

Research and the State

GRADUATE STUDENT POSTER SESSION

Program Booklet

Tuesday, October 29, 2013
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 70 K-State graduate students representing six academic colleges and 20 departments. 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 the spring.

AWARDS CEREMONY

1:00 pm
Room 227

The top 10 graduate student poster presenters selected to represent K-State by presenting their posters at the 11th annual Capitol Graduate Research Summit (CGRS) in spring 2014 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, and the University of Kansas Medical Center. 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 two presenters from each institution to receive scholarship awards.

Poster Titles and Presenters

1. **CONSUMER MEAT SAFETY CONCERNS: IMPACT OF BEEF E. COLI O157: H7 RECALLS ON MEAT DEMAND**
Xia Shang
2. **MEMBRANE REACTORS FOR USE IN THE PARTIAL HYDROGENATION OF VEGETABLE OIL: UNDERSTANDING THE INFLUENCE OF PRESSURE AND THE RATIO OF MEMBRANE AREA TO REACTION VOLUME**
Michael D. Wales
3. **THE EFFECT OF COMMERCIAL ENZYMES WITH DROUGHT STRESSED CORN AND SORGHUM ON POULTRY AND SWINE GROWTH PERFORMANCE**
Aaron C. Bingham
4. **INDIRECT THERMAL TREATMENT OF WHOLE WHEAT GRAIN AND WHOLE WHEAT FLOUR TO IMPROVE FUNCTIONALITY**
Moses Khamis
5. **MATHEMATICAL MODELING OF FLOW BEHAVIOR AND CELL STRUCTURE FORMATION DURING EXTRUSION**
Pavan Harshit Manepalli
6. **FEED PROCESSING PARAMETERS AND THEIR EFFECTS ON NURSERY PIG GROWTH PERFORMANCE**
Landon.L. Lewis
7. **WHEAT VARIETY YIELD DATA: DO COMMERCIAL AND PUBLIC PERFORMANCE TESTS PROVIDE THE SAME INFORMATION?**
Frank Nti
8. **STIMULATION OF LACTATIONAL ESTRUS AND OVULATION IN SOWS**
Hyatt L. Frobose
9. **VALIDATION OF WASHING TREATMENTS TO REDUCE PATHOGENS IN FRESH PRODUCE**
Keyla Lopez
10. **A FOUR PLEX REAL-TIME PCR ASSAY FOR THE DETECTION AND QUANTIFICATION OF ESCHERICHIA COLI O157 IN CATTLE FECES**
Lance W. Noll
11. **LUMINOL-BASED BIOLUMINESCENCE IMAGING OF PRE-CLINICAL TUMORS**
Hamad S. Alshetaiwi
12. **TRANSFER OF PHENOXY RESISTANCE FROM WILD RADISH (RAPHANUS RAPHANISTRUM), INTO CANOLA (BRASSICA NAPUS) VIA EMBRYO RESCUE**
Andrew J. Dillon
13. **RNAI MEDIATED VIRAL RESISTANCE IN TRANSGENIC WHEAT: STABILITY OVER FIVE GENERATIONS**
Jessica Rupp

- 14. THE EFFECT OF BACTERIAL INFECTION ON THE MIDGUT PHYSIOLOGY OF THE SAND FLY LUTZOMYIA LONGIPALPIS**
Matthew C. Heerman
- 15. CYTOTOXIC EFFECT OF SUBSTITUTED QUINOLINES ON SW480 HUMAN COLON CANCER CELLS**
Kristina Bigelow
- 16. DEVELOPMENT OF MULTIPLEX REAL TIME PCR ASSAYS FOR THE DETECTION AND QUANTIFICATION OF THE SIX MAJOR NON-O157 SHIGA TOXIN-PRODUCING ESCHERICHIA COLI SEROGROUPS IN CATTLE FECES**
Pragathi Belagola Shridhar
- 17. GENETIC BASIS OF GLYPHOSATE RESISTANCE IN KOCHIA SCOPARIA**
Kindsey Niehues
- 18. RUNOFF FLUXES IMPACT ON EPHEMERAL GULLY PROPAGATION IN CULTIVATED CROPLANDS**
Vladimir Karimov
- 19. MAPPING OF AGRICULTURAL REGION WITH EXPOSURE TO CLIMATE VARIABILITY IN KANSAS**
Abhishes Lamsal
- 20. DYNAMIC CURVE NUMBER (CN) DEVELOPMENT FOR NATURAL AND DISTURBED LANDS USING NORMALIZED DIFFERENCE VEGETATION INDEX (NDVI)**
Muluken Muche
- 21. COMPOSITION AND STRUCTURE OF RIPARIAN WOODLANDS OF TUTTLE CREEK WATERSHED**
Merilin Barahona
- 22. CLIMATE CHANGE AND LONG DURATION RAINFALL EVENT DISTRIBUTION IN KANSAS**
Vahid Rahmani
- 23. RUNOFF, SEDIMENT AND TOTAL PHOSPHORUS LOSS PREDICTIONS USING THE APEX MODEL**
Ammar Bhandari
- 24. GREENHOUSE GAS FOOTPRINTS OF TWO NON-LEGUME COVER CROPS FOLLOWING WINTER WHEAT**
Megan Brown
- 25. GROWTH OF HBN USING METALLIC BORON: ISOTOPICALLY ENRICHED ¹⁰B FOR NEUTRON DETECTION**
Tim B. Hoffman
- 26. THE EFFECT OF MIXED HYDROPHOBIC & HYDROPHILIC SURFACES ON FROST NUCLEATION & GROWTH**
Alex Van Dyke
- 27. CHARACTERIZATION OF BROADBAND ELECTROMAGNETIC PROPERTIES OF NANOPARTICLE CONTRAST AGENTS FOR ENHANCED HYPERTHERMIA CANCER THERAPY**
Brogan T. McWilliams

- 42. STUDY OF THE FEASIBILITY OF USING COMBINED GLASS PARTICLE SIZES AND TYPES IN CONCRETE AS PARTIAL CEMENT REPLACEMENT**
Mohammadreza Mirzahosseini
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Sumathy Sinnathamby
- 45. HYDROTREATING OF FAST PYROLYSIS OIL WITH CATALYTIC INTEGRAL-ASYMMETRIC MEMBRANES AT MILD CONDITIONS**
Michael G. Heidlage
- 46. STRUCTURAL BAMBOO IN EAST AFRICA**
Evan Myers
- 47. TRANSFER-LENGTH MEASUREMENTS ON CONCRETE RAILROAD TIES FABRICATED WITH 15 DIFFERENT PRESTRESSING REINFORCEMENTS**
Naga Narendra B. Bodapati
- 48. EFFECTS OF SETUP AND MATERIAL PARAMETERS ON THE STANDARD TEST FOR STRAND BOND**
Thomaida Polydorou
- 49. SAFETY EFFECTIVENESS FOLLOWING ADDING BYPASS LANES AT UNSIGNALIZED RURAL INTERSECTIONS IN KANSAS**
Alireza Shams
- 50. STUDYING THE IMPACT OF SPEED LIMIT CHANGE ON HORIZONTAL CURVE CRASHES**
Hojr Momeni
- 51. TRANSFER BOND TEST USED TO PREDICT TRANSFER LENGTH OF CONCRETE RAILROAD TIES**
Joseph R. Holste
- 52. ANALYZING THE EFFECTIVENESS OF BIOPHILIC DESIGN IN FACILITATING CREATIVITY**
Teague Peak
- 53. INDOOR AIR QUALITY IN OFFICE DESIGN**
Morgan Stafford
- 54. THE CHANGING TIMES, CHANGING NEEDS: THE FUTURE OF EFFECTIVE WAYFINDING IN THE WORKPLACE**
Brian Davis
- 55. THE IMPACT OF LIGHTING ON EMPLOYEES IN A CHANGING WORKPLACE**
Abigail Zohner
- 56. ENVIRONMENT VS. PRODUCTIVITY: A STUDY ON WORKING ENVIRONMENTS AND THEIR PSYCHOLOGICAL EFFECTS**
Nichole Finke

Poster Abstracts

1

CONSUMER MEAT SAFETY CONCERNS: IMPACT OF BEEF *E. COLI* O157: H7 RECALLS ON MEAT DEMAND

Xia Shang and Glynn T. Tonsor

Department of Agricultural Economics, College of Agriculture

BACKGROUND AND PURPOSE: Meat safety issues have dramatically concerned livestock producers, consumers, and governments in recent years. Foodborne contaminants directly impact producers and may also influence consumer food demand adversely. *E. coli* O157: H7 is a deadly toxin which can cause severe public health threat. The outbreak of *E. coli* O157: H7 is an obvious risk factor for not only consumers, but also meat industry. Food Safety Inspection Service (FSIS) mandates Federal Meat Inspection Act to inspect meat products and releases food safety recall information to the public. Previous literatures examined the impacts of *E. coli* O157: H7 recalls by different methods. However, they did not answer a detailed question: what is the magnitude of own- and cross-effects to the meat demand due to beef *E. coli* recalls. The main purpose of this study is to assess the effects of FSIS beef *E. coli* O157: H7 recalls on U.S. meat demand. **METHOD:** The Rotterdam model and the first difference almost ideal demand system (AIDS) are estimated in this study to investigate the effects of beef *E. coli* recalls. Then statistical tests are conducted to verify the significances of beef *E. coli* recall effects on meat demand. **RESULTS AND CONCLUSION:** The key findings of this study can be summarized as the FSIS beef *E. coli* recalls has i) contemporaneously negative effects on the demand of beef and ii) significantly reduced U.S. pork and poultry demand in both short- and long-run. Beef *E. coli* comes to be an important set of meat demand determinant which dominates the overall food safety event.

Relevance of Research to State-Related Topic(s)

According to Kansas Department of Agriculture, Kansas is a leader in beef production, with more than 19% of all U.S. beef coming from Kansas beef processing facilities. Given the meat purchasing decisions of representative U.S. consumers are influenced by the FSIS beef *E. coli* recalls, the meat industry in Kansas may need to pay more attentions and invest on routinely investigating the contaminations of foodborne illness. For example, since *E. coli* O157: H7 can contaminate meat products during the processes of producing, transportation, and storage, meat industry should maintain a strict quality and safety control within the whole supply chains.

MEMBRANE REACTORS FOR USE IN THE PARTIAL HYDROGENATION OF VEGETABLE OIL: UNDERSTANDING THE INFLUENCE OF PRESSURE AND THE RATIO OF MEMBRANE AREA TO REACTION VOLUME

Michael D. Wales, Wade Traylor, Mary E. Rezac, Peter H. Pfromm
Department of Chemical Engineering, College of Engineering

BACKGROUND AND PURPOSE: The partial hydrogenation of vegetable oil is employed to produce margarine and shortening; however, copious amounts of trans-fats are produced as an undesirable side reaction in this process. Previous bench scale studies have shown that using membrane reactors reduce the trans-fat produced by over 70%. Extending this technology from the bench scale to commercial use requires a more complete understanding of how process conditions and reactor design influences system performance. **METHOD:** Commercially available membranes are purchased, rendered catalytically active, and used to produce partially hydrogenated soybean oil. The impact of the hydrogen pressure applied and the ratio (membrane area / reaction volume treated) on the overall performance of the system is under investigation. **RESULTS:** We are able to reproduce the low trans-fat formation for the partial hydrogenation of vegetable oil using a scaled up membrane reactor. At low pressures, the reaction rate increases with hydrogen pressure. Above some minimum level, the reaction rate remains essentially constant even as hydrogen pressure is further increased. We report the change in reaction rate as a function of the ratio (membrane area / reaction volume treated). **CONCLUSION:** Scale up questions were investigated for membrane reactors in the partial hydrogenation of vegetable oil with low trans-fats. The ratio of membrane surface area to volume of oil reacted has a significant impact on the reaction rate. Additionally, above some minimum hydrogen level, the system is nearly zero order in hydrogen, indicating that the catalyst surface maintains high hydrogen coverage throughout the experiments.

Relevance of Research to State-Related Topic(s)

Trans-fat consumption increases the risk of coronary heart disease (CHD) by lowering the HDL cholesterol levels in the body and increasing the amount of LDL cholesterol. Over time high amounts of LDL can build up as plaque in the arteries and restrict blood flow. The Kansas Department of Health and Environment reports that, "CHD constituted the largest subcategory of cardiovascular disease accounting for 43% of all cardiovascular disease deaths in Kansas in 2008." In addition, 38.6% of Kansas adults have high cholesterol. As mentioned above, preliminary research has shown that membrane reactors can reduce trans-fats in the production of margarine and shortenings. By investigating scale up factors for this reactor we hope to gain insights into system design such that commercial application of this new technology is possible.

THE EFFECT OF COMMERCIAL ENZYMES WITH DROUGHT STRESSED CORN AND SORGHUM ON POULTRY AND SWINE GROWTH PERFORMANCE

Aaron C. Bingham and Cassandra K. Jones

Department of Grain Science and Industry, College of Agriculture

BACKGROUND AND PURPOSE: During drought conditions, grain yields and nutrient composition may be reduced, affecting animal performance. Carbohydrase enzyme inclusion may increase nutrient digestibility of drought-stressed grains, thus mitigating performance decreases in both swine and poultry. **METHOD:** 360 barrows (PIC 1050) were randomly allotted to 1 of 8 treatments in a 2x4 factorial design (drought v. normal, no enzyme v. Roxazyme VP v. Ronozyme G2G v. Roxyzyme VP + Ronozyme G2G). Diets were fed in 2 phases, from d 10 to d 25 for phase 2 and d 25 to d 35 for phase 3. 512 broiler chicks (Cobb × Cobb) were hatched and allotted to battery cages (8 birds/cage, 8 cages/treatment) for an 18-d growth experiment. Chicks were fed 1 of 8 dietary treatments arranged in a 2×2×2 factorial design (drought vs. normal conditions, corn vs. sorghum, Roxazyme vs. no Roxazyme). **CONCLUSION:** There were no significant differences between grain type, grain condition, or enzyme inclusion in ADG, ADFI, or FCR in poultry. Enzyme inclusion did increase dry matter digestibility and fat digestibility in poultry. Sorghum is an adequate replacement for corn in poultry diets during drought conditions. Nutrients from drought stressed corn are converted less efficiently by broiler chicks in the starter period. Roxazyme G2G tended to increase feed efficiency in swine during phase 2, but the trend was not carried over into phase 3.

Relevance of Research to State-Related Topic(s)

Kansas has been experiencing one of the worst droughts in recent history over the last 3-5 years. In 2011, livestock in Kansas was a \$5.3 billion dollar industry, with \$0.6 billion coming from swine production. Kansas also produces over 50% of all US Sorghum and 3.5% of all US corn. Providing a model for livestock producers to economically utilize crops during drought conditions stands to benefit not only Kansas livestock producers, but Kansas agriculture as a whole..

INDIRECT THERMAL TREATMENT OF WHOLE WHEAT GRAIN AND WHOLE WHEAT FLOUR TO IMPROVE FUNCTIONALITY

Moses Khamis and Hulya Dogan

Department of Grain Science and Industry, College of Agriculture

BACKGROUND: Dough conditioners, additives, modified starches are often added to cereal products to compensate for some of the lacking functional attributes of flour such as water absorption, freeze-thaw stability, gelling and consistency. **OBJECTIVES:** To develop a direct, rapid and continuous thermal processing technique to improve the functionality of wheat flour, shelf life and safety. And characterize treated wheat flours for their mixing, pasting, and baking performance. **MATERIALS AND METHODS:** Hard red winter wheat (12.76% protein) good bread-making quality flour and grain were subjected to an indirect short time and continuous heat treatment at various combinations of moisture content, temperature and time using Solidaire Model TCJS-8 (Bepex International, Minneapolis, MN) heating unit. The treated grain was milled to whole wheat flour using combination of two mills: Buhler experimental mill (straight grade flour), then Fitz mill (to reduce bran and shorts to below 215 μm). These constituents were then blended back to obtain whole wheat flour. The treated material was dried to stabilize product, cooled, collected in double plastic lined drum and sealed until further analysis for particle size, mixing, pasting and microbial efficacy. **RESULTS:** Overall, treated flour had relatively higher torque peak, break down viscosities than treated grain. Severity of agglomeration increased with increase in hydration moisture. Treated whole wheat flour had greater degree of gelatinization and it was affected by the hydration moisture content and the temperature. Flour had higher levels of microbial load than grain. There was about one log reduction in aerobic plate count after treatment.

Relevance of Research to State-Related Topic(s)

The state of Kansas is leading producer of hard red winter wheat. This research will add value to utilization of this wheat used in whole wheat flour grown in State of Kansas as increasing number of consumers demand whole, natural food. To meet such challenges, there is necessity for newer processing technologies that improve the performance of flours in general with minimum or no addition functional ingredients and prolonged shelf life. Indirect, rapid and continuous thermal treatment of wheat flour is a potential alternative for improving functional properties, as well killing microbes and deactivating enzymes. This technique can be optimized to modify intrinsic properties of native wheat flours to improve their functionality, safety and shelf life.

MATHEMATICAL MODELING OF FLOW BEHAVIOR AND CELL STRUCTURE FORMATION DURING EXTRUSION

Pavan Harshit Manepalli¹, Anubha Grarg¹, Hulya Dogan¹, John Mathew², and Sajid Alavi¹

¹Department of Grain Science and Industry, College of Agriculture; ²FritoLay R&D, Plano, TX

BACKGROUND AND PURPOSE: Expanded Snack Products have a large share in the market in terms of consumption and economic value. Cellular structure is an important parameter affecting the quality and the texture of the snack products. Cellular structure formation during extrusion of expanded snacks is dependent on the flow behavior of the melt and dynamics of vapor induced puffing. The objective of this work was to develop a predictive model for flow behavior of a biopolymer melt inside the extruder and formation of cellular structure during vapor induced puffing. **METHOD:** The temperature, pressure and barrel filling ratio profiles inside the extruder were developed from input parameters like in-barrel moisture content (16-25% wet basis) and screw speed (150-300 rpm), using one-dimensional modeling approach. Rheology of the flow was described using the non-Newtonian, non-isothermal viscosity model. **RESULTS AND CONCLUSION:** Specific mechanical energy and die temperature increased with the increase in screw speed and decrease in in-barrel moisture content. Cell structure (average cell radius = 48.53-245.23 microns, open-cell fraction = 0.544-0.782) and the expansion ratio (2.68-6.21) was modeled using mass, heat and momentum transfer equations. The effect of variability of input parameters on the expansion of the extrudate was also modeled using stochastic methods. Variability in expansion ratio was impacted more by variation in in-barrel moisture content compared to variation in screw speed.

Relevance of Research to State-Related Topic(s)

Kansas is one of the top states in agricultural production in US and the economy of Kansas mostly relies on food industries. Inconsistency in the quality of the product is becoming a big issue for the industry as well as to the consumer. The inconsistency in the quality of the product is due to the variability of the parameters during the process. Hence, stochastic modeling developed in the current study helps in controlling the variability of the parameters during the process. This helps in better control of the process. Investigation on input parameters such as moisture content and screw speed helps in designing the manufacturing equipment which would help industries such as Wenger which are based in Kansas. Investigation of raw materials would help industries such as MGP ingredients in supplying the right ingredients for the process. Consistency in the quality of the product would also improve the consumer acceptance.

FEED PROCESSING PARAMETERS AND THEIR EFFECTS ON NURSERY PIG GROWTH PERFORMANCE

Landon.L. Lewis¹, Cassandra K. Jones¹, Adam C. Fahrenholz², Marcio A.D. Goncalves³, Charles R. Stark¹,
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BACKGROUND: 180 nursery pigs (12.6 kg) were used to determine the effects of conditioning parameters and feed form on pig performance. Treatments included: 1) negative control mash diet; 2) positive control pelleted diet conditioned at 60 rpm; 3) pelleted diet conditioned at 30 rpm and reground; 4) pelleted diet conditioned at 60 rpm and reground, and 5) pelleted diet conditioned at 90 rpm and reground. **RESULTS/FINDINGS:** Average daily gain and G/F did not differ ($P > 0.12$) between treatments overall. Pigs fed mash diets tended to have greater ($P = 0.10$) ADG compared to those fed pelleted and reground diets, suggesting that processing may have had a negative influence on feed utilization, which is further supported because pigs fed mash diets tended to have greater ($P = 0.06$) ADG compared to those fed diets that were heat processed, regardless of regrinding. Considering these results, it was not surprising that pigs fed mash diets had greater ($P = 0.05$) ADG and ADFI ($P = 0.01$) than those fed pelleted diets. When directly comparing diets conditioned at 60 rpm, pigs fed pelleted diets had improved ($P = 0.01$) G/F due to lower ADFI ($P = 0.004$) but similar ADG ($P = 0.60$). **CONCLUSION:** The expected improvement in G/F from pelleting was observed, but lost when diets were reground to near original mash particle size. This may indicate that diet form impacts G/F more than degree of starch gelatinization or other intrinsic factors associated with conditioning ingredients.

Relevance of Research to State-Related Topic(s)

Through continual research in the area of Animal Health, nutrition and performance, we are able to better understand how to maximize animal growth and efficiency, resulting in lower costs and improved yields for consumers. This helps us in the eternal mission to feed the world. The reevaluation of feed processing parameters with new objectives in mind helps us to better understand the alteration of intrinsic effects involved in feed manipulation, generating improved animal performance. Animal nutrition is arguably one of the two driving factors in animal growth. It is critical that we focus on these factors and continue research these areas of interest in order to meet consumer demands.

WHEAT VARIETY YIELD DATA: DO COMMERCIAL AND PUBLIC PERFORMANCE TESTS PROVIDE THE SAME INFORMATION?

Frank Nti and Andrew Barkley

Department of Agricultural Economics, College of Agriculture

BACKGROUND: The article used innovative data: to quantify the impact of private and public wheat breeding programs on yields over time, to test if differences exist in reported wheat yields of commercial and public wheat variety trials, and to test for sample selection bias between public and private wheat yield data.

METHOD: An econometric model was specified and estimated to quantify any differences in varietal wheat yields across test plots, and a model of sample selection to test for which varieties are planted in each breeder's experiment trials.

FINDINGS: The multiple regression equation and the Heckman selection equation both shows no evidence of sample selection bias in the way breeders select and report yields of varieties test on experimental plots. **CONCLUSION:** This clearly suggests that, the study rejects the hypotheses that breeders non-randomly select and report their high-yielding "best" varieties (or "bad" varieties) together with low-yielding "best" varieties (or "bad" varieties) of their competitors.

Relevance of Research to State-Related Topic(s)

Wheat production is one of the mainstay of the Kansas economy. More than 20,000 of the 60,000 farmers grow wheat which generates over \$2.5 billion in revenue annually. Producers rely on published wheat performance test data to select a portfolio of optimal wheat varieties to grow on their farms. Misleading information is likely to influence farmers' choice of varieties and is, therefore, crucial to the overall wheat productivity, revenue and economic development of the state.

STIMULATION OF LACTATIONAL ESTRUS AND OVULATION IN SOWS

Hyatt L. Frobose¹, Michael D. Tokach¹, Joel M. DeRouchey¹, Steve S. Dritz², Robert D. Goodband¹, Jim L. Nelssen¹, and Duane L. Davis¹

¹*Department of Animal Sciences and Industry, College of Agriculture;* ²*Department of Diagnostic Medicine and Pathobiology, College of Veterinary Medicine*

BACKGROUND AND PURPOSE: Recently societal concerns have prompted policy changes that may soon eliminate gestations stalls in favor of group sow housing. Stimulating estrus in lactating sows could provide a new breeding management strategy that allows the swine industry to adapt to changing sow-housing mandates. **METHOD:** Fifty-three sows were allotted to control or an altered suckling method (ALT) at d 18 of lactation. The ALT sows were placed in adjacent pairs so that pigs could be alternated between litters. On d 18, all but the 5 lightest pigs from each ALT litter were weaned. The 5 lightweight pigs for each pair of litters formed a combined litter that nursed each sow of the pair 12 h/d from d 18 to 25. Therefore, pigs could nurse 24 h/d, but each ALT sow was only suckled 12 h/d. Boar exposure was provided to ALT sows for 15 min/d by removing sows to a pen outside the farrowing room. Control and ALT sows were weaned at d 21 and d 25, respectively. **RESULTS/FINDINGS:** A total of 26 ALT sows (93%) were detected in estrus and mated in lactation. Although duration from initiating ALT to estrus was greater ($P < 0.001$) than the wean-to-estrus interval for controls, ALT sows exhibited estrus earlier (23.0 vs. 24.6 d; $P < 0.001$) than controls post-farrowing. Subsequent reproductive performance was similar between treatments. **CONCLUSION:** Our results provide evidence that the ALT treatment can induce estrus in lactating sows at rates comparable to conventionally weaned sows with no detrimental effects on farrowing rate or litter size.

Relevance of Research to State-Related Topic(s)

Growing public concern regarding animal welfare issues has led to changes in consumer buying preferences and legislative actions that impose restrictions on production practices. While focusing on improving the well-being of livestock, these alterations have a potential negative impact on supply and cost, even as demand for meat and animal products continues to grow worldwide. To meet these demands, Kansas livestock producers must place increased emphasis on finding alternative production practices that can enhance animal well-being without sacrificing efficiencies of production. Breeding sows in lactation could ease the transition into group gestation housing while simultaneously reducing sow non-productive days and increasing lactation length to the benefit of the litter. As an important segment Kansas' rural economy, the swine industry must continue to challenge the status quo with novel strategies to meet consumer demands and provide a high-quality, affordable source of lean protein.

VALIDATION OF WASHING TREATMENTS TO REDUCE PATHOGENS IN FRESH PRODUCE**Keyla Lopez¹**, Kelly J.K. Getty¹, and Christopher I. Vahl²¹*Food Science Institute, College of Agriculture; and* ²*Department of Statistics, College of Arts and Sciences*

BACKGROUND AND PURPOSE: Many fresh produce outbreaks are the result of *Salmonella* and *Escherichia coli* O157:H7 contamination due to growing conditions or human handling. The purpose of this study was to determine the efficacy of a commercial wash solution for reducing pathogens in green leaf lettuce and tomatoes. **MATERIALS AND METHODS:** Lettuce ($25 \pm 0.3\text{g}$) and tomato samples were inoculated with *E. coli* O157:H7 ($\sim 7.8 \log \text{CFU/ml}$) and *Salmonella* spp. ($\sim 9.39 \log \text{CFU/ml}$), respectively. Inoculated samples were washed separately with commercial wash solution (contains citric acid and grapefruit oil) or tap water (control) for three contact times (30, 60, and 120 s). Lettuce ($25 \pm 0.3\text{g}$) and tomato (core of 11.34 cm^2) samples were diluted and stomached for 1 min and then 0.1 ml was plated onto CT-SMAC and XLD agar plates for *E. coli* O157:H7 and *Salmonella* recovery. Experiment consisted of three replications and two samples per treatment ($n=6$). **RESULTS AND CONCLUSION:** Recovery of *E. coli* O157:H7 populations on leaf lettuce were different ($P < 0.05$) between commercial wash solution and cold tap water. There were no differences ($P > 0.05$) between commercial wash and tap water in *Salmonella* populations recovered from tomatoes samples. Commercial wash solution reduced *E. coli* O157:H7 populations by 3.0 logs on leaf lettuce and *Salmonella* populations by > 2.0 logs on tomatoes for all contact times. The commercial wash solution is applicable for food service and home-use and would reduce risk of pathogens on produce.

Relevance of Research to State-Related Topic(s)

Fresh produce, such as tomatoes and lettuce have repeatedly been associated with foodborne outbreaks connected to *Escherichia coli* O157:H7 and various *Salmonella* serovars. Usually fresh produce is exposed to minimal processing in order to maintain organoleptic characteristics, which increases the potential risk of contamination. The aim of this research was to determine the efficacy of a tap water and a commercial wash solution for reducing pathogens on the surface of green leaf lettuce and tomatoes to develop recommendations for school food service personnel on best practices for washing fresh produce. Overall, these findings provide insights in how to improve the washing process of fresh produce in the food service systems in Kansas.

A FOUR PLEX REAL-TIME PCR ASSAY FOR THE DETECTION AND QUANTIFICATION OF *Escherichia Coli* O157 IN CATTLE FECES

Lance W. Noll, Pragathi B. Shridhar, Xiaorong Shi, Baoyan An, T.G. Nagaraja, and Jianfa Bai
Department of Diagnostic Medicine/Pathobiology, College of Veterinary Medicine

BACKGROUND AND PURPOSE: Cattle are asymptomatic reservoirs for Shiga toxin-producing *Escherichia coli* O157:H7, a major food borne pathogen. Typically, the organism colonizes the hindgut and is shed in the feces, which serves as a source of contamination of food products. Culture-based detection and quantification methods have been low-throughput and time-consuming. The objective was to develop a multiplex, real-time quantitative PCR (mqPCR) assay for the detection and quantification of *E. coli* O157 in cattle feces based on genes that code for the serogroup specific O157 antigen (*rfbE* O157) and three major virulence factors, Shiga toxins 1 and 2 (*stx1* and *stx2*) and intimin (*eae*). **METHOD:** Primer and probe concentrations were optimized with extracted DNA from a strain of O157 (ATCC 43894) containing all four genes. Sensitivity of the assay was determined with extracted DNA from serial ten-fold dilutions of *E. coli* O157 ATCC 43894 cultured. **RESULTS/FINDINGS:** In pure culture, the minimum detection limit of the assay was 3.1×10^3 CFU/mL. Serial dilutions of pure cultures of *E. coli* O157 strains (ATCC43889 and ATCC 43894) spiked in cattle feces were prepared to determine applicability of the assay to quantify the organism. Sensitivity of the mqPCR assay from spiked fecal samples was determined. **CONCLUSION:** The detection limit of the mqPCR assay for *E. coli* O157 (ATCC 43894) with DNA extracted directly from cattle feces was 7.8×10^4 CFU/g. However, after six-hour enrichment, sensitivity increased to 3.3×10^0 CFU/g. The assay targeting the four genes has the potential to be a high-throughput method for detecting and quantifying *E. coli* O157 in cattle feces.

Relevance of Research to State-Related Topic(s)

As recent as July of this year, a Kansas beef packing company initiated a recall of more than fifty-thousand pounds of ground beef that had shipped nationwide. The source of the recall was *E. coli* O157 contamination, which remains a potentially deadly food-borne pathogen. Any such disruption to the safety of Kansas beef can have devastating state-wide consequences on the entire beef industry. It is the goal of our research to create an efficient and high-throughput method for detecting *E. coli* O157 at the feedlot level, before it has the opportunity to contaminate the beef supply. Our mqPCR would have the ability to screen for the pathogen in cattle feces, allowing for early detection within the beef chain and ensuring the safety of beef consumers.

LUMINOL-BASED BIOLUMINESCENCE IMAGING OF PRE-CLINICAL TUMORS

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BACKGROUND AND PURPOSE: One of the main problems in cancer is metastatic tumor that is smaller than clinical detectable level. Therefore, detecting tumors at earlier stages could improve therapeutic outcomes. To achieve this goal, understanding tumor microenvironment might help tumor diagnosis at early stages. Because tumor microenvironment is difference from normal tissue and it has been characterized by low pH, hypoxia, over-expressed proteases, and infiltration of immune cells. Polymorphonuclear neutrophils (PMNs) are the most abundant circulating blood leukocytes. They are part of the innate immune system and provide a first line of defense by migrating toward areas of inflammation in response to chemical signals that have been released from the site. For example; solid tumors such as breast cancer causes activation of PMNs and release of myeloperoxidase. In this study, we demonstrate that giving a luminol to mice that have been transplanted with 4T1 breast adenocarcinoma cells allows detection of myeloperoxidase activity and location of tumor. **METHOD:** 1×10^5 4T1 luc2 mammary adenocarcinoma cells were transplanted orthotopically into the fat pad of mammary gland number seven. Luminol-dependent bioluminescence imaging 300mg/kg of luminol was injected intraperitoneally. Thus, IVIS Lumina II was used for non-invasive bioluminescence imaging. **RESULTS/FINDINGS:** Luminol allowed detection of activation of PMNs at tumor site only two days after cancer cell transplantation, even though tumors were not yet palpable. **CONCLUSION:** Luminol-bioluminescence imaging (BLI) can provide a way to image certain tumors at an early stage.

Relevance of Research to State-Related Topic(s)

Cancer is one of the major diseases that cause death in the United States and other countries around the world. For instance, the American Cancer Society estimates that 1,660,290 new cancer cases and 580,350 people will die of cancer in the U.S. in 2013. Furthermore, it has been reported the new cancer cases in Kansas is 14,370 and 5,430 people will die because of cancer in 2013. Therefore, developing new methods that detect tumors at early stages could improve the outcome of tumor treatment.

**TRANSFER OF PHENOXY RESISTANCE FROM WILD RADISH (*RAPHANUS RAPHANISTRUM*),
INTO CANOLA (*BRASSICA NAPUS*) VIA EMBRYO RESCUE**

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BACKGROUND AND PURPOSE: Phenoxy herbicides (e.g. 2,4-D) are widely used in agriculture for selective control of broadleaf weeds. Wild radish (*Raphanus raphanistrum*), a broadleaf weed, evolved resistance to 2,4-D due to intense herbicide selection pressure in western Australia. Weedy and wild relatives offer excellent genetic resources to transfer useful agronomic traits, such as herbicide resistance, into crop species. Canola (*Brassica napus*), a widely grown oilseed crop in Brassicaceae family, and a relative of wild radish, is sensitive to phenoxy herbicides. The goal of this study was to transfer phenoxy resistance from wild radish into canola by traditional breeding, coupled with *in vitro* embryo rescue. **METHOD:** Interspecific crosses were performed between *B. napus* and *R. raphanistrum*. Approximately 50 embryos were excised from immature siliques developed from these crosses and cultured *in vitro*. **RESULTS/FINDINGS:** Upon altering the cultural conditions as well as media composition, four F₁ hybrids were produced. One F₁ hybrid was subsequently established in soil. The F₁ plants will be evaluated for 2,4-D tolerance, fertility and DNA ploidy level. 2,4-D-tolerant and fertile hybrids will be used to introgress tolerant trait into canola through backcross breeding. **CONCLUSION:** Development of phenoxy-tolerant canola cultivars may facilitate effective broadleaf weed control, necessitate less tillage for weed management, and provide herbicide rotation options to growers.

Relevance of Research to State-Related Topic(s)

There is currently a shift towards cultivation of winter canola in Kansas as an alternative to winter wheat for crop rotations. Acreage of winter canola was 31,000 acres in the 2012-2013 season, and is expected to continue to increase to 50,000 to 60,000 acres during the 2013-2014 season. Canola is a commercially important crop and oil from canola seed is highly recommended as a part of a healthy diet since it contains only trace concentrations of erucic acid and high quantities of polyunsaturated fatty acids. Weed infestation results in considerable reduction in yield in canola crop. Although phenoxy herbicides are inexpensive and safe to use, they are not recommended for use in canola. Availability of phenoxy-tolerant canola cultivars provides farmers with: a) options to rotate herbicides, b) post-emergence application of phenoxy herbicides to control broadleaf weeds throughout crop season, and c) encourage less tillage to facilitate soil and moisture conservation.

RNAI MEDIATED VIRAL RESISTANCE IN TRANSGENIC WHEAT: STABILITY OVER FIVE GENERATIONS

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BACKGROUND AND PURPOSE: *Wheat streak mosaic virus* (WSMV) and *Triticum mosaic virus* (TriMV), are two viruses affecting wheat in the United States. Current disease management strategies incorporate the deployment of resistant varieties, mite vector control and various cultural practices; however, it is not fully effective. As an alternative strategy, RNAi was evaluated as a method to generate resistance to these wheat viruses. **METHOD:** RNAi expression vectors were independently created from the DNA sequences of the coat proteins (CP) of WSMV and TriMV and of the 6K2-N1a gene of WSMV. Immature embryos of the wheat cultivar ‘Bobwhite’ were independently co-transformed by gene gun with RNAi expression vectors and pAHC20, which contains the *bar* gene for glufosinate selection. After tissue culture, putative transformed plants were analyzed through PCR for the presence of the appropriate RNAi gene. Transgenic T₁ seeds were collected and tested for transgene expression via RT-PCR. Plants were mechanically inoculated with corresponding virus. Viral presence was established by ELISA. **RESULTS AND CONCLUSION:** In the T₁ generation, resistance was seen in up to 60% of plants evaluated for both CP constructs. Consistent resistance response was found in lines containing WSMV CP and TriMV CP constructs. T₅ generations have shown continuing high levels of resistance among the CP constructs. While these findings are scientifically significant; ultimately a stable resistant line is required for commercial use. Thirty-two crosses have been made to two Kansas elite cultivars. These plants have shown continued resistance to WSMV thereby offering a possible stable transgenic method of disease management.

Relevance of Research to State-Related Topic(s)

Kansas farmers typically produce more wheat than any other state in the nation and in 2009, Kansas wheat accounted for more than 16 percent of all wheat produced nationwide. In 2012, the Kansas crop was valued at \$17,943,343,000. Each year, Kansas loses approximately 2-5% of its wheat crop to *Wheat streak mosaic virus*, totaling \$10 million/year with losses up to \$130 million/year in epidemic years. There are very few options to combat viruses in the field. This research is focused on providing methods of viral control utilizing biotechnology to improve food security and provide significant economic benefits to Kansas wheat producers.

**THE EFFECT OF BACTERIAL INFECTION ON THE MIDGUT PHYSIOLOGY OF THE SAND FLY
*LUTZOMYIA LONGIPALPIS***

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BACKGROUND AND PURPOSE: Phlebotomine sand flies are vectors for parasites of the genus *Leishmania* the causative agents of leishmaniasis, a neglected disease currently present in 98 countries. During development within the vector, *Leishmania* parasites face many barriers; including the vectors own innate immune responses. Studies in fruit flies and mosquitoes indicate that upon infection by bacteria the innate immune system and epithelial homeostasis pathways are activated leading to restructuring of the midgut epithelium. Our studies suggest that this event also occurs in sand fly larvae, and may serve as a potential means for vector control. **METHOD:** 3rd instar larvae were fed GFP-labeled *Pantoea agglomerans*, *Bacillus subtilis* bacteria, LB, or paraquat *ad libitum* in agar for 12, 24, and 36 hours. At each time point midguts were dissected and processed. mRNA levels of target genes associated with immunity and epithelial responses were assessed by qPCR, and both epithelial cell death and regeneration were monitored using immunocytochemistry. **RESULTS:** Infection with GFP-labeled bacteria induced a significant change in levels of mRNA related to innate immunity and epithelial homeostasis, and induced cell death and midgut regeneration at 12 and 24 hours post infection. **CONCLUSION:** Identifying mechanisms associated with innate immune responses and midgut restructuring in sand flies can potentially be used as a novel tool for vector control for larval stages and, in adults, as a way to interfere with the development of *Leishmania*, preventing its transmission to naïve hosts.

Relevance of Research to State-Related Topic(s)

Our group has recently reported for the first time the presence of two sand fly species in southeast Kansas. One of these species is a suspected vector in the transmission of canine visceral leishmaniasis among American Foxhounds. In recent years there have been numerous reports of this disease in 23 states including Kansas. If successful, our studies would provide new tools to prevent the establishment and potential future transmission of *Leishmania* within the state of Kansas.

CYTOTOXIC EFFECT OF SUBSTITUTED QUINOLINES ON SW480 HUMAN COLON CANCER CELLS

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BACKGROUND: A hallmark of cancer is the loss of gap junction intercellular communication (GJIC). Substituted quinolines, known as PQs, have been demonstrated to have an anticancer effect as well as to increase gap junctional activity. Connexin 43(Cx43) a gap junction protein is relatively low in Caco-2, HT29, SW620 and SW480 human colorectal cancer cells compared to normal colon cells. **METHODS:** The effect of PQ1 on cell toxicity of colorectal cancer cell is being investigated using viability and proliferation assays. PQ1's effects on GJIC were tested using scrap load/dye transfer assay. Furthermore, western blot analysis was performed to determine the protein expression of Cx43 in the presence and absence of PQ1. **PURPOSE:** The effect of PQs on cytotoxicity of colorectal cancer cells is unknown; thus, the goal of this study is to examine the effects of PQs on colorectal cancer cells. **RESULTS/FINDINGS:** The IC₅₀ of PQ1 for 24 hour exposure was determined for various colorectal cancer cells as well as normal colon cells, ranging from 5 μ M to 20 μ M. A decrease in IC₅₀ for these cells was observed for 48 hour and 72 hour exposure. 200 nM PQ1 causes a 2-fold increase of gap junctional activity in SW480 cells when compared to no treatment control. However, 12-*O*-Tetradecanoylphorbol-13-acetate (TPA), GJIC inhibitor, can reverse the gap junctional activity of overexpressed Cx43 or treated PQ1 cells, suggesting the mode of action of PQ1 is through a TPA-mediated pathway. **FUTURE DIRECTION:** To conduct further studies on how PQs mediate TPA signaling pathway in colorectal cancer cells.

Relevance of Research to State-Related Topic(s)

The expected new number of cases of cancer in Kansas for 2013 is 14,370. The estimated number of deaths for Kansas in 2013 due to cancer is 5,430.

DEVELOPMENT OF MULTIPLEX REAL TIME PCR ASSAYS FOR THE DETECTION AND QUANTIFICATION OF THE SIX MAJOR NON-O157 SHIGA TOXIN-PRODUCING *ESCHERICHIA COLI* SEROGROUPS IN CATTLE FECES

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BACKGROUND : Non-O157 Shiga toxin producing *E. coli* such as O26, O103, O111, O45, O121 and O145, are being recognized as emerging cause of food-borne illness in human beings for which cattle is the major reservoir. **OBJECTIVE:** To develop multiplex real time PCR assays to detect and quantify non-O157 *E. coli* serogroups such as O26, O103, O111, O45, O121 and O145 in cattle feces. **MATERIALS AND METHODS:** Primers were designed targeting the O-antigen genes. Two sets of assays, O26, O103, O111 in assay 1, and O45, O121, and O145 in assay 2, were developed. Specificity of the assays was assessed by testing 148 strains of six non O157 *E. coli* serogroups and 100 strains of 42 other *E. coli* serogroups. Fecal samples were spiked with ten-fold serial dilutions of pooled cultures of 1. O26, O103, and O111; 2. O45, O121 and O145; and 3. O26, O103, O111, O45, O121 and O145 and enriched in *E. coli* broth. Fecal DNA, extracted before and after the enrichment, was subjected to real time PCR. **RESULTS:** The assays were specific for all the target genes. PCR amplification efficiencies ranged from 94-102% for pure culture, 88-95% for fecal samples before enrichment and 90-101% for fecal samples after enrichment. The detection limits of the assays were 10³CFU/ml, 10⁴ CFU/g, and 10² CFU/g for pooled pure cultures, before and after enrichment of spiked fecal samples, respectively. **CONCLUSION:** The two sets of multiplex real time PCR assays developed are sensitive diagnostic tools for the detection and quantification of six non-O157 *E. coli* serogroups in cattle feces.

Relevance of Research to State-Related Topic(s)

In US people consume beef on daily basis. Kansas State is a leader in beef production. More than 19% of the US beef originates from the Kansas beef processing facility. Our research is supported by USDA NIFA CAP grant. The research is involved in reducing the occurrence and public health risks from Shiga toxin-producing *Escherichia coli* (STEC), a serious threat to the food supply. Non O157 *E. coli* (STEC) serotypes are the emerging cause of food-borne illness in human beings. Ruminants are the major reservoirs of non-O157 infections in human beings. Cattle hides and feces have been shown to be the major sources of pathogens at slaughter facilities. Our research is involved in developing multiplex real time PCR for simultaneous detection of six non O157 *E. coli* serogroups which are underrecognised because of lack of proper diagnostic methods. This knowledge will then be used to find practical and effective STEC risk mitigation strategies.

GENETIC BASIS OF GLYPHOSATE RESISTANCE IN KOCHIA SCOPARIA**Kindsey Niehues** and Mithila Jugulam*Department of Agronomy, College of Agriculture*

BACKGROUND AND PURPOSE: Glyphosate is a non-selective, broad-spectrum herbicide used extensively in agriculture. Prolonged use of glyphosate in glyphosate-resistant (GR) crops created selection pressure, therefore several weeds evolved resistance to glyphosate. Kochia (*Kochia scoparia*) is an annual broadleaf weed that infests both crop and non-cropland in Kansas. Previous research suggests that glyphosate resistance in kochia is determined by increased copy number of the gene coding for EPSPS (5-enolpyruvyl shikimate 3-phosphate synthase), the target site of glyphosate. However, the inheritance of glyphosate resistance is unknown. **METHOD:** Using homozygous GR and susceptible (GS) lines, F₁ progeny were produced by reciprocal crosses. F₁ progeny was screened for glyphosate resistance and self-pollinated to generate F₂ progeny. The response to glyphosate, shikimic acid levels and EPSPS gene copy number will be determined at each generation. **RESULTS/FINDINGS:** Homozygous GR and GS parental lines were identified and upon estimating shikimate levels in these lines. It was found the GS plants accumulated higher amounts of shikimate than GR. Conversely, GR individuals possessed higher EPSPS gene copies (6-9), while the susceptible individuals had only one copy. The F₁ progeny from reciprocal crosses survived various doses of glyphosate application, suggesting nuclear inheritance of glyphosate resistance in kochia. F₁ progeny showed intermediate response to parents for shikimate accumulation and EPSPS gene copy number. **CONCLUSION:** Glyphosate resistance in kochia is a nuclear inherited trait. Analysis of the F₂ segregation will assess the number of genes that control resistance, which assists in determining the possible spread of resistance in the kochia population.

Relevance of Research to State-Related Topic(s)

Many Kansas residents are directly related to farming whether it be by row crop or livestock. Herbicide-resistant weeds pose serious threats to weed management by negatively impacting yields and depleting nutrients necessary for crop growth and range management. Kochia infests approximately two-thirds of the crop fields in western Kansas and the infestation has increased in the past 5-6 years. GR corn and soybean are heavily relied on in Kansas and lack of efficacy can cause major issues in production. Understanding the genetic basis of glyphosate resistance in kochia will help determine the rate of spread of this resistance in new populations; thereby, proactive management practices can be implemented to reduce the spread of the resistance.

RUNOFF FLUXES IMPACT ON EPHEMERAL GULLY PROPAGATION IN CULTIVATED CROPLANDS

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BACKGROUND AND GOAL: Ephemeral gullies are ephemeral channels in cultivated croplands occurring due to water runoff during intensive rainfall events, and which can be removed by tillage operation. Ephemeral gully erosion carries out the essential part of topsoil from agricultural fields. The goal of this study was to estimate the impact of rainfall runoff fluxes on ephemeral gully propagation. **METHOD:** A field experiment was conducted during the summer of 2013 on a no-till field near the city of McPherson in Central Kansas. Precipitation data were collected, and 11 channel cross sections 10 cm apart around a gully headcut were measured every 3 to 4 weeks during the monitoring period. The rainfall excess was calculated for each storm event, and headcut migration rates were estimated. **RESULTS:** Cross sectional profiles at different times showed that no gully development was detected for rainfall events of short duration and low intensity. Only for rainfalls of high intensity (>240 mm/hour) the headcut propagation was detected primarily due to high peak of runoff. **CONCLUSION:** The conducted study helps to understand the mechanics of the ephemeral gully development. Further measurements of precipitation and gully morphology will provide additional data for regression analysis of gully erosion and the associated soil losses due to rainfall events. These data can also be used for validating a gully advancement physical model that is currently under development.

Relevance of Research to State-Related Topic(s)

Growing population of the world demands more food. Kansas is one of the main agricultural states in the U.S. It is important to keep efficiency of food production on high level to cope with the growing demand. One of the very important agricultural issues is soil loss due to surface erosion. And situation is becoming worse with changing climate because of the amplifying fluctuations between draughts and excess rainfalls. It is well understood that we need to spend more time on improving our technics of agricultural work. Research in the field of soil erosion due to surface water runoff will help us to understand what best management practices should be implemented to preserve Kansas soils and increase food production.

MAPPING OF AGRICULTURAL REGION WITH EXPOSURE TO CLIMATE VARIABILITY IN KANSAS

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BACKGROUND AND PURPOSE: Despite of the high potential for agricultural production, remarkable variability in climate has made Kansas unpredictable. Vulnerability assessments based on degree of climate exposure is important for prioritizing investment adaptations where exposure is one of the major dimensions. In addition, lack of standardized framework to assess exposure is another over-arching challenge. Thus, the objective of this study is to i) understand the nature and degree of an agriculture system exposed to climate variation and map them. **METHODS:** Climate stressors (rainfall, high and low temperature) are considered from late 1800's to 2009 from 23 centennial stations across Kansas, whereas crops (Maize, Sorghum, Wheat, and Soybean) and their specific growing season, critical season, and floating season length are considered as a different approach for evaluating Exposure Index (ExI). Mean ExI for all stations were evaluated as a ratio of average to actual extent of stressor per year during different time period (1920-49; 50-79; 80-2009). **RESULTS:** Our studies suggest that degree of agriculture system exposure varies depending upon the region, climate stressor, and specific time period. Based on rainfall, comparatively higher ExI was observed in western region but degree of ExI was decreased throughout recent decades. Considering high and low temperature, increasing and decreasing trend of ExI per decade was observed respectively. **CONCLUSION:** Overall results suggest that western Kansas's agricultural crops are most vulnerable to drought and high temperature. **FUTURE ANALYSIS:** More rigorous testing of different approaches will help to develop the generalized framework to assess the agricultural system exposed to climate change for future analysis.

Relevance of Research to State-Related Topic(s)

It's the well-known fact that different climatic conditions exist in Kansas such as low precipitation in the west, wet to dry condition from east to west, increasing temperature gradient across north to south, and reducing water aquifers levels. However, there is still a lack of information explaining the nature, degree, and overall trend of climate variations across the region. Mapping these regions based on degree of climate exposure will help farmers to choose the suitable cropping systems for that region. Additionally, it will afford researchers and policymaker's tools to develop region specific technologies and adaption strategies.

DYNAMIC CURVE NUMBER (CN) DEVELOPMENT FOR NATURAL AND DISTURBED LANDS USING NORMALIZED DIFFERENCE VEGETATION INDEX (NDVI)

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BACKGROUND AND PURPOSE: The Curve Number (CN) method for assessing runoff potential was developed by the USDA Soil Conservation Service (SCS) in the 1950s. It has been adapted to various hydrologic conditions in many parts of the world and successfully applied to situations ranging from simple runoff calculations and land use change assessment to comprehensive hydrologic/water quality simulations. It is a widely used means of estimating storm runoff from rainfall events and designing water management structures. SCS (1964) runoff estimates assume a relationship between accumulated total storm rainfall, runoff, and infiltration plus initial abstraction. The CN is traditionally determined from land-use, hydrologic soil group, and hydrologic condition of the watershed. Since a watershed is usually a combination of different land-uses and soil conditions, an area weighted average curve number for the entire watershed is often calculated. However, CN based on literature do not consider seasonal or dynamic land-use changes. **METHOD:** This study intends to develop an interactive model to derive and map CN from land-use, hydrologic soil group, and Normalized Difference Vegetation Index (NDVI) which is calculated from satellite data. **RESULTS AND CONCLUSION:** ArcGIS based model is created to develop dynamic CN map for every 16 days based on the MODIS NDVI satellite data. The interactive CN map will be used to provide estimates of surface runoff from the precipitation events such that more timely land management decisions can be made.

Relevance of Research to State-Related Topic(s)

Kansas State is affected by weather patterns as adjoining States. Estimation of floods and droughts are essential for efficient watershed and farm management; and also surface water resource planning. Better surface runoff management is crucial for the State's economic stability. Kansas's economy mainly relies on agriculture which contributes about \$ 8.7 billion each year (USDA-NRCS). Curve number method is one of the mainly used approaches to calculate surface runoff. Runoff estimation based on curve number is intended for "direct runoff" hydrograph which is based on individual rainfall events. The curve number approach that is used in literature does not reflect the seasonality of hydrologic conditions accurately. Dynamic curve number method will provide seasonally and periodically varying curve number to predict runoff which could alleviate the static nature of the traditional method.

COMPOSITION AND STRUCTURE OF RIPARIAN WOODLANDS OF TUTTLE CREEK WATERSHED

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BACKGROUND AND PURPOSE: Riparian woodlands are recognized as an important part of river ecosystems that perform many functions such as flood attenuation, streambank stabilization, improve water quality, and provide natural habitat. Tuttle Creek Watershed is located in Kansas and Nebraska. One of the important characteristics of this watershed is that drains to a large federal reservoir. Therefore knowledge and management of the riparian woodlands is imperative. Previous research have shown that riparian woodlands are more effective than other type of land cover for stream stabilization during high water events, and can significantly slow flood waters retaining sediment deposition within riparian areas instead of downstream into the reservoirs. The study objective was to collect on-the-ground data on the condition of the riparian forest in several sub-watersheds at Tuttle Creek Watershed in Kansas. The project will result in a GIS database that will categorize riparian areas and identify landowners so that they can be invited to participate in educational and technical assistance programs. **METHOD:** GIS, remote sensing, and on-the-ground field measurements were employed to assess the riparian woodlands in 10 sub-watersheds. Data such as tree species, diameter, height and canopy class was gathered. Also regeneration and qualitative notes of the area were documented. **RESULTS/FINDINGS:** Preliminary data indicate that the predominant tree species are hackberry (*Celtis occidentalis*) followed closely by black walnut (*Juglans nigra*) and American elm (*Ulmus americana*). **CONCLUSION:** Tuttle Creek Watershed shows few signs of active forest management. There is high potential for forest management to improve riparian woodlands in the watershed.

Relevance of Research to State-Related Topic(s)

Tuttle Creek Reservoir is the second largest impoundment in the state of Kansas. It provides flood protection downstream and also a vast area for recreational opportunities. Lifespan of the reservoir has been decreasing rapidly because of the high rate of sediment entering the reservoir. This study targets riparian woodlands that have the potential of slowing the rate of sedimentation and extending the lifespan of the reservoir. Also this study will strengthen a GIS database that will assist stakeholders, like the Kansas Forest Service and the Tuttle Creek Watershed Restoration and Protection Strategy group (WRAPS), to promote establishment and management of riparian forests.

CLIMATE CHANGE AND LONG DURATION RAINFALL EVENT DISTRIBUTION IN KANSAS

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BACKGROUND AND PURPOSE: Water control structures are designed based on the maximum runoff rate resulting from storms with a specific return period and duration. Structures associated with systems that pose a lower risk of injury to humans and/or loss of property such as agricultural terraces, grassed waterways, and small water and sediment control basins are typically designed to control the runoff from 10-yr, 24-hr storm. The Rainfall Frequency Atlas (NWS TP40, 1961), provided the statistical rainfall analysis used as the basis for hydrologic structure design until the information was updated for Kansas in February 2013 (NOAA Atlas 14). **METHOD:** This study compares the 10-yr, 24-hr storms from TP40 and NOAA Atlas 14 to determine the change in structural failure risk in Kansas based on rainfall patterns changing. In addition, trend analysis on the number of the exceedance from the 10-yr, 1, 2, 3, 4, 7, and 10-days rainfall events and the annual maximum for the same durations, on 23 stations in Kansas were accomplished. **RESULTS/FINDINGS:** The surface maps indicated a change of -12% to 5% between the 10-yr, 24-hr rainfall events. On the other hand, an increasing trend on the frequency and magnitude of longer rainfall events were observed at the majority of the stations. This indicates an increase in antecedent soil moisture with a corresponding reduction in available water storage and increase in runoff potential. **CONCLUSION:** The results of this study is useful in hydrologic structure design to prevent serious flooding with the current changing climate.

Relevance of Research to State-Related Topic(s)

Kansas has one of the most variable climates in the United States. Kansas climate is defined as a mid-continental temperate climate that is hot during the summer and cold in the winter with humidity ranging from humid in the east to arid in the southwest. Total rainfall amount has increased over the last century with an increase on the extreme events. On the other hand the frequency of rainfall events with longer than 1 day duration experienced an upward trend over the last century meaning that the antecedent moisture has increased. Results of this study suggests that new rainfall patterns should be considered in water management systems and hydrologic structure design.

RUNOFF, SEDIMENT AND TOTAL PHOSPHORUS LOSS PREDICTIONS USING THE APEX MODEL

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BACKGROUND AND PURPOSE: Agricultural fields are an important source of phosphorus (P) enrichment to water bodies. Reduction of P loss from agricultural production requires accurate estimates of how management practices impact P loss relative to soils, landscape position, slope, and hydrology. Computer models can be used as a tool to assess the impact of management practices on P loss. This study determines the accuracy of un-calibrated model in predicting runoff, sediment and total P loss from agricultural fields using Agricultural Policy/Environmental eXtender (APEX) model. **METHODS:** The un-calibrated APEX model was run using field-scale runoff data. The model's performance indicators coefficient of determination (r^2), Percent Bias (PBIAS) and Nash-Sutcliffe Efficiency (NSE) were calculated. **RESULTS:** Overall, the crops yield (grain-sorghum and soybeans), runoff, sediment, and total P loss were over-estimated by the model. The PBIAS, r^2 and NSE values for runoff ranges from -11 to -191, 0.22 to 0.86, and 0.59 to -9.32 respectively. Likewise, for sediment losses were -41 to -2409, 0.001 to 0.5 and -4.6 to -863 and for total P loss were -6.2 to -307, 0.001 to -0.73, and 0.41 to -70.6 respectively. Even-though the runoff statistics for some treatments were within the acceptable range, the statistics for sediment and total P loss were poor. The model predicted P loss amended with turkey litter was much higher than measured data. **CONCLUSION:** We conclude that using the un-calibrated model without calibration and validation would not predict the sediment and phosphorus loss accurately and P sub-routines may need to be updated to better estimate P loss.

Relevance of Research to State-related Topic(s)

Decreasing P loss from agricultural fields is an important environmental and agricultural priority. When P enters surface water it promotes algal growth and leads to eutrophication, which is a major cause of water quality degradation. High P concentrations can also promote toxin production from harmful algal blooms (HAB) (Hudnell, 2010). In 2011, there were 34 reports of human or animal illness from HABs in Kansas, resulting in two people being hospitalized and five animal deaths (KDHE, 2012). Failure to control P export from agriculture may also promote the creation of regulations that restrict P fertilizer use. Our research will improve phosphorus management tools and assist researchers and conservationists to better estimates P loss, identify critical source areas of P export, and target conservation practices more effectively and efficiently, thus addressing water quality concerns associated with agricultural fields in Kansas.

GREENHOUSE GAS FOOTPRINTS OF TWO NON-LEGUME COVER CROPS FOLLOWING WINTER WHEAT

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Agriculture practices can affect the production of greenhouse gas emissions. **BACKGROUND:** Conflicting studies on the ability of cover crops to alter carbon and nitrogen (N) storage, reduce nitrogen losses and improve crop yields necessitate further study. One understudied loss mechanism is gasses losses of carbon and nitrogen. The objective of this study was to measure CO₂, N₂O, and CH₄ gas emissions from summer and winter non-legume cover crop and chemical fallow treatments planted after wheat. **METHODS:** Field plots were established in 2007 at the Kansas State University Experiment Station in Riley County, Kansas to examine the use of different cover crops in a Soybean -Wheat/Cover Crop-Sorghum rotation, with a range of nitrogen fertilizer application rates applied at sorghum planting. Gas flux measurements were measured weekly from polyvinyl chloride (PVC) chambers constructed according to USDA-ARS GRACEnet Project Protocols. Two PVC rings 30-cm diameter 15 tall were installed in each plot to a depth of 10-cm, and used to support soil chambers during measurements. Flux measurements were taken by placing vented chambers on rings and collecting samples at 0, 15, 30, 45 min. Linear regression techniques were used to determine flux rates for each chamber and average flux rates for each treatment were used to calculate total season fluxes. I do not have **RESULTS** and **CONCLUSIONS** at this time.

Relevance of Research to State-Related Topic(s)

The implication of greenhouse gas research in Kansas is important for not only environmental quality issues, but for proper and efficient use of fertilizers in Kansas cropping systems. Kansas is well known for its large amounts of farm land, understanding the amount of greenhouse gas emission from these lands will allow Kansans to improve agriculture practices to sustain the environment for future use. Cropping rotations that include cover crops are becoming more popular on Kansas farms. This research will help to discover how cover crops are affecting the agro-ecosystem in Kansas; and what these changes mean for the environment and for fertilizer efficiency.

GROWTH OF HBN USING METALLIC BORON: ISOTOPICALLY ENRICHED ^{10}B N FOR NEUTRON DETECTION

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BACKGROUND AND PURPOSE: Due to the increasing scarcity of ^3He for gas detectors there is a growing need for a highly sensitive neutron detector with high gamma radiation discrimination. Hexagonal boron nitride (hBN) has recently shown promise as a solid-state neutron detector due to the development of a growth technique for bulk hBN single crystals¹ using a Ni-Cr solvent. **METHOD:** Our research modified this technique to allow for the growth hBN single crystals from metallic boron sources. Crystals were precipitated through cooling of a molten metal solution composed of Ni, Cr and B under nitrogen flow at high temperatures and atmospheric pressures. This process facilitates the growth of hBN from enriched ^{10}B and ^{11}B sources. ^{10}B enrichment of hBN detectors should improve neutron capture efficiency up to a factor of five thereby decreasing the hBN single crystal thickness needed to produce a full neutron interaction spectrum. **RESULTS:** Crystals grown using this process were extracted from the metal surface using a thermal release tape exfoliation technique. This technique produced free crystal layers which could then be employed as free-standing crystals or transferred onto an arbitrary substrate. Confirmation of isotopically pure hBN was tested by shifts in the Raman spectra peak. Metal contacts were deposited onto the surface of crystals to allow for electrical characterization and neutron response measurements. Finally, enriched h(^{10}B)N and h(^{11}B)N crystals were tested under neutron flux and compared to previously measured spectra produced by natural hBN to confirm the benefits of isotopic enrichment.

Relevance of Research to State-Related Topic(s)

This research is relevant, both on a state and federal level, due to the need for nuclear security and determent. ^3He , the isotope currently used by the DHS for port-side detection of nuclear weapons material, has recently grown short in supply due to reduction of nuclear weapons production. Due to this shortage, new neutron-detection materials must be developed to ensure that these weapons materials can be detected and prevented from being brought into the country. Development of new radiation-detection materials, such as hBN, ensures the U.S.'s ability to detect nuclear weapons material and enforce nuclear non-proliferation agreements. Additionally, hBN shows potential to be able to be developed into a portable, hand-held detector, allowing for more flexibility than traditional gas detectors.

¹ Kubota, et al. *Chemistry of Materials* **2008**, 20, 1661-1663.

THE EFFECT OF MIXED HYDROPHOBIC & HYDROPHILIC SURFACES ON FROST NUCLEATION & GROWTH

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BACKGROUND AND PURPOSE: The purpose of this research is to test mixed hydrophobic and hydrophilic surfaces to see if they mitigate frost and ice formation. Frost forms when humid air comes into contact with a surface that is below the dew point and freezing temperature of water. Many engineering systems are hindered by frost, such as aeronautics, refrigeration, wind turbines, and electrical transmission wires. These materials are highly dependent on operating conditions and surface roughness, which fluctuate easily. Our hypothesis is that a mixed hydrophobic and hydrophilic surface will slow the frost formation process as well as create a less dense frost layer. The water in the air will want to condense on the hydrophilic areas, thus controlling where nucleation will first occur. Therefore, we can control the size, shape, and location of frost nucleation.

METHOD: To fabricate these mixed surfaces, we coated a hydrophobic material (OTS) on a glass slide/silicon wafer, and then removed circles of OTS using photolithography and oxygen plasma to reveal the hydrophilic glass/silicon underneath. The circles were patterned at different pitches and diameters. The tests were conducted at room temperature and humidity (23°C and 50%) and at an elevated humidity (80%).

RESULTS/FINDINGS: The tested patterns show a decrease in density and an increase in time for frost to grow when compared to plain hydrophilic or plain hydrophobic slides. **CONCLUSION:** Preliminary results show that our hypothesis was correct and further testing is warranted to see how they operate on the engineering systems listed above.

Relevance of Research to State-Related Topic(s)

This research applies to Kansas in multiple areas. The first area is technology; biphilic surfaces are a new technology that show promise for better control over frost formation. The need for such a surface is great, with applications in aeronautics to refrigeration. Kansas has many small airfields that smaller planes use; smaller planes are more susceptible to icing which causes crashes. The next area of interest is energy and wind energy. Frost forms around cooling coils, blocks airflow, and inhibits heat transfer which quickly deteriorates the efficiency of a refrigeration system. This helps buildings that have issues with frost or ice on A/C units, coolers, or freezers. The surfaces would allow a 'defrost mode' in coolers to consume less energy. Frost also inhibits efficiencies in wind turbines. Biphilic surfaces could aid in water collection or conservation. Finally, these surfaces could promote economic development, allowing companies to manufacture biphilic surfaces.

CHARACTERIZATION OF BROADBAND ELECTROMAGNETIC PROPERTIES OF NANOPARTICLE CONTRAST AGENTS FOR ENHANCED HYPERTHERMIA CANCER THERAPY

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BACKGROUND AND PURPOSE: Hyperthermia ($39 < T < 45$ °C) is under investigation for treatment of cancer and infectious disease. One method of delivering hyperthermia is by depositing electromagnetic energy (f : 100 MHz – 2.45 GHz) in targeted tissue using non-invasive antennas placed on the body surface. Nanoparticle contrast agents that can be selectively delivered to target tissues may serve as a method for enhancing energy deposition in targets, while limiting heating of healthy tissue. Broadband measurements of the complex permittivity and permeability of candidate nanoparticle contrast agents in solution were performed to characterize their suitability to serve as electromagnetic energy absorbers. **METHOD:** The complex permittivity and permeability of iron oxide nanoparticles with cubic, hexagonal, and spherical molecular structures dissolved in distilled water and dimethyl sulfoxide were measured over 1-6 GHz. This was accomplished by using a custom two-port coaxial transmission line measurement technique and extracting the complex permittivity and permeability from the measured scattering parameters with a form of the Nicolson-Ross algorithm. **RESULTS/FINDINGS:** This studies a quantitative observation of the changes in bulk electrical and magnetic characteristics of the material from changes in the molecular structure. Changes in scattering parameters were observed between hexagonal and cubic nanoparticles in solution when compared to deionized water or pure DMSO. An implementation of the Nicolson-Ross algorithm was demonstrated to be suitable for extracting complex permittivity and permeability from simulated scattering parameters. Ongoing work will extract complex permittivity and permeability values from measured scattering parameters. **ACKNOWLEDGEMENT:** This work is supported by an Innovative Research Award from the Terry Johnson Center for Basic Cancer Research, and NSF CBET Award 1337438.

Relevance of Research to State-Related Topic(s)

Hyperthermia is in clinical use and under further investigation for treatment of select cancers. In 2013, an estimated 14,370 cases are estimated in Kansas alone, with over 1.6 million new cases nationwide. Thermal therapies may be minimally invasive alternatives for the large volume of patients who are ineligible for surgery and other treatment modalities. Thermal therapies are also under investigation for treatment of resistant infectious disease in humans and animals. Raising livestock is a significant economic activity in Kansas. Targeted thermal therapies may have applications to treatment of resistant infections in livestock animals.

EXTENDING THE SEMANTICS IN NATURAL LANGUAGE UNDERSTANDING**Michael Marlen***Department of Computing and Information Sciences, College of Engineering*

BACKGROUND AND PURPOSE: There has yet to be a system that is fully capable of understanding English. We define understanding as the ability to reason by successfully mapping an ontology onto a preexisting ontology built from the premises. **METHOD:** This is demonstrated using the FraCaS Test Suite problems that are presented in English. Each problem within the test suite contains one or more premises, information about some scenario, and a question about the scenario. We had to define every word in the FraCaS Test Suite and provide the instructions for each word to take on the overall representation of our model. **RESULTS/FINDINGS:** We achieve a 5.23% higher accuracy compared to other methodologies on the FraCaS Test Suite using the same sections that they do. On top of our higher accuracy we also are capable of answering more problems in the test suite, notably problems with multiple premises, which is key to more complex scenarios. **CONCLUSION:** The implications of having software that is capable of understanding language, will essentially be like having an expert at your disposal.

Relevance of Research to State-Related Topic(s)

Having software that understands language at a high level is essential to the healthcare industry as well as the defense industry. Suppose a doctor describes the patients' symptoms, the software could then understand what those mean and start to derive possibilities for the doctor and even offer possible treatment plans for the patient. For the defense industry, having software that understands language at a high level translates to analysts being able to ask more complex questions and treat the raw intelligence, more than just a keyword search. Software capable of understanding language at a high level enables analysts to look for concepts or actions involving specified targets.

EPITAXIAL GROWTH OF THICK FILMS OF BORON PHOSPHIDE ON SILICON CARBIDE AND IT'S PROPERTIES

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BACKGROUND AND PURPOSE: Boron phosphide (BP) is potentially useful in neutron detection because of the large thermal neutron capture cross-section of the boron-10 isotope. In the CVD growth of BP films, various problems like film cracking and incorporation of substrate impurities into the film have been reported in the literature. Silicon carbide (SiC) which is a superior substrate in terms of lattice match, thermal expansion coefficient and chemical stability could eliminate these problems. **METHOD:** In this work, cubic BP was epitaxially grown on SiC by thermal decomposition of $B_2H_6-PH_3$ mixture in H_2 at temperatures between $1100^{\circ}C-1300^{\circ}C$ and pressure at 700 torr. The effect of growth parameters like temperature, reactants composition and substrate orientation on the structural and electrical properties of the films was examined in detail. The intentionally misoriented (off-cut) substrates were investigated for their potential to eliminate dislocations and inverse domain boundaries. **RESULTS:** We succeeded in obtaining single crystal BP films on 4H- and 6H- SiC substrates with thickness of 15 microns. The best BP single crystals were grown at $1250^{\circ}C$ with preferred (111) orientation on the 4H-SiC (4° off-cut) with smooth surface which was revealed by the electron microscope. X-Ray Diffraction and Raman spectroscopy data showed these BP films to be highly crystalline. The electrical properties of the films grown on electrically insulating 4H-SiC substrate were also studied. **CONCLUSION:** These BP films with high crystal quality, low defect densities and desired electrical properties will make best suitable materials for fabricating the neutron detectors.

Relevance of Research to State-related Topic(s)

The demand for neutron detectors has surged in the past few years as a result of increased efforts to stop nuclear proliferation and terrorism. These solid state BP neutron detectors are more compact, more sensitive and less expensive than current 3He detectors. This would allow for more profuse use of these detectors at international ports, decreasing the likelihood of contraband plutonium and uranium. But, the difficulty in producing high quality, defect free BP epitaxial layers has prevented the use of this semiconductor in practical devices. Most prior studies produced BP with poor electrical properties with silicon as the substrate. My research is focused on growing high quality epitaxial BP films on SiC substrate with low dislocation densities and low residual impurities that are necessary to realize the best electrical properties for excellent neutron detection.

NANOPARTICLE BASED DRUG DELIVERY SYSTEM FOR THE EFFECTIVE TREATMENT OF CANCERS

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BACKGROUND AND PURPOSE: Nanotechnology-based drugs have the ability of delivering chemotherapeutic drugs to the targeted areas more selectively. The general delivery mechanisms are understood based on one of the key features observed during cancer propagation, which is known as angiogenesis. Angiogenesis causes the formation of leaky, irregular blood vessels with larger gaps in their walls and these gaps provide perfect getaways for the nanoparticles with correct dimensions (< 100 nm) to deliver chemotherapeutic drugs selectively to tumor cells, rather healthy tissue around them. **METHOD:** A Fe/Fe₃O₄ nanoparticle based drug delivery system has constructed to carry essential components by tethering them to the nanoparticles. Chemotherapeutic prodrugs are activated by enzymatic cleavage within the cancer cells during endocytosis. The combination of targeted transport and activation of prodrugs will result in a more effective drug activity, minimizing collateral effects. **RESULTS/FINDINGS:** We were able to synthesize chemotherapeutic nanoplatforms featuring Fe/Fe₃O₄ central nanoparticles and the diameters can be fine-tuned to achieve 10 to 40nm with very low degrees of polydispersity. Dopamine and its derivatives are known to be a robust anchors, which bind strongly to the surfaces of iron-oxide containing nanoparticles and are essentially non-toxic to prevent bio-corrosion in-vivo for several days. The chemotherapeutic drug doxorubicine and the tumor homing and uptake sequence CGKRK were tethered in various ratios. **CONCLUSION:** We have synthesized and characterized a stable iron/iron oxide-based nanoplatform capable of tumor-homing and delivering doxorubicine, which inhibits the enzyme topoisomerase II, by means of endosomal uptake and proteolytic release. This nanoplatform is currently being evaluated in cell tests in- vitro.

Relevance of Research to State-Related Topic(s)

According to the Kansas Department of Health and Environment there were approximately 5300 deaths due to cancer in Kansas and about 13000 new cases are diagnosed among residents. Most common type of cancer is lung cancer in both men and women while prostate cancers, breast cancers and colorectal cancers are also commonly diagnosed among Kansas residents. According to the Department of Health and Environment about \$ 2 billion are spent on cancers annually. Therefore developments of promising treatment methods for cancers are highly advantageous. This particular drug delivery system can be used for the treatment of several different cancers by simple modifications done to the therapeutic drug and other targeting devices.

****WITHDREW****

QUANTITATIVE ANALYSES OF CATHEPSIN B ACTIVITY USING ENHANCED AC VOLTAMMETRY AT CARBON NANOFIBER NANO-ELECTRODE ARRAYS: A STUDY TOWARD MULTIPLEX ELECTROCHEMICAL PROTEASE PROFILING

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BACKGROUND AND PURPOSE: Cathepsin B is a lysosomal cysteine protease which is highly expressed during cancer invasion and progression. Increased level of cathepsin B in tumors or in extracellular fluids can serve as prognostic factors for cancer patients. Our purpose is to develop a portable multiplex technique for simultaneously detecting a large number of distinct proteases in a minute drop of serum or lysate sample. **METHOD:** The proteolytic activity of a cancer-related enzyme cathepsin B is measured with real-time AC voltammetry (ACV) using ferrocene (Fc) labeled tetrapeptides attached to a nanoelectrode array (NEA) fabricated with vertically aligned carbon nanofibers (VACNFs). **RESULTS/FINDINGS:** Consistent quantitative analyses using a heterogeneous Michaelis-Menten model have been obtained with the “extracted proteolytic signal” derived from nine experiments with purified cathepsin B solutions at three concentrations, giving “specificity constant” $k_{cat}/K_M = (3.68 \pm 0.50) \times 10^4 \text{ M}^{-1}\text{s}^{-1}$. A $29.1 \mu\text{g}\cdot\text{mL}^{-1}$ whole tissue lysate was found to contain effective cathepsin B activity equivalent to $\sim 26.2 \text{ nM}$ of purified cathepsin B. The e-beam patterned regular VACNF NEAs show much faster kinetics for cathepsin B proteolysis with $k_{cat}/K_M = 9.2 \times 10^4 \text{ M}^{-1}\text{s}^{-1}$, about twice of that of the random VACNF NEAs. **CONCLUSION:** These results show the exciting potential of this technique as a portable multiplex electronic system for rapid protease profiling of serum or blood samples, which may be used in diagnosis and treatment monitoring of cancers.

Relevance of Research to State-Related Topic(s)

More than 5,000 Kansansians died each year from cancer, accounting for approximately 22 percent of all deaths. Cancer has been the second leading cause of death in Kansas. Early diagnosis plays a critical role in preventing these deaths. It is well known that over expression of certain enzymes such as kinases and proteases correlated to cancer. Cathepsin B is a lysosomal cysteine protease which is highly expressed during cancer invasion and progression. Increased level of cathepsin B in tumors or in extracellular fluids can serve as prognostic factors for cancer patients. Therefore simple and rapid detection of the expression level of cathepsin B is highly demanded for early diagnosis and treatment of cancers. Our research aimed to develop a simple portable multiplex system for ultrasensitive detection of cathepsin B activities in cancerous cell lines. This work may greatly facilitate the early cancerous diagnosis and the monitoring of cancer therapeutic treatments.

IMPACT OF NITROGEN RATE ON NITROUS OXIDE EMISSIONS AND LIFE CYCLE GREENHOUSE GAS EMISSIONS IN SWITCHGRASS-BASED CELLULOSIC ETHANOL

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BACKGROUND AND PURPOSE: The 2007 Energy Independence Security Act mandates the production of 16 billion gallons per year of cellulosic biofuel by 2022. These biofuels will be required to have life cycle assessment (LCA) greenhouse gas (GHG) emissions 60% below gasoline. Switchgrass is one potential feedstock for the production of cellulosic ethanol. Emissions of the GHG nitrous oxide (N_2O) from soils treated with nitrogen fertilizer could negatively impact the GHG balance of biofuels. The objectives of this study were to 1) measure the yield and N_2O emissions from switchgrass receiving different rates of N fertilizer and 2) determine the impact of these emissions on the LCA GHG emissions of switchgrass-based ethanol. **METHOD:** Annual N_2O emissions were measured from switchgrass receiving different N rates. Measured yields and N_2O emissions were used as inputs in the GREET LCA model to simulate the life cycle GHG emissions of switchgrass-based ethanol. **RESULTS/FINDINGS:** Nitrogen rate increased switchgrass biomass by an average of 20 kg / ha per kg N applied. Increasing nitrogen rate caused substantial increases in the LCA GHG emissions of switchgrass-based cellulosic ethanol. Much of the increase was due to increased N_2O emissions, which accounted for 58% of total LCA GHG emissions in switchgrass receiving 150 kg N / ha. LCA GHG emissions of ethanol were lower than emissions from gasoline at all N rates. **CONCLUSION:** Increased N rates increased yield but also substantially increased the GHG balance of switchgrass-based ethanol. Optimal N management will be key in maximizing GHG savings from the use of switchgrass for cellulosic ethanol production.

Relevance of Research to State-Related Topic(s)

To help meet the mandates in the 2007 Energy Security Act, the Department of Energy is contributing funding to the construction of several cellulosic ethanol plants throughout the United States, including the Abengoa Bioenergy Plant in Hugoton, Kansas. Farmers who sign contracts to provide biomass to cellulosic plants will be looking at growing a variety of crops, including switchgrass, to fulfill their contracts. However, nitrous oxide emissions from soils planted in switchgrass could impact the effectiveness switchgrass-based cellulosic ethanol in mitigating GHG emissions. This study aims to measure nitrous oxide emissions from soils grown in switchgrass receiving different rates of nitrogen fertilizer. These measurements will be essential for developing accurate estimations of GHG emissions from switchgrass in Central Kansas and provide information to farmers about optimal nitrogen management in switchgrass grown for bioenergy production.

REAL-TIME HIL SIMULATION OF SHIPBOARD POWER SYSTEM AND ENERGY STORAGE DEVICES MANAGEMENT

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BACKGROUND AND PURPOSE: There are many situations that can cause a fault on a shipboard power system, especially in naval battleships. Batteries and ultra-capacitors are simulated to be the backup energy storage devices (ESDs) to power the shipboard power system when an outage and damage happen. In this research, the real-time hardware-in-the-loop (HIL) simulation of shipboard power system (SPS) and ESDs are being designed and implemented on OPAL-RT simulator to test the performance of SPS and ESDs in different fault locations. **METHOD:** Research efforts require model development for the battery, ultra-capacitor, bidirectional DC-DC converter and SPS system in real-time HIL and developing the possible sets of fault location tests. Testing the system in different ESDs combinations will validate the power efficiency of power system. **RESULTS/FINDINGS:** The ESDs should provide power to the SPS when the system is damaged or lacked power. Also, the generators in the SPS can charge ESDs under normal operation to make the system operate efficiently. The performance of different ESDs combinations at different fault locations can be tested and evaluated in future work to decide the best combination of size, types and location of ESDs. **CONCLUSION:** The SPS can be more stable and sustainable with ESDs. By using this system developed in my research, more tests can be done in the future such as building sensors to locate faults, testing the relay performance and investigating the tolerance of the system parameters.

Relevance of Research to State-Related Topic(s)

Smart electric power systems are essential as we advance renewable energy sources such as wind and solar energy as well as investigate storage techniques and electric vehicles. While my current research relates to shipboard power systems, the techniques of energy storage device management are essential for land based systems as well. The study of the system integration of power generation, storage and alternative energy supplies is a critical challenge in effectively integrating the abundance of wind energy within the state of Kansas and our electric power grid. Additionally investigating the operation of micro-grids for land or ship systems helps us advance power system operations for control and communications with the smart grid.

****WITHDREW****

CONTROLLED GROWTH OF VERTICALLY ALIGNED CARBON NANOTUBE STRUCTURES ON COPPER AND GRAPHENE FOR ENERGY APPLICATIONS

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BACKGROUND AND PURPOSE: Carbon nanotubes (CNTs) are one-dimensional nanostructures composed of rolled up sheets of sp^2 bonded graphite. Experiments and theory have shown that the electrical, mechanical and thermal properties of CNTs can either rival or exceed those of current state-of-the-art materials in terms of their current carrying capacity and thermal conductivity, estimated at 10^9 A/cm⁻¹ and 3000 W/mK, respectively [1, 2]. In order to harness these unique properties of CNTs, this study focuses on fabricating CNT carpets of controlled properties for applications in Li-ion batteries (electrodes) and microelectronic cooling (thermal interface materials). For these applications, it is necessary to grow CNT arrays on highly conductive substrates such as Cu and graphene in order to minimize the contact resistance. Hitherto, the growth of high-quality, highly dense, vertically aligned CNTs via chemical vapor deposition occur mainly on catalysts supported on insulators (SiO₂ or Al₂O₃). Obtaining similar growth on metals has remained a challenge due to the inability of metals to stabilize the catalyst and prevent the high rates of intermetallic diffusion and catalyst deactivation. **METHOD:** To improve growth on metals, a good understanding of their interfacial properties and the mechanistic phenomena associated with catalysis of CNTs at the nanoscale is required. The interfacial properties of the substrates will be studied using contact angle measurement while the evolution of the catalysts on substrates will be studied using microscopic and spectroscopic techniques. **CONCLUSION:** The results of these experiments would benefit current efforts in optimizing the efficiency of CNT carpet growth on metallic substrates.

Relevance of Research to State-Related Topic(s)

The research has the potential of stimulating economic growth and job creation in Kansas through the creation of new innovative start-up companies. Companies such as Boeing, 3M, Intel, Honeywell, Dow Corning, and General Electric have many products that utilize either Li-ion batteries or thermal interface materials. Innovative discoveries of new electrode materials that increase the power and energy densities of Li-ion batteries and decrease the thermal resistance of thermal interface materials in heat sinks found in microelectronics would be of interest to these businesses.

ENHANCED POOL BOILING UNDER HIGH PRESSURE

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BACKGROUND AND PURPOSE: Boiling is an efficient way of heat transfer because it can remove large amount of heat due to the latent heat of evaporation. Enhanced pool boiling has extensive applications in chemical industries, microelectronics industries, and power industries, etc. Many variables, such as surface properties, fluid properties, and system pressure, will affect the performance of pool boiling. The purpose of this research is to find how heat transfer enhances at increased pressure (up to 20bar) with deionized water and refrigerants on different heater surfaces. These surfaces include a plain copper surface, micro-structured copper surfaces, and coated surfaces. **METHOD:** The boiling vessel is pressurized with nitrogen and the system pressure is controlled by a pressure regulator. The test fluid is preheated to saturation temperature by two 500W cartridge heaters. When the system reaches steady state, an additional heat flux is added to the test surface with two 225W cartridge heaters controlled by a process controller. The heat flux is increased from 0kW/m^2 to critical heat flux or the designed maximum heat flux (568kW/m^2) with an increment of 20kW/m^2 . The wall superheat corresponding to each heat flux is extrapolated by three thermocouple readings. The heat transfer coefficient is calculated at each heat flux for each fluid at each pressure. **RESULTS/FINDINGS:** We anticipate that at higher pressure, heat transfer rate will increase for each test surface and modified surfaces will perform better than plain surface. **CONCLUSION:** The test results will help industries optimize cooling apparatus design and minimize water or refrigerants consumption.

Relevance of Research to State-Related Topic(s)

Water is used as an ideal coolant in various industries because of its physical and chemical properties and relatively lower cost. For example, in the State of Kansas many industries such as Wolf Creek Nuclear Generating Station, Westar Energy's Jeffrey Energy Center and Coffeyville Resources, LLC use water for cooling purposes for energy production. Large amount of water is used annually during the cooling process. If the cooling devices are designed and built with the most suitable surface geometry and have certain surface coating that works the best under the system pressure, the increased heat transfer rate will allow less water consumption during the cooling process and also make cooling devices more compact.

THE EFFECTS OF LIGHT-HARVESTING COMPLEX II STRUCTURE ON PHOTOVOLTAIC PROPERTIES OF SENSITIZED TiO₂ SOLAR CELLS

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BACKGROUND AND PURPOSE: A modified solar cell with a thin TiO₂ barrier layer sensitized with natural light-harvesting complex II (LHCII) was used as a biomimetic model to study the effects of LHCII structure on photovoltaic properties. The aggregation of LHCII was found to dramatically increase the photocurrent, correlating well with the formation of charge transfer states observed by spectroscopy studies. **METHOD:** The morphology of small- and large-sized LHCII aggregates deposited on a surface was confirmed by atomic force microscopy. Enhanced LHCII immobilization was accomplished via electrostatic interaction with amine-functionalized photoanodes. The photocurrent responses under illumination of three wavelength bands correlated well with the peak and valley features in the UV-Vis absorption spectrum of LHCII solutions, confirming the effectiveness of LHCII as a photosensitizer in the assembled solar cells. **RESULTS AND CONCLUSION:** The enhanced photocurrent observed with aggregated LHCII is most likely due to the formation of the chlorophyll-chlorophyll charge transfer states that are effectively coupled with TiO₂ surface to inject electrons into the TiO₂ conduction band. The assembled solar cells demonstrated remarkable stability in both aqueous buffer and acetonitrile electrolytes over 30 days.

Relevance of Research to State-Related Topic(s)

This work is related to the renewable energy by applying solar light. With the global shortage of energy resource, the development of various renewable resources such as wind, biofuel, solar energy etc. becomes a popular topic. Kansas State where has sufficient solar illumination is undoubtedly a promising place to develop solar energy related industry. Currently, the major limitations on solar energy include the design of photovoltaic device and the transmission efficiency etc., which to some extent relate to the materials being used. Here, a photosynthesis protein subtracted from spinach leaves was used to sensitize the solar cell and transmit the solar energy into electricity. This biomolecule makes our device “greener” and more environment-friendly. More importantly, as a basic study, this work helps to understand the natural photosynthesis better, from which the scientists may get inspiration and create more advanced solar energy devices in the future.

PRODUCTION OF DIMETHYLFURAN FROM HYDROXYMETHYLFURFURAL, A BIOMASS DERIVED PRODUCT, USING A CATALYST COATED POLYMERIC MEMBRANE REACTOR

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BACKGROUND AND PURPOSE: Catalytic membrane reactors afford an efficient method for performing three-phase heterogeneous chemical reactions. In this study a polymeric membrane is coated with a noble metal catalyst and positioned to act as an interface between a liquid and gas phase allowing gas transport while restricting the liquid. This design has the potential to utilize hydrogen pressures of a few atmospheres as compared to traditional heterogeneous reactors for hydrogenation that require orders of magnitude higher hydrogen pressures. This study examines the capability of this reactor design for hydrogenation/hydrogenolysis reactions and explores the reaction kinetics and the influence of reaction temperature and gas phase pressure on system performance. **METHOD:** An integrally-skinned, asymmetric polyimide membrane was produced and employed as the phase contactor. This report details the hydrogenolysis of 5-hydroxymethylfurfural, a biomass based platform chemical, to 2,5-dimethylfuran, a potential liquid fuel. Studies relating to membrane stability and compatibility with various reaction solvents and under various reaction conditions are also underway. **RESULTS/CONCLUSIONS:** Materials compatibility studies have shown that polyimide membranes are stable in water, low molecular weight alkanes and in lower alcohols. Consequently, water has been selected as the reaction solvent for the HMF to DMF transformation. Initial studies demonstrate that the membrane reactor system promoted the hydrogenation reaction. If the reactor system is shown to produce significant conversion of HMF while maintaining long-term membrane stability and performance, the hydrogenolysis reaction of HMF to DMF using a catalyst coated polymeric membrane may serve as a model reactor/reaction for several other biorefinery operations.

Relevance of Research to State-Related Topic(s)

This research relates to developing technologies for the efficient production of alternative and sustainable biomass based energy. The chemical reactions and reactor systems involved in this research could be important in the operations and success of a biorefinery. The importance of agriculture and the abundant production of biomass feedstocks in the state of Kansas support much of the infrastructure and logistics needed for a biorefinery. Further developing the technology of biomass conversion and chemical production will be a direct asset to biorefining, agriculture, and the economics and people of Kansas. As petroleum resources decline alternative and sustainable energy sources are becoming increasingly important in our world and Kansas will in many ways benefit from developing and supporting the robustness of the future global energy supply.

A NONLINEAR CONTROL SCHEME FOR EXTREMUM POWER SEEKING IN WIND TURBINE ENERGY CONVERSION SYSTEMS

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BACKGROUND AND PURPOSE: an adaptive control scheme for wind turbine systems has been developed. The role of the controller is to adaptively reach the maximum estimated power coefficient when the wind speed changes. The contribution of this work is that instead of using the dither signal used in previous works, the extremum seeking controller uses fluctuations in wind speed to adaptively maximize the output power. **METHOD:** In the proposed control scheme, the wind turbine power coefficient is estimated using a Lyapunov-based adaptive control technique. The estimated power coefficient is used to determine a desired turbine rotor speed based on an estimate of the power coefficient gradient with respect to rotor speed. **RESULTS/FINDINGS:** This control system was developed in a Matlab/Simulink environment, which simulates dynamics of the system from the turbine rotor (using NREL 5MW FAST model), where the kinetic wind energy is converted to mechanical energy, to the generator, which transforms mechanical power to electrical power. The two main control schemes, i.e. power coefficient estimation with rotor speed regulation and desired rotor speed calculation based on maximizing the estimated power coefficient, have shown robust dynamic behaviors. **CONCLUSION:** The NREL FAST numerical results demonstrated the validity and robustness of the developed control scheme.

Relevance of Research to State-Related Topic(s)

Wind is a cost-effective, clean renewable energy that can benefit Kansas future energy needs. Although the Kansas receives only a small percentage of electrical energy from wind, increasing total wind power capacity in the state will be very helpful. This desired growth in wind energy provides motivation to conduct many engineering investigations to improve efficiency and productivity of these systems. However, one technical challenge is to develop a robust control scheme for maximum power seeking in wind turbines in the presence of wind speed fluctuations. So this research relates to alternative energy sources in the state of Kansas.

**PROTECTION, CONTROL AND COMMUNICATION FOR A 230 KV TRANSMISSION LINE
USING A PILOT OVERREACHING TRANSFER TRIPPING (POTT)**

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BACKGROUND AND PURPOSE: New applications emerge in the increasingly changing field of power systems in the United States and across the world. Thus, it causes new pressure in the grid performance. Hence, power system protection being fundamental aspect of a system that must be addressed. When a system is under high stress, such as when there is high demand of energy, it is imperative to have adequate protection of the transmission line. A fault in a transmission line can affect a large number of customers. **METHOD:** Transmission lines in a power system are frequently exposed to faults and generally protected by distance relays. If a faulted segment of transmission lines is not cleared in a short period of time it will cause instability to the system. **RESULTS/FINDINGS:** Distance protection has a basic function which is to detect faults on buses, transmission lines or substations and then isolate them. **CONCLUSION:** Protection devices with the appropriate settings and configured with the proper communication protocol are able to distinguish between a stress system or fault in the transmission lines. The addition of renewable resources has changed the one directional power flow to bidirectional. Also, power system protection has been focusing on matching automation and control technologies to systems performance needs. This presentation will focus on the design of a human machine interface for protection a protection of transmission line using a pilot distance protection of a Permissive Overreaching Transfer Tripping (POTT).

Relevance of Research to State-Related Topic(s)

The increasing implementation of renewable energy resources across the electric grid has led to the growth of the transmission infrastructure across the state of Kansas. Thus, the transmission lines carrying the power generated through these renewable resources, specifically wind must be reliably transported with minimal disturbances. Also the transmission lines are a vital component in a power system; if a fault occurs in the transmission area of the power system a large part of a power system would be affected. Hence, the implementation of a reliable protection scheme in the transmission lines for the Kansas electric system is essential to its reliability and sustainability.

FROM GARBAGE TO GOURMET: SUSTAINABLE WASTE PREVENTION AND MUSHROOM CULTIVATION FROM SPENT COFFEE GROUNDS

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BACKGROUND AND PURPOSE: Diversion of waste from landfills through recycling and composting ultimately saves disposal costs and protects groundwater resources from contamination. Kansas State University recycled less than 20% of materials on campus, yet more than 50% of waste generated could be recycled or composted. Kansas State University has a large amount of trash bins but is lacking in recycling and compost bins. The ease of disposing of waste in available trash bins and the challenge of finding recycling and composting bins are a deterrent to recycling and composting. Our objectives were to 1) convert some receptacles at a K-State campus coffee shop into waste sorting stations, 2) facilitate composting at the coffee shop, and 3) utilize spent coffee grounds to cultivate different mushroom species as an innovative way to reuse a waste product to create an essential product before being properly disposed. **METHOD:** At this stage, we have introduced pre- and post-consumer composting receptacles at Radina's Coffeehouse and Roastery on campus and begun experimentation utilizing compostable coffee grounds to cultivate different mushroom species. **RESULTS/FINDINGS:** This pilot study has decreased the amount of waste entering the landfill by introducing composting into the coffeeshop, as well as reusing waste material (used coffee grounds) as a substrate for mushroom mycelium. **CONCLUSION:** Post-consumer composting is feasible campus-wide and six different mushrooms species have been inoculated successfully on used coffee grounds, but have yet to fruit. Experimenting with different carbon inputs to the substrate is our next step.

Relevance of Research to State-Related Topic(s)

Water: Our pilot study is relevant to the state of Kansas because it prevents pollution to the air, water, and land by diverting waste from the landfill, decreasing the need for transport of the waste to the landfill, and using resources to their fullest before they are recycled or composted. Sending the majority of our waste to a landfill is not sustainable. The landfills in current use are filling up, leading to the need for new landfills soon if we do not slow down the rate at which we landfill solid waste. Also, it is nearly impossible to design a landfill that prevents any leaching into the groundwater or any release of methane into the atmosphere. Reducing the materials being placed in landfills prevents potential pollution issues to water and the environment.

USING A MEMBRANE REACTOR TO UPGRADE BIODIESEL TO MORE VALUABLE FATTY ALCOHOLS

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BACKGROUND AND PURPOSE: Currently, biodiesel refineries produce methyl esters and glycerol. Diversification of the product slate would allow biorefineries to maintain profitability in a range of market conditions. Inclusion of higher-value chemicals in the mix is a key goal. Fatty alcohols are attractive targets as they can be manufactured from methyl esters. Heterogeneous catalysts effectively promote the selective hydrogenation of the C=O bond in a three phase reaction system. Hydrogen is present as a gas, the methyl esters a liquid, and the catalyst a solid. In these systems, the rate of reactant delivery to the catalyst surface is limited by poor mass transfer. Consequently, high pressures must be used. **METHOD:** We are exploring the use a metal-coated membrane contactor to serve as the reactor to promote effective mass transfer. By placing the metal catalyst on the membrane surface and supplying hydrogen through the membrane, this system enables the delivery of hydrogen directly to the catalyst while the methyl esters flow past the surface. **RESULTS/FINDINGS:** Membranes fabricated from commercial polyimides have the thermal stability to operate in the conditions required to produce fatty alcohols. We report a comparison between the conventional three-phase system and the novel membrane reactor system. **CONCLUSION:** A membrane reactor is suitable for producing fatty alcohols from biodiesel. Using a membrane reactor decreases mass transfer resistance inherent in the reaction, allowing for less harsh reaction conditions and lower volumes of hydrogen recycle, simplifying the process and decreasing costs.

Relevance of Research to State-Related Topic(s)

Producing fatty alcohols from biodiesel could improve the economics of biorefineries because fatty alcohols are worth more than biodiesel. Biodiesel is advantageous over petroleum-based fuel sources because it is renewable, nontoxic, carbon neutral, biodegradable, can reduce our dependence on foreign oil and enhance local air quality. Kansas currently has four biodiesel refineries, three of which are located in rural areas. Improving the economics of biorefineries would bring more jobs to rural Kansas, either by the expansion of existing sites or the construction of new biorefineries. In the United States, biodiesel is made almost exclusively from soybeans. Soybeans are already an important crop in Kansas with over 100 million bushels produced annually. By providing an additional market for these soybeans, farmers would see higher prices for their product.

STUDY OF THE FEASIBILITY OF USING COMBINED GLASS PARTICLE SIZES AND TYPES IN CONCRETE AS PARTIAL CEMENT REPLACEMENT

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BACKGROUND AND PURPOSE: Finely ground glass has the potential of pozzolanic reactivity, and can serve as a supplementary cementitious material (SCM). The uniform composition, amorphous nature, and high silica content of glass make it ideal for studying effects of glass type and particle size on reactivity at different temperatures. This study focuses on determining how combining glass types and particle sizes affects the microstructure and performance properties of cementitious systems containing glass cullet as a SCM. **METHOD:** In this study, the reaction rate, pozzolanicity, and hydration degree quantification of four sets of combined glass types and sizes have been investigated using isothermal calorimetry, thermogravimetric analysis (TGA), and analysis of scanning electron microscope (SEM) images. Moreover, compressive strength tests were performed to correlate reactivity of cementitious materials containing glass to its performance. **RESULTS/FINDINGS:** The results show that combined glass can increase reaction rate and have pozzolanic properties, especially when particles below 25 μm of clear and green glass were used at curing temperature of 50°C. Additionally, at elevated curing temperatures the combined glass was able to increase the compressive strength of the mortar samples. **CONCLUSION:** Glass cullet is a very temperature-sensitive supplementary cementitious material. Additionally, glass pozzolanic reactivity is a linear function of surface area, reflecting that the surface area would be a significant factor affecting glass cullet reactivity. Combined glass cullet, especially glass below 25 μm in diameter, can be used as an effective SCM.

Relevance of Research to State-Related Topic(s)

Concrete pavements are very common in road construction in the State of Kansas. They are expensive, largely due to the cost of raw materials and labor both in construction and maintenance. Additionally, cement production releases large amounts of CO₂ gas, leading to more environmentally detrimental impacts, i.e. Global Warming. The current study investigates glass cullet performance in concrete as supplementary cementitious materials (SCMs). The project is based on laboratory activities and microstructural studies, and is trying to quantify the behavior of combined glass cullet types and sizes in concrete, as well as study their effects on concrete strength and durability. Using glass cullet as a SCM in concrete pavements decreases the amount of cement needed, which results in lower pavement costs. Using less cement also reduces the environmentally harmful effects of cement production.

INCORPORATION OF SWEET SORGHUM JUICE INTO CURRENT DRY-GRIND ETHANOL PROCESS FOR IMPROVED ETHANOL YIELDS, ENERGY SAVING AND WATER EFFICIENCY

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BACKGROUND AND PURPOSE: Sweet sorghum is a potential energy crop. The plant juice has high concentration of fermentable sugars (sucrose, glucose, and fructose) of approximately 16-18%. Sorghum has a high biomass yield (20-30 dry tons/hector), and is highly adaptable to diverse climate and soil conditions. Currently, a year-around ethanol production based on sweet sorghum is difficult to achieve due to instability of supply. One possible way to solve this challenge is to incorporate sweet sorghum juice into current dry-grind ethanol process. The goal of this research is to develop a new processing technology for current ethanol industry using sweet sorghum for ethanol production. In this study, the optimum grain sorghum flour loading with sweet sorghum juice that will produce highest fermentation efficiency and ethanol yield within the shortest enzymatic hydrolysis time is determined. The fermentation performance of sweet sorghum juice with grain flour using raw starch hydrolyzing enzyme is, as well, investigated. **METHOD:** Ethanol fermentation by *Saccharomyces cerevisiae* were performed on 6 different slurries which contained varying quantities of grain sorghum flour (0 g, 6 g, 9 g, 12 g, and 15 g) added to a 100 ml of sweet sorghum juice and a 30 g sorghum db flour with 100 mL distilled water, as control. **RESULTS AND CONCLUSION:** The primary results revealed that grain sorghum flour loading was 15 g added to 100 ml of sweet sorghum juice produced the highest ethanol yield of 16.74 v/v%. The optimum enzymatic hydrolysis time was 30 minutes – energy conserved.

Relevance of Research to State-related Topics(s)

The processing techniques developed from our research will have a significant impact on both regional and national economic development. It will be a new technology to commercialize sweet sorghum for ethanol production; benefit all sectors involving in the sweet sorghum ethanol industry, sorghum producers, and sorghum breeders in the State. The second generation ethanol production is not commercialized yet and ethanol production from cereal grains could not catch up with the demand for fuel ethanol, sweet sorghum ethanol will join and help the whole ethanol industry realizing the target set up by the 2007 EISA.

**THE CHANGE IN ECOSYSTEM SERVICES: A TRADE-OFF INVOLVED IN BIOFUEL
PRODUCTION IN NORTH EASTERN KANSAS RIVER BASIN**

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BACKGROUND AND PURPOSE: Millennium Ecosystems Assessment defines ecosystem services as the benefits that people obtain from ecosystems. Interest in ecosystem services is growing tremendously and has been recognized as a tool for conservation by government agencies, academics and NGOs. It can be used to improve land management decisions. However, the quantification of ecosystem services is challenging and critical. In this study, a distributed parameter watershed model (Soil and Water Assessment Tool, SWAT) is being used to simulate current conditions of Perry watershed, a downstream of Kansas River basin, located in northeastern Kansas, and to develop quantitative methods to evaluate ecosystem services. **METHOD:** The Perry SWAT model was calibrated and validated for crop yields and stream flow. A multi-objective function using the four quantitative statistics was used as model evaluation statistics. The output from Perry SWAT model will be used to study the trade-off involved in biofuel production in two ecosystem services: Fresh Water Provision and Food Provision. Alternative land management scenarios will be identified to improve ecosystem service provision in Perry watershed. **RESULTS/FINDINGS:** Intense corn cultivation may increase the concentrations of nitrogen and phosphorus in surface waters, due to the high fertilizer demands of corn and erosion. Therefore, increasing Food Provision is expected with diminishing Fresh Water Provision. **CONCLUSION:** The results of this research will be used to stimulate discussions on ecosystem services and help to identify the emerging threats on them. In particular, this project will be used to develop a defensible methodology to quantify ecosystem services.

Relevance of Research to State-Related Topic(s)

This project will help the landowners and farmers to identify the “value” of their land other than what it is currently producing. The ecosystem service simulation results from this study will provide a useful tool to communicate complex ecosystem impacts and responses to individual land-use-shift scenarios. This study will have immediate impact because of the ability to integrate project results within the framework of the long-term relationships of the project team with numerous watershed stakeholder groups in Kansas. When the ecosystem services are quantified, the degrading and diminishing services can be easily identified. Therefore, through ecosystem quantification there is a chance to maintain the land productivity while protecting existing ecosystem services. This will ultimately yield sustainable land management. As the quantification of ecosystem services can be applied in policy and management plans, many societies including government agencies and land managers could benefit through this study.

HYDROTREATING OF FAST PYROLYSIS OIL WITH CATALYTIC INTEGRAL-ASYMMETRIC MEMBRANES AT MILD CONDITIONS

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BACKGROUND AND PURPOSE: Fast pyrolysis of biomass is a thermochemical approach to obtain liquid fuels and chemicals. Fast pyrolysis is feedstock agnostic as opposed to fermentation-based processing which requires adaptations and sophisticated pre-treatments for different feedstocks. Bio-oil is not sufficiently stable after fast pyrolysis to allow storage and/or transport. Post-pyrolysis chemical reactions due to a high oxygen content of the molecules that comprise bio-oil are generally thought to be a main issue. Partial deoxygenation is therefore desirable. **METHOD:** Oxygen-rich bio-oil requires stabilization that can be achieved through heterogeneous liquid-phase catalytic hydrodeoxygenation (HDO). State of the art HDO typically requires severe conditions (20-55 atmospheres and 250-400°C). H₂ is fed from the substructure (permeate side) of the membrane through the selective membrane skin directly to the catalyst avoiding the hydrogen solubility issue of conventional liquid phase hydrotreating. HDO was tracked by monitoring the greatly increasing water concentration in the bio-oil. **RESULTS/FINDINGS:** Here we report successful HDO of bio-oil at mild conditions near 3 atm H₂ and 90°C using a catalyst-decorated polymeric integral-asymmetric membrane. The treated oil phase-separated into water and organic rich phases while the original untreated bio-oil did not. **CONCLUSION:** HDO at mild conditions as demonstrated here could enable decentralized processing of biomass first by fast pyrolysis followed by stabilization of the oil on site prior to storage and transport. Decentralized processing is important to overcome the well-known transport issue for non-densified biomass. Rural economies would likely benefit from exporting an intermediate such as stabilized bio-oil rather than unprocessed materials.

Relevance of Research to State-Related Topic(s)

Renewable energy from biomass, including wheat straw, yard waste, corn stover, paper or wood waste, drought-resistant bioenergy crops, will be enabled by fast pyrolysis to bio-crude. Fast pyrolysis is feedstock agnostic, proven at industrial scale, and very rugged. It is far superior to the boutique-processing for each feedstock needed for fermentation. Our work enables the necessary upgrade of oil for shipment to and processing in the refineries of Kansas. Kansas has over 300,000 barrels per day of refinery capacity, 10% or 30,000 barrels could come from biomass via fast pyrolysis and the upgrading process proposed. Fast pyrolysis can be downscaled to regional or local operations to improve rural economies. Oil with no refining needed (only our upgrading) can also be cofired with fuel oil in both power and cement plants within Kansas.

STRUCTURAL BAMBOO IN EAST AFRICA

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PURPOSE: The intent of this document is to address the need for safe, sustainable, and affordable housing in East Africa and to promote the use of bamboo as a structural material by providing adequate information and resources to evaluate the strength of bamboo. Housing in East Africa continues as a main headline because of the population growth in the region and specifically in urban areas where the resources for housing and infrastructure cannot match the population growth. The solution may reside in providing bamboo housing as an alternative to standard housing. The bamboo species *Oxytenanthera abyssinica* is available throughout the East African region and has been accepted and implemented in traditional housing throughout the region. **METHOD:** This document covers the resources provided by the ICC, ISO, and INBAR for the use of bamboo as a structural material. The focus turns to the mechanical strength bamboo provides, and the structural behavior bamboo provides in building applications. Then, bamboo construction shows the tools, connections, and preservatives used in the field. The design example, using the bamboo species *Oxytenanthera abyssinica*, provides the traditional layout of an Amhara house, and the calculations for the design of a house bamboo. **RESULTS/FINDINGS:** This document has led to recommendations for engineers and the bamboo industry, including developing specific, global guidelines for bamboo design and creating a document for quality control for farms or plantations growing bamboo. **CONCLUSION:** From research, bamboo has been determined a viable structural material for East Africa to provide for the housing shortage.

Relevance of Research to State-Related Topic(s)

The research on structural bamboo in East Africa pertains to the state of Kansas because bamboo as a structural material provides a safe, sustainable, and affordable alternative to other structural materials. Bamboo can be used in similar applications as wood, and as wood resources become depleted, new materials will have to be developed to sustain the residential and small commercial construction in the United States. Although bamboo is not a well-known resource in this region of the United States, bamboo can be grown here in Kansas. Developing this material for structural or other applications could make Kansas a hub for bamboo in this region and open the Kansas economy to new avenues of revenue. In the world we live in today, innovation is required to succeed and creating a market for bamboo in the center of the United States could bring success to Kansas in many forms.

TRANSFER-LENGTH MEASUREMENTS ON CONCRETE RAILROAD TIES FABRICATED WITH 15 DIFFERENT PRESTRESSING REINFORCEMENTS

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BACKGROUND AND PURPOSE: Concrete rail road ties are becoming popular because of its advantages over wooden ties. Performance of these concrete cross ties would depend on various factors like indentation of the reinforcement, concrete release strength etc. Present study involves the study of an important parameter called Transfer Length with different indentations of the reinforcement used in concrete rail road ties. This study involved both laboratory and plant phases. This study would enhance the knowledge about the performance of concrete rail road ties. **METHOD:** An in-depth evaluation of the bond of different prestressing reinforcements that are used in the manufacturing of pre-tensioned concrete railroad ties was conducted as part of a research project. Fifteen (15) different prestressing reinforcements that are used to fabricate pre-tensioned concrete railroad ties worldwide were obtained and were then used to manufacture pre-tensioned concrete prisms in the laboratory, and railroad ties at a PCI member plant. Primary variable in this portion of the study was the prestressing reinforcement type. The transfer-lengths were determined by measuring concrete surface strains. **RESULTS AND CONCLUSIONS** Results from both phases indicated that there is a large variation in the bond quality of reinforcements that are currently used in the fabrication of pre-tensioned concrete railroad ties worldwide. There was excellent correlation between the plant-phase data and the laboratory-phase data. This indicates that the laboratory prisms, cast with a similar concrete mixture, were able to accurately represent the behavior of the same reinforcement in a concrete railroad tie.

Relevance of Research to State-related Topic(s)

Prestressed concrete railroad ties are becoming increasingly popular in the United States, and are an essential component for higher speed railway lines. Developing the rail road infrastructure would enhance the transportation of heavy haul loads and would develop any state. There would be no barrier to develop a big industry or manufacturing units in the transportation point of view, if the rail road infrastructure is sufficiently developed in a state. Usage of these concrete rail cross ties would increase the safety of the track by increasing the track stability. Safety is a major concern in any state. It would also be useful for the environment, since no trees will be cut as wooden ties will be replaced by these concrete cross ties. Maintenance costs of rail road system shall be reduced from this study and further service life can be increased.

EFFECTS OF SETUP AND MATERIAL PARAMETERS ON THE STANDARD TEST FOR STRAND BOND

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BACKGROUND AND PURPOSE: ASTM recently adopted the Standard Test Method for Evaluating Bond of Seven-Wire Steel Prestressing Strand as ASTM A 1081. The precision and bias statement for this test method has not however been developed. The first step in developing the precision and bias statement is to perform a ruggedness study to determine how the results are affected by allowable variations in methods and materials. **METHOD:** A ruggedness study was performed for ASTM A 1081 as the first step in an ongoing interlaboratory study to determine the test method precision and bias. After an initial survey of the pull-out strength of North American Strand in mortar, three strands of differing pull-out strengths were selected for inclusion in the ruggedness study. During this study, the mortar flow, compressive strength at testing, and test loading rate were varied in order to determine their effect on the test results. **RESULTS/FINDINGS:** The results showed that flow was a significant variable in the testing program. **CONCLUSION:** A recommendation that the specified allowable mortar mixture flow range of 100-125% be changed to 105-120% was made by the authors, in order to reduce the variability in the standard test results.

Relevance of Research to State-Related Topic(s)

Findings from this research study, along with the results from an extensive interlaboratory study that followed, will lead the development of a precision and bias statement for the newly adapted ASTM A 1081, the “Standard Test Method for Evaluating Bond of Seven-Wire Steel Prestressing Strand”. The authors have also recommended changes to the test specifications, in order to reduce the variability of the test results. These changes will improve the standard test method, and therefore provide a robust testing system for the qualification of steel prestressing strand, an essential material to the development of the infrastructure of the State of Kansas.

IMPROVING SAFETY AT RURAL INTERSECTIONS IN KANSAS

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BACKGROUND AND PURPOSE: In concern of highway safety, at unsignalized rural intersections, where a portion of the paved shoulder may be marked as a lane for through traffic to bypass vehicles making a left turn, installation of bypass lanes has been identified as a low cost way to improve safety. If a vehicle is stopped in the through travel lane waiting to make a left turn, following vehicles can use the bypass lane to avoid having to stop themselves. This study was conducted to evaluate the safety effectiveness of adding bypass lanes at unsignalized rural intersections. **METHOD:** The crash modification factor (CMF), as an acceptable factor for evaluating the safety effectiveness of a countermeasure, is defined the expected number of crashes with a countermeasure divided by the number of crashes expected without the countermeasure. This study evaluates the use of the case - control method to estimate CMF for evaluating the safety effectiveness of adding bypass lanes at unsignalized rural intersections in Kansas. This study evaluated the changes in crash severity at intersections with the shoulder bypass lane versus intersections without Bypass Lane. **RESULTS AND CONCLUSION:** The paper concludes the expected number of crashes and crash severity are lower at intersections with bypass lanes in comparison to intersections without bypass lanes.

Relevance of Research to State-related Topic(s)

Nearly 98.9 % of Kansas are Rural area. In addition, half of all motor vehicle crashes which result in injuries occur at intersections. In the state of Kansas in 2012, 56489 crashes occurred, 17386 crashes occurred at intersections and/or were intersection related. These crashes included 81 fatal crashes and 5233 injury crashes. Kansas Department of Transportation (KDOT) has been using the shoulder bypass lanes as a rural intersection treatment for years. Bypass lanes are fairly prevalent in Kansas roadways and there is a need to conduct a study to identify whether it is beneficial for KDOT to continue adding bypass lanes. Due to evaluate safety effectiveness of adding bypass lanes, crash data of more than 1100 rural unsignalized intersections were obtained from Kansas crash database for the years 2009 to 2011.

STUDYING THE IMPACT OF SPEED LIMIT CHANGE ON HORIZONTAL CURVE CRASHES**Hojr Momeni**¹, Eugene R. Russell Sr.¹, Malgorzata J. Rys²¹*Department of Civil Engineering, College of Engineering;* ²*Department of Industrial and Manufacturing Systems Engineering, College of Engineering*

BACKGROUND AND PURPOSE: Driving at horizontal curves is a more complicated task in comparison to straight sections of a roadway and poses more workload on drivers as well. Approximately a quarter of all fatal crashes on highways occur at horizontal curve sections, and most of the fatal crashes at horizontal curves are run-off-road (ROR) crashes which preliminary cause of them is exceeding the safe speed. Providing more visual cues prior to and on horizontal curves inform drivers about changes in horizontal alignment and improve the safety. However, increasing visual clues at horizontal curves does not necessarily result in decrease of speed of navigating vehicles. **METHOD:** This study evaluates the impact of the speed limit reduction on the crash occurrence at horizontal curve sections by applying statistical methods on K-05 highway, in Leavenworth County, KS, where several curves with high numbers of crashes are located and a number of low-cost countermeasures have been implemented on them. The advisory speeds of these curves are 15 to 25 mph lower than the speed limit. In the middle of 2009 the speed limit was reduced from 55 mph to 50 mph. **RESULTS AND CONCLUSION:** A t-test statistical method was used and crash frequency and crash rate were considered for various crash groups. The results of t-test showed the speed limit reduction had no effect on the most of the crash groups by crash frequency. Moreover, using crash rates and t-test showed significant changes in some groups of crashes at the 10% significance level.

Relevance of Research to State-Related Topic(s)

A considerable number of people are injured or killed due to crashes on roadways and significant amount of expenses is imposed to the society because of these crashes that emphasize on necessity of effective road safety programs in state and nation levels. This study was conducted to investigate the effectiveness of the speed limit reduction in a rural two-way road through implementing a statistical method. The results of the study would be beneficial for considering the existing treatments for next road safety programs.

TRANSFER BOND TEST USED TO PREDICT TRANSFER LENGTH OF CONCRETE RAILROAD TIES

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BACKGROUND AND PURPOSE: A study was conducted at Kansas State University to determine the correlation between tensioned-wire pullout tests and the corresponding transfer lengths in prestressed concrete railroad ties. Five different 5.32-mm-diameter pre-stressing wires were selected to be used on this project based on previous testing conducted at Kansas State University (KSU). The wires were tested to simulate the transfer-length bond. **METHOD:** The transfer-length bond test involved tensioning each of the wires to 75% of their ultimate capacity, casting concrete around each wire and then de-tensioning the wire when the concrete had reached 4,500 psi. End-slip and force measurements were recorded on both sides of the specimen as the wire was de-tensioned. **RESULTS/FINDINGS:** Transfer bond data was used to investigate the transfer length that each wire type would expect to see in a concrete railroad tie. Prisms with each wire type were cast and the transfer length was measured for each type of wire. **CONCLUSION:** Prism end-slip measurements were used along with the transfer bond data to correlate a relation between the transfer bond test and the transfer lengths of the prisms.

Relevance of Research to State-Related Topic(s)

This research project deals with the use of prestress wire in concrete railroad ties. The use of concrete tie is important to the environment and to the public since the concrete ties last longer and are more durable than wooden ties. The study of the behavior of the concrete tie reinforcements is crucial to be able to better understand the nature of the reinforcement.

ANALYZING THE EFFECTIVENESS OF BIOPHILIC DESIGN IN FACILITATING CREATIVITY

Caitlin Molenaar and Teague Peak

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In this paper, authors will discuss how biophilic design practices enhance the innovation and creativity of employees in the work environment. **BACKGROUND AND PURPOSE:** Biophilia, a concept first described by biologist E.O. Wilson, is described as humanity's innate response to nature and connection to natural systems (Wilson, 1984). This concept supports the theory that humans cognitively perform better through close connection to nature. This enhanced cognitive activity is generated through both instinctual and pre-developed responses. **METHOD:** In order to evaluate these responses, authors will conduct qualitative and quantitative research such as surveys, interviews, and case studies to better understand the effects that biophilic design has on employees' creativity. The authors plan to utilize brain scans to measure differing biophilic stimuli and their effect upon employees. Evolutionary inclination will also be examined, with intent to show how instinct plays a part in modern human behavior. In reference to the brain scan results, research into cognitive psychology theories will serve as a bridge between these instinctual and pre-developed attitudes, linking human perception and reaction to the presence of biophilic design. **RESULTS/FINDINGS:** Authors anticipate to find that there will be heightened cognitive activity in relation to creativity when biophilic stimuli are present. The legitimacy of these results will be assessed through a series of psychometric theories specifically relating to preferences in how people perceive the world and make decisions. **CONCLUSION:** Together, this research will serve to indicate the relationship between biophilic design and enhanced creativity. Results will then be used to implicate better design practices within the working environment.

Relevance of Research to State-Related Topic(s)

If proven effective, biophilic design practices could greatly increase the economic development of companies within the state of Kansas. The creativity and productivity of workers is directly related to the economic success of an organization. Any way to heighten these qualities should be instated within the workplace environment, if this is done, not only will the company experience success but so will the state and the communities directly related to these companies.

INDOOR AIR QUALITY IN OFFICE DESIGNRachel Botten, Rachael Mayhill, **Morgan Stafford**, and Vibhavari Jani*Department of Interior Architecture and Product Design, College of Architecture, Planning, and Design*

BACKGROUND AND PURPOSE: Human factors have a direct effect on the health and wellness of the individuals occupying the space. Human factors refer to environmental, organizational and job factors, and human and individual characteristics which influence behavior at work in a way which can affect health and safety (WHO). These consist of the acoustics, lighting, color, anthropometrics, and indoor air quality. Within the workplace, indoor air quality plays an important role in the wellbeing of the office workers. According to the EPA, the fourth largest environmental threat to the United States is poor indoor quality (American Lung Association). Most designers place major influence on selection of materials while designing any office environment and sometimes forget its impact on IAQ. In this paper, the authors discuss how ideal IAQ within an office can positively influence health and wellness of the occupants thus improving the work environment.

METHOD: These authors adapted both quantitative and qualitative research methods including surveys, interviews with professionals, analysis of past data, and precedent studies that show the effects of air quality in an office space. The authors are in the process of analyzing the data gathered and based on their research findings, will develop guidelines that can assist designers in considering IAQ to improve work environments.

RESULTS AND CONCLUSION: The authors hope that their findings and guidelines will assist the design professionals to gain awareness and become more mindful while selecting materials and systems which can be a catalyst in improving the health and well-being of employees through design.

Relevance of Research to State-Related Topic(s)

Poor indoor air quality has been found to have harmful effects on workers in their environment. This can lead to a variety of issues such as decrease in performance, long and short term health concerns, ultimately influencing the overall success of the company. If this problem persists, this will not only have negative results on the wellbeing of the workers, but can create a ripple effect throughout the economy. This is not only a current issue for the state of Kansas but across the nation.

THE CHANGING TIMES, CHANGING NEEDS: THE FUTURE OF EFFECTIVE WAYFINDING IN THE WORKPLACE

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BACKGROUND AND PURPOSE: The office is an ever changing environment, and with the transformation of office layouts, signage too needs to change. “[Wayfinding is the] notion of incorporating all the perceptual, cognitive, and decision-making processes necessary to find one’s way” (Arthur and Passini, 1992, Sorensen 2011). Its ability to dictate circulation, develop branding and aesthetic, as well as compliment the physical environment all contribute in the overall clarity and culture of the office. Since signage and way finding provides many opportunities throughout the workplace to fulfill both physical and psychological needs of the employees and visitors, these authors are focusing on understanding the changing needs of the work environments. The purpose of this study is to highlight the changes that serve as the influencing factors of deliberately designed signage and wayfinding in the office of the future. **METHOD:** In this paper the authors will analyze the historical precedents and review changes happening in the current work environments to provide an understanding of why there is a need for the changes in the way we design signage and wayfinding systems. The authors adapted both quantitative and qualitative research methods for this study. **RESULTS/FINDINGS:** The precedent analysis will serve as the basis to show how office design and way finding has evolved from the past, as well as what makes its signage effective. **CONCLUSION:** The authors will then reference designers that are currently designing the signage and way finding systems today and how the past and present will influence the changes in the design of the future signage and wayfinding systems.

Relevance of Research to State-Related Topic(s)

The Kansas economy is largely dependent on the welfare of its office workers. Signage and Wayfinding has a large impact on the well-being of these workers, and helps dictate circulation, develop branding and aesthetic, as well as compliment the physical environment. These factors all contribute to the overall clarity and culture of the office. With a positive culture, effective work is most certainly always achieved.

THE IMPACT OF LIGHTING ON EMPLOYEES IN A CHANGING WORKPLACE

Abby Buchmann, Rutvik Date, **Abigail Zohner**, and Vibhavari Jani

Department of Interior Architecture and Product Design, College of Architecture Planning and Design

BACKGROUND AND PURPOSE: An important aspect to consider when designing an office is the comfort of the building's inhabitants. Environmental characteristics such as temperature and humidity, the use of lighting, and the quality of sound, as well as physical characteristics such as design and ergonomics of furniture, the spatial layout and use of color play an important role. The authors focused on the balance of natural and artificial lighting and its impact in the changing workspace. According to Vrabel (2003), lighting is a key component in planning a workspace for the well-being of the employees. He further acknowledges that "the impact of lighting on productivity, aesthetics, and general human well-being should not be underestimated—we conduct our lives under artificial lighting most of our waking hours. Proper design layout is critical." (Vrabel, 2003). Poor design and layout of lighting affects the health and mood of the staff. A designer must understand specific use of lighting and its effects on the physical, psychological and emotional well-being of employees, especially concerning creativity and productivity. **METHODS:** The authors will discuss their research on the impact of different types of lighting on employees in the changing work space of the 21st century. The authors reviewed published research to determine appropriate case studies, conducted personal interviews to explore how changes affected overall productivity and creativity of employees, and surveyed design professionals and students to understand how the lighting in their everyday workplaces impacts them. **RESULTS/FINDINGS/CONCLUSION:** The authors are in the process of analyzing the collected data and will share their findings.

Relevance of Research to State-Related Topic(s)

Lighting design immediately affects the health of individual workers in offices throughout Kansas. This seemingly small-scale change instigates a rather large chain reaction. If the employees are in good health, they will produce work to the best of their abilities. In effect, increased productivity will slowly but surely affect the output of the company as a whole. This then affects the surrounding community and Kansas' overall economic standing. Although our topic of proper lighting in office design is a small-scale obstacle, it has the ability to affect many different issues at many different scales.

ENVIRONMENT VS. PRODUCTIVITY: A STUDY ON WORKING ENVIRONMENTS AND THEIR PSYCHOLOGICAL EFFECTS

Nichole Finke, Katherine Pruser, and Vibhavari Jani

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BACKGROUND AND PURPOSE: Today many corporations allow their workers to work from home or other remote locations. This alternative provides much needed flexibility to many workers; however there are also some disadvantages to this arrangement. In this paper, the authors compare and contrast the differences between working in an office and working from a remote location to determine how it impacts the end user's psychological well-being. In the last 50 years there has been increased interest by psychologists and sociologists in looking into the relationships between people and their physical surroundings (McCusker, 2002). **METHOD:** From these initial findings, the authors decided to further study the differences between a collaborative office environment and a distance working environment, and how this affects the user's work and personal life. Furthermore, the authors also interviewed and surveyed selected businesses to understand how these two settings affect their productivity and profit. **RESULTS/FINDINGS:** Finally, the authors also conducted additional literature reviews and precedent studies to analyze the previous findings to determine how a collaborative work environment affects the psychological state of the employees. **CONCLUSION:** The authors will analyze the collected data and based on their findings, they will develop guidelines that a designer or a business can adapt to benefit the employee's mental welfare.

Relevance of Research to State-Related Topic(s)

Office environments are changing to accommodate for modern business development. The space of the office is becoming more valuable therefore the space dedicated to individual workers is decreasing which causes employees to work from remote locations. These changes in the office culture directly impact multiple aspects of Kansas's economy. The economic development could be impacted from companies owning less square footage therefore more business could be located to Kansas. Family stability could be impacted by having one or more parents working from home or having to travel more frequently, which in return affects Kansas after school and early development programs. Nomadic employees may require the need for advanced technology in order to fill job requirements from a remote location, which could increase technology research in Kansas and attract more technological companies.

CONSIDERATION OF SUSTAINABLE STRATEGIES IN OFFICE ENVIRONMENTS AND ITS IMPACT ON COLLABORATION

Kunyan Wei, Dylan Howe, and Vibhavari Jani

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BACKGROUND AND PURPOSE: The incorporation of sustainable strategies in the design of office environments and the positive effects on energy consumption and reduction of the carbon footprint are constantly improving. The sustainability of the built environment is increasingly coming to the forefront of infrastructure design and maintenance decisions (Lepech, 2008). How does this shift affect the office environment and the daily function of its inhabitants, and how does it affect collaborative environments? **METHOD:** To understand the importance of integrating sustainable strategies in the design of office environments, the authors are conducting a research project to understand its impact on collaboration. Literature review and precedent studies formed the basis for discovery of consistent observations subsequently used to develop a survey instrument distributed to focus groups within selected corporate office environments. The survey instrument serves as a measure to gauge the positive or negative impact these sustainable strategies have on the office space. It will also reveal any impact sustainable strategies have on collaborative environments, efficiencies, overall health and wellbeing of the workers. Interviews with experts in the fields of sustainable design and psychology, as well as other supplemental fields will allow the authors to understand the views and extrapolate the knowledge to corroborate the data from the surveys. **RESULTS/FINDINGS:** The authors are analyzing the gathered data and will report the results. **CONCLUSION:** Authors will develop guidelines to be used in future work environments to foster collaboration. In this paper the authors will share their results and the procedures to support the design of collaborative office environments.

Relevance of Research to State-Related Topic(s)

As Kansas is continually developing as a state, considering sustainable strategies, health and the future of the workplace is vital. The key in moving forward in today's economy is to maximize efficiency of space and productivity. Here in Kansas we have a unique opportunity to explore how the findings of this research project can help us in developing for the future. The world today is fighting a battle of trying to "do more, with less." The implementation of sustainable strategies is a step in the right direction. By developing design strategies that focus on sustainability, we aim to improve work environments, so that the hard working people of Kansas have offices that allow them to operate to their full potential. Let us as the state of Kansas set an example for others to follow, and put our name on the map as more than just another fly over state.

COUPLES' COPING IS RELATED TO DIABETES MANAGEMENT THROUGH SELF-EFFICACY.

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BACKGROUND AND PURPOSE: Type 2 diabetes is a chronic health condition afflicting nearly 350 million people worldwide. Proper self-management, including following specific dietary and exercise regimens, are key to delaying complications of the disease through promoting good glycemic control. Therefore, it is imperative that the factors that directly and indirectly influence glycemic control are identified. The couple relationship is an understudied, yet potentially powerful factor that could influence glycemic control. The current study analyzed the association of common dyadic coping on dietary and exercise adherence via its effect on patient and spouses reports of diabetes self-efficacy in a sample of married couples where one partner is diagnosed with type 2 diabetes. **METHOD:** 117 couples (one partner diagnosed with Type 2 diabetes) were surveyed and measures of common dyadic coping, diabetes self-efficacy, dietary and exercise adherence, and several control variables were assessed. Data were analyzed using structural equation modeling and indirect effects were tested using bootstrapping. **RESULTS/FINDINGS:** Results indicated common dyadic coping was associated with higher levels of diabetes self-efficacy for both partners which is then associated with better diet and exercise adherence for the patient. Bootstrap analyses revealed two significant indirect paths: common dyadic coping → patient diabetes self-efficacy → dietary adherence and common dyadic coping → partner diabetes efficacy → exercise adherence. **CONCLUSION:** This study promotes awareness of relationship factors associated with type 2 diabetes outcomes and informs clinicians of the benefits of healthy relationships on type 2 diabetics' well-being.

Relevance of Research to State-Related Topic(s)

Over the last three decades, the number of individuals diagnosed with type 2 diabetes has doubled in size (Danaei et al., 2011). Families and partner relationships are inevitably impacted when one member is diagnosed with a chronic health condition. The findings of this pilot study demonstrate a need to consider the impact of diabetic patients' social environment when monitoring diet and exercise regimens. Specifically, the results of this study show that couple support processes, in this case dyadic coping, is positively related to both partners' confidence in the patient's ability to manage the diabetes which is then positively associated with greater adherence to diet and exercise regimens. Family scientists, researchers, mental health providers, and medical professionals may benefit from a greater understanding of the mechanisms through which couple processes may impact health outcomes of diabetics.

**ENCOURAGING THE ADOPTION OF *E. COLI* CONTROL AND PREVENTION STRATEGIES:
ANALYSIS OF AN ONLINE TRAINING INTERVENTION**

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BACKGROUND AND PURPOSE: This study explores the effectiveness of health communication strategies in the control and prevention of foodborne diseases. The theory of planned behavior is utilized to analyze an online video training intervention by identifying individual attitudes, norms, perceived behavioral control and intentions of adopting management strategies for *E. coli* among beef cattle producers (n=60). **METHOD:** An online questionnaire was used to measure pre-video attitudes, norms, perceived behavior control and intentions regarding *E. coli* in the beef industry before allowing participants to watch an *E. coli* management training video. Next, the questionnaire measured perspectives on the video's content, favored sources for receiving educational information, as well as post-video attitudes, norms, perceived behavior control and intentions. **RESULTS/FINDINGS:** The results showed significant positive changes in respondents' perceptions on *E. coli* and the advocated prevention strategies after viewing the video. Although most of them had not used previously used online training, they found the information disseminated easy to understand. Also, results demonstrated that while beef cattle producers primarily rely on periodicals or veterinarians for management information, many of them identified online sources as the preferred method to receive prevention-related training. **CONCLUSION:** Based on the findings of this study online training is an appropriate tool for encouraging the adoption of *E. coli* control strategies among beef cattle producers. The findings also suggest that there is an unmet demand for online training. Further research is, however, is needed to identify the barriers to using online training including accessibility as well as individual characteristics such as level of knowledge and self-efficacy.

Relevance of Research to State-Related Topic(s)

Since Kansas is one of the most important cattle-producing states in the country, conducting research related to issues involving cattle production is important to the state. One important public health and economic concern for beef producers and consumers is *E. Coli* 0157:H7 contamination. It is important to encourage the adoption of pre-harvest *E. coli* control and prevention strategies to help control this contamination through strategic communication with cattle producers. With the advances in technology, online health communication strategies can effectively provide this education. This study provides preliminary evidence demonstrating the potential effectiveness and validity of using online training to encourage the adoption of *E. coli* control and prevention strategies. Adoption of such strategies within a cattle production ranches can have an impact on public health and ensure that the industry will deliver healthy a healthy, quality product.

STAIR USAGE IN OBESITY PREVENTION: FORMATIVE RESEARCH FOR A HEALTH COMMUNICATION INTERVENTION

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BACKGROUND AND PURPOSE: Obesity has increased sharply in the US where two-thirds of Americans are considered overweight or obese. Individuals can increase their recommended physical activity levels by using the stairs instead of the elevator or escalator. Based on the Diffusion of Innovation theory, the study examined college students' perceptions on the potential benefits of a stair usage as a baseline for a health communication campaign to increase physical activity among young adults. **METHOD:** A questionnaire was administered (n=213) in a large Midwestern University. Most respondents were within 18.5 – 24.9 BMI between the ages of 19 to 23 years. Key variables included attitudes, knowledge, adoption rate, opinion leadership, observability, trialability, and preferred communication channels for health messages. **RESULTS/FINDINGS:** Health opinion leaders have a strong association with positive attitudes towards stair use ($r = .350, p < 0.01$), observability of stair use is associated with an increased intent to use stairs ($r = .481, p < 0.01$), and interpersonal communication (specifically that of friends) was the preferred method of behavioral influence. Respondents also viewed stair usage as a healthy alternative over taking other methods of transportation, (88%) and 76% of students indicated feeling healthier after taking the stairs. **CONCLUSION:** The encouragement of stair use is an important part of improving fitness among university students and observability is critical in motivating the new behavior. Influential sources for health information such as friends, health professionals, and communication channels specifically the internet should be included in future stair use health campaigns in a university setting.

Relevance of Research to State-Related Topic(s)

While many research articles have shown the benefits of a stair use campaign, very little research has shown the effectiveness of the diffusion of innovation theory as the theoretical basis of a stair use campaign. Coincidentally, very little research has examined the role of innovators in effective social marketing for increase in physical activity. Mass media campaigns are beneficial in creating awareness for healthy behaviors. However, interpersonal influence by opinion leaders is more effective when targeting behavior and decisions. Therefore, our research aims to provide a positive link into increasing active transport physical activity using the diffusion of innovation. Stair usage to combat physical inactivity and obesity has been shown to be of great benefit in the workplace environment. Programs surrounding stair use are inexpensive to implement, and with stairs being readily available in many places of business, a good option for many companies to consider.

NUTRITIONAL KNOWLEDGE IS RELATED TO SELF-EFFICACY IN MAKING HEALTHY FOOD CHOICE AMONG COLLEGE STUDENTS

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BACKGROUND AND PURPOSE: Obesity-related diseases cost the U.S. billions of dollars each year and prematurely end or diminish the quality of millions of Americans' lives. People of low-income, including some college students, are disproportionately impacted by obesity. This research project was sought to identify the factors that contribute to food choices among low-income residents, particularly college students, with the goal of designing a communication campaign to improve healthy food choice behavior. **METHOD:** As a cross sectional study, this project surveyed 110 college students in Mid-Western University using a structured questionnaire that measured key variables that were derived from the Social Cognitive Theory. **RESULTS/FINDINGS:** Though with high nutrition knowledge and self-efficacy, many college students lacked awareness or belief of available, budget-friendly healthy food choices. Most students also agreed that they sometimes made food choices even though they knew they were unhealthy. Chi-square test confirmed that there is a significant correlation between respondents' MyPlate awareness and nutritional knowledge ($p < 0.001$) as well as nutritional knowledge and self-efficacy ($p = 0.022$). Nearly 85% of respondents indicated that they had home access to the Internet as their primary source of health and nutrition knowledge. **CONCLUSION:** Improving nutritional knowledge especially in regards to access to cheaper healthy food options on campus is important to boost students' self-efficacy. The study recommends an online awareness campaign to promote affordable healthy food choices for college students and encourage them to make healthy food choices more frequently.

Relevance of Research to State-Related Topic(s)

As obesity becomes a major health issue that disproportionately affects those of lower socioeconomic status in the United States. This study focused on examining college students in a local university about their knowledge and understanding of healthy food choices, perceived risk of health problems, self-efficacy, and outcome expectations of making healthy food choices based in the state of Kansas. This research aims at developing an effective health communication intervention to improve the food choices of college students in Kansas, as a way to improve public health.

NEUROTICISM, DISTRESS, AND DIETARY ADHERENCE AMONG COUPLES WITH DIABETES

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BACKGROUND AND PURPOSE: The rising rates of Type 2 diabetes have been labeled a global epidemic. The patient's quality of life is undermined by complications of the disease, which often can be delayed through good glycemic control. Dietary adherence is often considered the most difficult part of self-care management, therefore, an investigation of patient and spouse psychological and diabetes related factors that may be associated with patient dietary adherence could provide important information that could inform intervention. The current study explored how both patient's and spouse's levels of neuroticism, general emotional distress (e.g. negative affect and depressive symptoms), and diabetes related distress were associated with the patient's dietary adherence. **METHOD:** 117 couples (one partner diagnosed with Type 2 diabetes) were surveyed and measures of neuroticism, depression, negative affect, diabetes distress, dietary adherence, and several control variables were assessed. Data were analyzed using path analysis and indirect effects were tested using bootstrapping. **RESULTS/FINDINGS:** The most striking findings from the analyses were that patient's depression significantly mediated the link between patient's neuroticism and dietary adherence and that spouses' diabetes distress was related to patient's dietary adherence. **CONCLUSION:** This study highlights how psychological variables are associated with dietary adherence among couples, underscoring the importance of the spouse when considering diabetes self-care management. This information may inform clinicians of the role of emotions and social context in the treatment of Type 2 diabetes.

Relevance of Research to State-Related Topic(s)

The number of individuals diagnosed with type 2 diabetes is nearly 350 million worldwide (Danaei et al., 2011). Managing the disease can be quite difficult for both the patient and the spouse who often feels some weight of responsibility in its management. This study highlights the need to consider diabetic patient's psychological experience and social context when monitoring dietary adherence. Specifically, the results indicate that patient's dietary adherence is related to both their own emotional distress and their spouses' diabetes-specific distress. These findings may apprise medical professionals and mental health providers of the importance of considering potential social and emotional factors related to self-care management. Furthermore, family scientists and researchers may benefit from understanding the key mechanisms that may impact the health outcomes of patients with Type 2 Diabetes.

WAR DEPLOYMENT: RESILIENCE OF NATIONAL GUARD YOUTH
 Joyce Baptist, **Patricia Barros-Gomes**, Bryan Cafferky, and Elaine Johannes
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BACKGROUND AND PURPOSE: The current context of military service includes higher operation tempo, increased deployments, relocations, and family separations (Military Family Resource Center, 2000). Military-connected children are especially at risk. In addition to deployment-related stressors, they must also cope with developmental and social challenges -- puberty/maturity, academic rigors, and their peer/family relationships. Research on military-connected children is scarce. The purpose of this study is to understand how children of the U.S. National Guard experience and cope with parental deployment. Theoretical framework: (Lerner's developmental contextual model). **METHOD:** Participants were 30 children (aged 15 to 18) of the U.S. National Guard who had at least one deployment. Teens were interviewed individually. Data was analyzed using grounded-theory. **FINDINGS:** The relationship with the non-deployed parent was especially important to teens. Teens' social and school systems appeared to not provide teens the support they needed. For only a few teens did community support especially neighbors played an important role during parental deployment. Finally, teens took it upon themselves to counter negative societal messages that down-played the value and mission of the military. **CONCLUSION:** Findings suggest that military-connected youth are resilient and embraced the values of the military as their own. They rely heavily on their families especially parents to cope with the stress of deployment. The lack of reliable support from external systems makes it more pertinent for families to be strong and in-tuned to the needs of these youth. Further research should focus on the role of the extended family as well as factors that can enhance family resilience.

Relevance of Research to State-Related Topic(s)

This study targets military families and family stability, two key focus issues by the Kansas legislature. This study provides family professionals a better understanding of the needs of military-connected youth and useful information that can guide and enhance programming for National Guard families. The findings suggest that a focus on the family's overall resilience may better help military-connected youth cope with long separations from a parent.

**BURNS & MCDONNELL - KANSAS STATE UNIVERSITY SMART GRID LABORATORY:
PROTECTION, COMMUNICATION, AND POWER METERING - INTEGRATED SMART GRID
LABORATORY**

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BACKGROUND AND PURPOSE: The Burns & McDonnell - Kansas State University Smart Grid Laboratory was created because of a need for the energy industry (electrical utilities, equipment manufacturers, and contractors) and engineering universities to recruit highly skilled power engineers and develop state-of-the-art educational programs. The smart grid laboratory integrates communication, protection, metering, and control equipment in order to demonstrate engineering and electric power concepts for smart grid research and educational activities. **METHOD:** Smart grid lab objectives are defined for pre-college, undergraduate, and graduate students based on Bloom's taxonomy levels, providing hands-on experiences and demonstrations. With the help of power system manufacturers and industrial funding, faculty and graduate students have created an experimental laboratory that allows visitors and students to explore various issues in power system protection, communications, and control. By integrating laboratory experiences with computer-based simulations, students gain a deeper understanding of engineering principles and real-world challenges. **RESULTS:** This poster highlights results from integrating the smart grid laboratory with university and college events, engineering courses, research and projects, and KSU facilities, for educational outreach and scholarly advances. **CONCLUSION:** The smart grid laboratory is an integrated facility focused on the combination of protection, communication, and power metering areas in order to educate the public, introduce K-12 students in engineering careers, and advance knowledge for current K-State students. In this laboratory, students can integrate equipment and software with course knowledge to understand electric utility challenges.

Relevance of Research to State-related Topic(s)

The current energy industry is a competitive market in which highly-skilled engineers trained in protection and communications are difficult to recruit. As a result, universities and the energy industry have a valuable opportunity to collaborate on educational projects. The Burns & McDonnell – Kansas State University Smart Grid Laboratory was developed because of the industry and university needs to recruit highly-skilled engineers and create a high-level engineering educational program. Smart grid applications in the power grid and building systems specifically require engineers with power protection, metering, and communication skills. The creation of this smart grid laboratory is necessary in order to provide state-of-the-art education for the industry's future workforce in Kansas.

EMPOWERING PRE-SERVICE TEACHERS TO UTILIZE PROGRAMMING IN THE CLASSROOM

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BACKGROUND AND PURPOSE: A major obstacle in recruiting students to the computing fields is lack of exposure to relevant topics in K-12 classrooms [2]. A key reason for this is that K-12 educators have little training in areas such as computer programming. Given today's high quality software development environments such as Scratch [1], teachers no longer need to be experts in programming to introduce basic concepts to students within courses such as math, science, art and music. **METHOD:** The STEM Summer Institute is a collaborative effort between the Manhattan-Ogden School District and Kansas State University. During the four week program, 200 sixth to ninth grade students select a different course of study each week. In the I. Code course, Scratch was used to introduce basic programming concepts in a fun, hands-on manner. Students followed an instructor through a series of demonstration projects followed by challenge activities which applied the concepts they had just learned. After two days, students had enough knowledge to begin planning a final project they would develop and present to the class on the fourth day. Five pre-service teachers helped teach the course as part of their required field experience. **RESULTS:** Pre- and post-surveys of the students show that confidence in programming, enjoyment of programming, and interest in continuing to program increased. Meanwhile, the pre-service teachers discussed ideas for incorporating additional topic-specific material into Scratch activities. These results show it is possible for new teachers to effectively introduce programming into the K-12 curriculum and increase the number of students exposed to computing topics.

Relevance of Research to State-Related Topic(s)

Computing has invaded every aspect of our lives. In 2012, only 34 students in the state of Kansas took the Computer Science AP exam. Compare this to Colorado (308), Missouri (212), Nebraska (57) and Oklahoma (129). The analysis is more complicated since states have differing populations, so we examine the ratio of students taking calculus to those taking computer science. Kansas has a ratio of 39:1 while the other states range between 11:1 and 15:1. It becomes apparent that Kansas is lagging behind its neighbors in providing opportunities for students to study computing topics. We need to help students gain experience with computing concepts in the K-12 curriculum. To do this, we introduce pre-service teachers to programming concepts, and help them teach those concepts to students in a classroom setting so they will be able to carry them into their own classrooms upon graduation.

A META-ANALYSIS OF RELATIONSHIP FACTORS IMPACTING COUPLES WITH IPV

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BACKGROUND AND PURPOSE: Intimate Partner Violence (IPV) is a major public health concern affecting millions of families in the United States each year. Research has focused on gaining a greater understanding of risk factors associated with IPV. A meta-analysis was conducted to identify the relationship factors that counselors should target in working with couples experiencing IPV. This presentation will focus on attachment characteristics, jealousy, and communication skills. **METHOD:** Computer database searches were the primary method utilized for identifying articles for inclusion in the study. Over 460 articles were included in a larger meta-analysis, of which this poster proposal is a part. Effect sizes were entered and analyzed using Comprehensive Meta-Analysis Version 2 (Borenstein et al., 2008). **RESULTS/FINDINGS:** Preliminary analyses indicated that jealousy ($r = .36$) is the strongest risk factor and dismissive – avoidant attachment style ($r = .002$) is the weakest risk factor for IPV. However, other factors examined varied in their strength, negative relationship communication ($r = .28$), and anxious-pre-occupied attachment style ($r = .16$). The poster will also address gender differences, for example, anxious-preoccupied attachment is a significant predictor of female perpetration ($r = .34$), but not of male perpetration ($r = .09$). **IMPLICATIONS:** Preliminary findings suggest that attending to issues of attachment, helping clients build trusting relationships, improving communication skills, and increasing overall relationship satisfaction can be important factors in preventing and/or reducing IPV in relationships.

Relevance of Research to State-Related Topic(s)

In the state of Kansas from 2009-2011, there were 71,851 reported incidents of domestic violence (24,459 in 2011 alone) with a 40,256 incidents of domestic violence that resulted in an arrest (13,478 in 2011) (Kansas Bureau of Investigation, 2013). Thus, IPV is a pervasive social problem that has devastating effects on family members and the larger Kansas community. In addition, studies have shown that there is a similar IPV prevalence rate between military and civilian populations and there is a large presence of military personnel and their families in the K-State student body and surrounding community. Thus findings from this research can have an impact on how mental health professionals support civilian and military families dealing with IPV.

COUPLES THAT PARENT TOGETHER, STAY TOGETHER

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BACKGROUND AND PURPOSE: In comparison to couples that do not have children, those that do make the transition into parenthood tend to have a steeper decline in marital quality (Doss, Rhoades, Stanley, & Markman, 2009). It is important to determine how both stressors and adaptive behaviors the couple can engage in are related to the potential to separate. **METHOD:** This research study utilized the Fragile Families and Child Wellbeing Study (FFCWS). Data from both the mothers and fathers within 48-hours of the child's birth, and then again at three follow-ups when the child was 1, 3, and 5-years-old were incorporated in analyses. The sample was limited to 1,291 couples that were married or cohabiting, and having their first child at Wave 1. Measures examined parenting stress, coparenting, and identified whether couples had ever separated or divorced. **RESULTS/FINDINGS:** A conditional dyadic growth curve for coparenting and parenting stress with a relationship status variable (i.e., whether the couple ever separated or divorced) predicting the slope and intercept was conducted. Mothers and fathers that remained intact through the first five years of parenthood indicated higher initial levels of coparenting and greater increases in coparenting overtime. There was no significant rate of change for parenting stress overtime, and no differences existed between parents that remained intact and those that did not. **CONCLUSION:** Maintaining couple health as they make the difficult transition to parenthood can be better targeted by clinicians if there is a better understanding of the positive influence that coparenting has on couple relationships.

Relevance of Research to State-Related Topic(s)

Maintaining couple health as the transition to parenthood can be better targeted by clinicians if a better understanding of threats to family stability are formulated. With clinicians being able to recognize that positive perceptions of a partner's contribution to coparenting significantly decreases the risk of parents separating. The maintenance of stability within a marriage can directly affect not only the family's well-being, but children's also. With clinicians in the state of Kansas specifically targeting coparenting behaviors in couples, the strength and stability of Kansas families can be supported.

****WITHDREW****

THE INFLUENCE OF AWARENESS AND DESTINATION IMAGE ON INTENTION TO VISIT: THE CASE OF FREEDOM'S FRONTIER NATIONAL HERITAGE AREA

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BACKGROUND AND PURPOSE: The destination image was dominant factor on the decision making process by travelers (Chen & Tsai, 2007). Destination image was defined that it is feeling or sense acquired by the general public about specific destination or an experience (Milman & Pizam, 1995). Destination image affecting traveler's attitude (Um & Crompton, 1990), has relationship with other consumer behavior constructs and is regarded as main concept to investigate travelers' behavior (Baloglu, 1999). However, there are few researches to explore a relationship among awareness, destination image and future intention to visit toward local heritage sites. Freedom's Frontier National Heritage Area (FFNHA) is located at the Kansas State and the Missouri State border. It consists of 29 eastern counties of Kansas and 12 western counties of the Missouri. The purpose of this research paper consists of two fold: One is to identify the relationship among the constructs and the other is to suggest practical implications for developing a marketing plan. **METHOD:** Data will be collected from a web-based survey. The review of existing studies will be used to identify dimensions of sub-image and select survey items. Factor analysis and regression analysis will be conducted. All questions will be measured on a 5-point Likert scales. **RESULTS/FINDINGS:** The detailed image measurements for FFNHA will be confirmed and there will be positive relationship among degree of awareness, image, and future behavior intention. **CONCLUSION:** The marketing plan to facilitate increase of awareness and positive image should be implemented in order to attract travelers to FFNHA.

Relevance of Research to State-Related Topic(s)

Travel industry is the one of major sectors to affect on the United State economy. However, there is a little contributes on local economy in Kansas State. According to U.S. Census Bureau, KS was ranked 37th of domestic travel expenditure out of whole U.S. (Census Bureau, 2012). FFNHA could become a critical attraction to raise income for local government and residents, and to obtain knowledge of U.S. history because this was designed to commemorate the Border War. Our study will identify which image will be effective on intention to visit for FFNHA toward potential travelers and offer a clue how KS government develop a promotion and marketing plan.

THE INTERGENERATIONAL TRANSMISSION OF FAMILY VIOLENCE: A META-ANALYTIC REVIEW

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BACKGROUND AND PURPOSE: Witnessing or experiencing violence during childhood is one of the most commonly known risk factors for intimate partner violence (IPV). Previous research suggests a small to moderate relationship between being raised in an abusive family environment and later involvement in IPV (Stith et al, 2000). As the literature on the intergenerational transmission of violence has grown exponentially in recent years, a current meta-analytic review provides for examination of gender of parent perpetrator and IPV in adulthood. **METHOD:** A literature search of four databases was conducted to locate articles from 2001-2012. Additional articles from a previous meta-analysis of IPV (Stith et al., 2004), which covered literature before 2001, were included. Comprehensive Meta-Analysis Version 2 (Borenstein et al., 2008) was used for the analysis. **RESULTS:** Preliminary analyses indicate that witnessing IPV has a significant effect on perpetration of IPV ($r = .24, p < .001$) as well as on IPV victimization ($r = .16, p < .001$). Although witnessing fathers abusing mothers has a stronger impact on subsequent IPV victimization ($r = .27, p < .001$) than does witnessing mothers abusing fathers ($r = .21, p < .05$), the effect of either is significant. Additionally, child abuse perpetrated by the father ($r = .24, p < .01$) or the mother ($r = .21, p < .01$) has similar effects on perpetration of IPV. **IMPLICATIONS:** The results of this study may inform the development and enhancement of prevention and intervention programs for family violence.

Relevance of Research to State-Related Topic(s)

According to the Child Welfare League of America, a total of 32,377 referrals for child abuse and neglect were made in the state of Kansas in 2010. An additional 23,828 domestic violence incidents were reported to law enforcement agencies across Kansas during that same year. Both the Centers for Disease Control and Prevention and organizations such as the Kansas Coalition against Sexual and Domestic Violence are calling for evidence-based information on which to base the development and enhancement of prevention and intervention programs. This research indicates that in order to prevent IPV, programs should be designed to reduce risk factors during childhood as well as adulthood. Understanding the impact of the gender of the parent perpetrator and whether violence was witnessed and/or experienced during childhood are significant predictors and factors to address in prevention and intervention.

THE RECIDIVISM RATE OF KANSAS

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BACKGROUND: In 2011 the Pew Center on the States, a division of The Pew Charitable Trusts, in a study on recidivism across the United State of America, reported 45.4% of 470,666 individuals released in 1999 returned to prison by 2002 and that 43.3% of 567,903 individuals released in 2004 had returned by 2007 (“State of Recidivism: The Revolving Door of America’s Prisons”, p. 11). While the Pew report explicates these findings further, analyzing recidivism under new crimes and probation violations at the state level, it fails to investigate the distribution of these findings by race, gender, and age. Furthermore, the Pew report, conducted periodically, fails to account for the fluctuations in recidivism rates, rates which change from day to day, a shortcoming this study addresses. **PURPOSE:** This study aims to calculate the recidivism rate at the state level on a daily basis and identify moments at which it is largest across demographic variables. **METHOD:** Data were drawn from an on-line offender population search utility; a utility used to better public safety through the dissemination of corrections data to the public. **RESULTS:** Anticipated findings include: the number of individuals entering, leaving and returning to the criminal justice system distributed by race, age, gender. **CONCLUSION:** Knowing the day-to-day recidivism rate can give researchers the ability to better identify and understand factors which incline so many real people toward continued involvement in the criminal justice system, and, more importantly, find ways to do something about them.

Relevance of Research to State-related Topic(s)

The re-involvement of ex-offenders in the criminal justice system is one of the single biggest problems facing the state of Kansas today (*Sen. Brownback bill to address prison recidivism* 2005). Pew findings for the state of Kansas showed 51.8% of 5, 088 individuals released in 1999 returned to prison by 2002 and that 42.9% of 5, 178 individuals released in 2004 had returned by 2007 (“State of Recidivism: The Revolving Door of America’s Prisons” 2011, p. 10). Of those who returned to prison in 2002, 10% were for new crimes and 45% were for technical violations (p. 14). For those who returned to prison in 2007, 12% were for new convictions and 31% were for technical violations (p. 14). All data used in this study were drawn from real Kansans residing in the state of Kansas.

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