focus on weight bias and its impacts whereas; research focusing on determinants is limited. Therefore, this study is significant as it provided a considerable endeavor to develop tailored intervention and improve health communications towards patients with obesity, which in turn will contribute to better quality of dietetic services provided in the State of Kansas.

A POPULATION-BASED STUDY OF COUPLING AND PHYSICAL ACTIVITY BY SEXUAL ORIENTATION FOR MEN

Joseph S. Lightner

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INTRODUCTION: Physical activity guidelines recommend minimum (active) and health-enhancing (high-active) levels of aerobic and muscle-strengthening activities for health benefits. Research suggests that coupled men engage in more physical activity than single men. However, no population-based studies have been conducted on the relationship between coupling status and physical activity for gay men. This study provides a nationally representative analysis of physical activity and coupling status by sexual orientation. **METHOD:** Logistic regression was conducted using aggregated data from the 2013-2014 National Health Interview Survey. Dependent variables were dichotomous for meeting guidelines or not meeting guidelines. **RESULTS:** Coupled gay men are more likely to meet physical activity recommendations than coupled straight men. Unadjusted odds ratios suggest that coupled gay men are 1.62 (95% CI: 1.05-2.50) times more likely to be active, 1.67 (95% CI: 1.10-2.51) times more likely to be high active, 1.89 (95% CI: 1.24-2.89) times more likely to engage in muscle-strengthening activities, and 2.00 (95% CI: 1.28-3.11) times more likely to meet physical activity recommendations than coupled straight men. After accounting for age, race, education, and income, coupled gay men are 1.57 (95% CI: 1.00-2.46) times more likely to engage in muscle-strengthening activities and 1.61 (95% CI: 1.01-2.56) times more likely to meet physical activity recommendations than coupled straight men. There were no statistical differences for single gay and single straight men. **CONCLUSIONS:** More research is needed to help understand the underlying mechanisms to explain why coupled gay men engage in more physical activity than their straight counterparts.

Relevance of Research to State-related Topic

In February of 2015, Governor Sam Brownback issued an executive order removing discrimination protections for gay, lesbian, and transgender state workers. The House Standing Committee on Health and Human Services' mission is to legislate for better health of all Kansans. Health behaviors of sexual minorities are integral to this mission, yet this committee has not taken action on health issues of sexual minorities in the last two years. My research shows that, for gay men, coupling may help promote physical activity to protect them from harmful health impacts of discrimination. This research should be followed with an extensive analysis of the Behavioral Risk Factor Surveillance System (BRFSS) data that are collected by the Kansas Department of Health and Environment. This allows us to determine if similar relationships exist for gay men in Kansas and potentially to what degree harmful effects of discriminatory policies may be present in Kansas.

FACTORS INFLUENCING BARRIERS TO STUDENTS REPORTING SEXUAL ASSAULT TO UNIVERSITY OFFICIALS

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BACKGROUND AND PURPOSE: Sexual assault (SA) is a serious issue on college campuses. One in five women and one in sixteen men are sexually assaulted in college. Barriers remain that keep students from reporting despite universities efforts to improve SA reporting. This project examines common factors discussed as barriers and their relationship with student reported reasons for not reporting. **METHOD:** A mixed-method analysis was used to analyze a sample of 241 students who did not report their SA. Six qualitative themes were analysed using logistic regressions. Predictors included dichotomous questions about prevention/policy training, being a victim of SA, if a student or employee was the perpetrator, unconsensual sexual contact, a friend's disclosure of SA, and observing a situation that could lead to SA. **RESULTS/FINDINGS:** Students reporting sexual contact while unable to consent had lower odds ($OR = .05$) of reporting the theme "blame"; students that had observed a situation that might lead to SA had lower odds ($OR = .28$) of reporting the theme "Didn't want to report"; students with policy training had lower odds ($OR = .18$), of reporting the theme "Embarrassed/Scared"; victims of a completed sexual assault by another student were twice as likely ($OR = 2.7$) to report the theme "Felt they couldn't report" and students who had a friend tell them about their assault had lower odds ($OR = .27$) of reporting the theme "Felt they couldn't report". **CONCLUSION:** Students who did not report their SA appear to have had experiences that influenced the odds of which barrier might prevent them from reporting.

Relevance of Research to State-Related Topic(s)

Following the Campus Sexual Violence Elimination Act (Campus SaVE), all universities receiving Title IV funding must offer primary prevention education on sexual assault, bystander intervention training, and ongoing prevention campaigns. This affects every university in Kansas. The policies implemented under the SaVE act require universities to educate students in order to prevent sexual assault. However, the simple fact remains that barriers specific to student reporting need to be considered and incorporated into prevention efforts and improving odds of reporting. The findings from this research suggest that there are areas that colleges in Kansas can directly impact such as training on policy regarding sexual assault, education on consent, and improving peer support.

WHAT WE CAN LEARN ABOUT HEALTH FROM KANSAS TEENS: RESULTS OF THE KANSAS ADOLESCENT HEALTH NEEDS ASSESSMENT

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BACKGROUND AND PURPOSE: The inclusion of adolescent health objectives in the national Healthy People 2020 plan is an acknowledgement that health issues impacting teens are unique from those affecting children or adults. Consequently, a three-pronged assessment process was initiated to identify key health issues among Kansas adolescents. Information obtained in the assessment informed the development of Kansas Department of Health and Environment's federal Title V funding application and recommendations for a Kansas adolescent health plan. **METHOD:** The assessment process consisted of: a) review of existing population health data, b) online community input survey (854 responses), c) community focus groups (324 youth of 401 participants), and d) interviews with Kansas health leaders. **RESULTS AND FINDINGS:** The top health issues affecting adolescents identified after triangulation of data were mental health (including depression and self-injury), substance abuse, sexuality and reproductive health, nutrition and physical activity, and injury prevention. Top health-related barriers and challenges adolescents confront include lack of information and access to services, cost, lack of parental support/skills and awareness, embarrassment/shame, and lack of trusted adult mentors for youth to confide in. **CONCLUSION:** The results of the Kansas adolescent health needs assessment show that issues facing adolescents are unique and require systemic approaches that include prevention, early intervention, and treatment strategies delivered at community, school and family levels. Future research into the health experiences and health literacy of adolescents will strengthen adolescents' "voice" to inform health interventions, health delivery and health promotion to improve the health of all adolescents in Kansas.

Relevance of Research to State-Related Topics

Adolescence is an important developmental stage filled with health risks as well as positive health opportunities. This positive view of adolescence has been adopted by 18 federal agencies, and has framed the adolescent health objectives of the nation's Healthy People 2020 plan. For Kansas, the 2016-2020 Title V Maternal and Child Health Services Block Grant for the Bureau of Family Health, Kansas Department of Health and Environment used the findings and recommendations of the recently completed adolescent health needs assessment which was conducted by Kansas State University's Kansas Adolescent Health Project. The results of this assessment informed an adolescent health plan for Kansas, and led to behavioral health assessment projects funded by SAMHSA (Substance Abuse Mental Health Services Administration) currently underway in Riley and Wyandotte counties.

BARRIERS TO REPORTING SEXUAL ASSAULTS TO UNIVERSITY OFFICIALS**Chelsea Spencer**, Allen Mallory, Michelle Toews, and Sandra Stith*School of Family Studies and Human Services, College of Human Ecology*

BACKGROUND AND PURPOSE: Sexual assault is a serious issue on college campuses. Approximately 1 in 5 women and 1 in 71 men will be raped during their lifetime, and 1 in 2 women and 1 in 5 men will experience other forms of sexual violence. Sexual assault survivors experience an array of physical and mental health problems, and the impact of an assault can disrupt, or even end the college experience. Approximately 80 percent of sexual assaults go unreported. The purpose of this study is to examine student reported barriers for reporting sexual assaults to university officials. **METHOD:** Using the qualitative responses to an online survey, 241 students from a large university responded to a question about why they did not report to university officials. Using thematic analysis, six main themes were identified from student responses. **RESULTS/FINDINGS:** The major themes were: blamed themselves/thought others would blame them (n = 11), that they did not want to report (n = 116), that they felt like they could not report (n = 61), embarrassment or fear (n= 28), lack of information about the reporting process (n= 48), and lack of information about the perpetrator or assault (n= 13). **CONCLUSION:** Examining the barriers for reporting sexual assaults to university officials allows for opportunities to implement training and procedures to encourage sexual assault survivors to report the assaults. Since universities are required to provide reporting survivors with various resources, this will allow survivors to receive resources that may help their mental and physical health symptoms related to the assault.

Relevance of Research to State-Related Topic(s)

Sexual assault on college campuses directly impacts education outcomes, and student achievement in the State of Kansas. Sexual assault survivors experience immediate and long-term health risks, including emotional distress, depression, anxiety, substance use, PTSD symptoms, poor academic and work performance, and increased rates of suicide. Even an unsafe campus climate can negatively impact the educational experience for students. The Campus Sexual Violence Elimination Act (Campus SaVE) requires all universities to provide information about existing counseling, mental health, victim advocacy, legal assistance and other services available to survivors who report to the university. If college campuses in the state of Kansas were able to implement policies that encouraged students who have been sexually assaulted to report these incidents, these students may be able to receive the resources that will aid in their recovery, as well as help to identify the perpetrators of sexual assault

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