RESEARCH AND THE STATE

GRADUATE STUDENT POSTER SESSION

FEBRUARY 2, 2011
K-STATE STUDENT UNION, K AND S BALLROOMS

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Program Schedule

FIRST ROUND OF POSTER JUDGING 9:00 AM to 11:00 AM

Research posters will be presented by 28 graduate students representing 15 academic disciplines at K-State. The top 16 presenters will be selected to compete in the second round of judging.

SECOND ROUND OF POSTER JUDGING 1:00 PM to 4:00 PM

The top 10 of 16 graduate student poster presenters will receive awards and will be selected to represent K-State by presenting their posters at the 8th annual Capitol Graduate Research Summit (CGRS) at the State Docking Building in Topeka on Thursday, February 17, 2011.

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 to state legislators, the governor, and the Board of Regents. Awards will be presented to the top two presenters from each institution.

Poster Titles and Presenters

1. **ESTIMATING ANNUAL NET PRIMARY PRODUCTIVITY OF THE TALLGRASS PRAIRIE ECOSYSTEM OF THE CENTRAL GREAT PLAINS USING AVHRR NDVI SATELLITE IMAGERY**
   Nan An

2. **PREFERENCES OF U.S. AND E.U. UNDERGRADUATES FOR CLONING**
   Shonda R. Anderson

3. **CROP MODELING APPROACH FOR ASSESSING IMPACTS OF CLIMATE CHANGE AND VARIABILITY ON CROP PRODUCTIVITY IN THE OGALLALA AQUIFER REGION**
   George Paul

4. **NITROUS OXIDE EMISSIONS FROM A COMMERCIAL CATTLE FEEDLOT IN KANSAS**
   Orlando Aguilar

5. **THE INFLUENCE OF GRAZING ON HEADWATER CHANNEL CHARACTERISTICS IN TALL GRASS PRAIRIE**
   Bartosz Grudzinski

6. **COUPLING PYRAZOLE TO PYRIDINE: STEPS TO ENGINEERING A BETTER AGRICULTURAL CHEMICAL AND PREDICTING BINDING PREFERENCES THROUGH CO-CRYSTAL SYNTHESIS**
   Evan P. Hurley

7. **EFFECTS OF CONTROLLED INTERVENTION STRATEGIES ON THE QUANTITIES OF A CEFTIOFUR RESISTANCE GENE (*bla*$_{\text{CMY-2}}$) IN THE FECES OF FEEDLOT CATTLE**
   Neena Kanwar

8. **THE EFFECTS OF INTAKE ON STEERS ADMINISTERED ANABOLIC GROWTH IMPLANTS**
   Tiffany Lee

9. **DEVELOPMENT OF A MULTIPLEX PCR FOR THE DETECTION OF MAJOR SEROTYPES OF SHIGA-TOXIN PRODUCING *E. COLI* IN BOVINE FECES**
   Zachary D. Paddock

10. **MOLECULAR EPIDEMIOLOGY OF VANCOMYCIN-RESISTANT ENTEROCOCCUS FAECIUM ISOLATED FROM A SEMI-CLOSED AND INTEGRATED AGRI-FOOD SYSTEM**
    Raghavendra Amachawadi

11. **A COMMERCIALLY AVAILABLE SIDEPHORE-RECEPTOR AND PORIN-BASED VACCINE REDUCED THE PREVALENCE OF E. COLI O157:H7 IN THE FECES OF BEEF CATTLE UNDER FIELD CONDITIONS IN 10 COMMERCIAL FEEDLOTS**
    Brooks Butler

12. **DIELECTROPHORETIC CAPTURE OF *E. COLI* CELLS AT NANOELECTRODE ARRAYS**
    Lateef uddin Syed

13. **RENEWABLE ENERGY AND THE RURAL COMMUNITY**
    Krystal M. Schuette

14. **THEORETICAL INVESTIGATION ELECTROCHEMICAL MECHANISM OF WATER SPLITTING REACTIONS IN TITANIUM OXIDE CLUSTERS**
    Lila Pandey

15. **SYNTHESIS AND CHARACTERIZATION OF PHOTOCATALYTICALLY ACTIVE SiO_2/TiO_2 MIXED OXIDE SYSTEMS DOPED WITH VARIOUS TRANSITION METAL IONS**
    Manindu Weerasinghe

16. **CHARACTERIZATION OF ICOSAHEDRAL BORON ARSENIDE ($B_{12}As_2$) EPITAXIAL FILM: A NOVEL SEMICONDUCTOR FOR BETA-CELL AND NEUTRON DETECTOR**
    Yi Zhang

17. **HYDROGEN GAS FROM ACIDIC WATER UNDER VISIBLE LIGHT: PHOTOCATALYSTS PRODUCED BY NITRIDING TITANIUM DIOXIDE AND INDIUM OXIDE INTIMATE MIXTURES**
    Yenting Kuo

18. **RELIABLE AND SECURE NETWORKS FOR THE COMMUNICATION OF THE POWER GRID**
    Sarah Kubler

19. **LES AND RANS SIMULATION OF TURBULENT AIRFLOW AND TRACER GAS INJECTION IN A GENERIC AIRCRAFT CABIN MODEL**
    Khosrow Ebrahimi

20. **DISTRIBUTED SOURCES AND ISLANDING TO MITIGATE CASCADING FAILURES IN POWER GRID NETWORKS**
    Sakshi Pahwa

21. **TREND ANALYSIS AND COMPARISON OF FACTORS ASSOCIATED WITH RUN-OFF-ROAD AND NON-RUN-OFF-ROAD CRASHES IN KANSAS**
    Uttara Roy

22. **PERCEIVED AVAILABILITY OF AND ATTITUDES TOWARD HEALTHY FOOD CHOICES IN ASSISTED-LIVING FACILITIES IN KANSAS**
    Pei Liu

23. **FOOD AND SAFETY TRAINING NEEDED FOR ASIAN RESTAURANTS: LONGITUDINAL REVIEW OF HEALTH INSPECTION DATA IN KANSAS**
    Young Gin Choi

24. **YOUTUBE IN THE CLASSROOM**
    William E. Genereux

25. **CREATIVE PLAY: INTEGRATING ART INTO PLAYGROUNDS**
    Alli Gerth

26. **DIETARY INTAKES OF OMEGA-3 FATTY ACIDS AMONG SOLDIERS DEPLOYING TO COMBAT**
    Jennifer Hanson

27. **USING DATA-MINING TO CLASSIFY STUDENT BEHAVIORS**
    Rachel Manspeaker

28. **AN INVESTIGATION OF WATER USAGE IN CASUAL DINING RESTAURANTS IN KANSAS**
    Matthew VanSchenkhof

Poster Abstracts

1

ESTIMATING ANNUAL NET PRIMARY PRODUCTIVITY OF THE TALLGRASS PRAIRIE ECOSYSTEM OF THE CENTRAL GREAT PLAINS USING AVHRR NDVI SATELLITE IMAGERY

Nan An[1], Kevin Price[1], John Blair[2]
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Aboveground Net Primary Productivity (ANPP) is indicative of an ecosystem's ability to capture solar energy and store it in the form of carbon. Annual and interannual ecosystem variation in ANPP is often linked to climatic dynamics and anthropogenic influences. Measurements of ANPP are of critical importance to the proper management and understanding of climatic and anthropogenic influences on tallgrass prairie, yet detailed and systematic measurements of ANPP over large geographic regions of this system do not exist. For these reasons, this study was conducted to investigate the use of the Normalized Difference Vegetation Index (NDVI) to model ANPP for the tallgrass prairie. The goal of this study is to develop a robust model using satellite AVHRR biweekly NDVI values to predict tallgrass ANPP. This study was conducted using ANPP data from the Konza Prairie Biological Station, the Rannells Flint Hills Prairie Preserve and other sites near Manhattan, Kansas. The optimal period for estimating ANPP using AVHRR NDVI composite datasets was found to be period 30 (late July). The Tallgrass ANPP Model (TAM) explained 53% ($r2 = 0.53$, $r = 0.73$) of the year to year ANPP variation. The TAM model was valid by using Cross-Validation method. Comparing with other previous independent ANPP model predictions, the TAM is the optimal model for Central Great Plains. A series of 1 km x 1 km resolution ANPP maps for a four-county were also created using the TAM model. The maps showed considerable variation in annual and interannual ANPP spatial patterns.

Relevance of Research to State-related Topic(s)

The tallgrass prairies of the Kansas Flint Hills are among the most productive in North America. The 2007 USDA Agricultural Statistics report that Kansas live stock, most of which are cattle that spend part of their life grazing on the Flint Hills, are worth nearly 7 billion annually. Annual variation in grassland productivity greatly influences forage and habitat for livestock and wildlife, which have impacts on the state and local economies. The influence of climatic variation and land management practices on productivity is mostly unknown because we lack methods for accurately monitoring prairie productivity across large areas. Research being conducted in the Ecology and Agriculture Spatial Analysis Laboratory (EASAL), Agronomy at KSU is focused on development of satellite remote sensing data analysis methods for estimating aboveground net primary productivity. Results show the method has considerable promise for development of an accurate large area grassland monitoring system.

PREFERENCES OF U.S. AND E.U. UNDERGRADUATES FOR CLONING

Shonda R. Anderson, John A. (Sean) Fox
Department of Agriculture Economics, College of Agriculture

The concept of animal cloning was first introduced to the public's attention in 1996 with the birth of "Dolly the Sheep," the first mammal to be cloned. Now, after more than a decade the technology has reached a point of feasibility on a commercial scale. With the publication of the U.S. Food and Drug Administration risk assessment on animal cloning in 2008, a report that concluded that the technology was safe and posed no risk to consumers, the issue has received renewed attention. In 2010, the European Parliament has attempted to ban the technology for human food use which could cause trade descrapancies between Europe and the U.S. Despite the advantages cloning could bring to the Kansas livestock industries and the regulatory assessments by both domestic and international government agencies, there continues to be concern about the marketability of the technology on a consumer level. In this paper, we examine attitudes to the use of cloning in animal food production among samples of U.S. and European college students. We compare expressed levels of concern about cloning to concerns about other food production technologies, issues, and production practices (genetic modification, bacterial contamination, packaging, etc). Furthermore we attempt to correlate attitudes toward cloning and willingness to purchase cloned products to individual characteristics including socio-demographic variables (gender, household income, farming background) and attitudinal variables measuring political disposition (whether the individual tends to lean conservative or liberal on social and economic issues). The data was collected using Survey Monkey.

Relevance of Research to State-related Topic(s)

With the promises for greater efficiency in livestock production, a more sustainable industry, and the looming 58% increase in future world demand for meat products (2009 United Nations), the likelihood of the human food chain becoming more dependent on animal cloning is being realized. While there is still much research to be done on the science, understanding how to communicate the aspects of animal cloning to consumers while keeping the integrity of the science and continued increased profits for the product. In addition, the livestock industry is incredibly important to Kansas's economy. Interestingly, Kansas has been on the forefront of bringing cloning technology to the commercial beef industry in the United States and Europe. The acquired information will open a new realm of study and refocus efforts and marketing preparedness for the technology in the future on both a regional and global scale.

3

CROP MODELING APPROACH FOR ASSESSING IMPACTS OF CLIMATE CHANGE AND VARIABILITY ON CROP PRODUCTIVITY IN THE OGALLALA AQUIFER REGION

George Paul[1], P.V. Vara Prasad[1], Scott A. Staggenborg[1], Prasanna H. Gowda[2], Charles W. Rice[1]
[1]Department of Agronomy, College of Agriculture; [2]USDA-ARS-Conservation & Production Research Lab

Future cropping systems depends on how the future climate unfolds. The objectives of this study were: (a) to analyze climate variability and change resulting from greenhouse gas emissions using high resolution regional climate model (RCM); and (b) to determine its impact on the crop production in the Ogallala region. Three RCM's used in this study were Canadian Regional Climate Model (CRCM), Regional Climate Model (RegCM3) and the Hardley Regional Model (HRM3). The A2 climate scenario for historic period (1971-2000) and future (2041-2070) were acquired from North American Regional Climate Change Assessment Program (NARCCAP). Spatial crop modeling was performed in AEGIS/WIN 4.0.2 program available in the DSSAT (Decision Support System for Agrotechnology Transfer) crop simulation model suite. The A2 climate scenario showed variable spatial pattern and magnitude across the Ogallala region with extreme climate conditions during the cropping season. Analyses showed that Ogallala region will experience 4-5°C increase in the maximum temperature for the month of July and August. In addition rainfall distribution will be highly variable with some regions receiving high rainfall during the month of May and very low rainfall during the month of August. Simulation results of future climates predicted a 30% decrease in the yield of grain sorghum. However, a substantial increase in wheat production throughout the region with an average increase of 35% was predicted in future climates. Crop management decision helped improve productivity by decreasing yield losses.

Relevance of Research to State-related Topic(s)

Fifty six counties in the State of Kansas are in Ogallala aquifer region. Crop production in these counties is stressed due to the limited water availability from the aquifer. Coupled with the water stress is the changing climatic conditions (e.g. extreme temperatures, variable rainfall) which has adverse effects on crop production. Using three regional climate models, our study provides crucial information on the magnitude of change that could be expected in future climates. We used future climate data and spatial crop model to analyze the performance of various crops. Results of the study provide critical information needed to help decision/policy makers to device long-term strategies to cope with impacts of climate change and variability on water use and crop production. Based on our results agronomists, breeder and water managers can formulate/modify their programs, targeting the requirements of future climate, water and food security.

4

NITROUS OXIDE EMISSIONS FROM A COMMERCIAL CATTLE FEEDLOT IN KANSAS

Orlando Aguilar, Edna Razote
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Nitrous oxide (N_2O) is an important greenhouse gas with a global warming potential of 296 times greater than carbon dioxide. Nitrous oxide is generated from various sources, including soils, livestock and manure management. Nitrous oxide emissions from agricultural soils have been studied extensively; however, limited scientific information is available on emission rates of N_2O from pen surfaces in open beef cattle feedlots. The main objective of this preliminary study was to quantify the N_2O emission rate from a pen surface in a commercial beef cattle feedlot in Kansas. Air sampling was conducted for 10 days from July to November 2010 on a pen surface in a commercial beef cattle feedlot. Static enclosed chambers with a diameter of 30 cm were placed on various locations in the pen surface. Samples of air were collected from the chamber headspace at 0, 5, 10, 15, 20, and 30 min with syringes and then analyzed with a gas chromatograph to determine the N_2O concentration. From the N_2O concentrations, the N_2O emission rates were determined. Results indicated large spatial variability in measured N_2O emission rates. Details of the measurement protocol and analysis of results will be presented. These preliminary results will be useful in designing a sampling scheme to establish the emission rate for the whole feedlot.

Relevance of Research to State-related Topic(s)

Increasing levels of greenhouse gases, such as carbon dioxide, methane, and nitrous oxide (N_2O) has resulted in the atmosphere warming trend of 1.0 to 1.7°F. This may have severe consequences to humans. Considering the following facts, Kansas might be an important N_2O contributor to the national greenhouse gases inventory:

- Agricultural activities are ranked fourth as N_2O emission source, and animal feeding operations is one of its three main N_2O emission sources.
- The nation production of cattle in 2009 was 94.521 million heads. One-third of it is produced in large feedlots, wherein huge amount of manure is deposited on the soil, being able to decomposition by microorganisms, emitting several pollutants as greenhouse gases.
- Kansas ranked second, with 7% of the total cattle national inventory

Because pollutants associated to cattle feedlots are important issues for their potential risks on people's health, the State of Kansas will benefit from this research as this research tries to estimate emission rates of N_2O from a Kansas' feedlot.

5

THE INFLUENCE OF GRAZING ON HEADWATER CHANNEL CHARACTERISTICS IN TALL GRASS PRAIRIE

Bartosz Grudzinski, Melinda Daniels
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From 1940 to 1960 the number of cows in the United States increased by 60% while the acreage of private grazing land decreased by 15%. As a result there has been increased strain on private rangelands. Cattle have a direct influence on stream morphology due to their summer grazing habits. Cattle graze near riparian vegetation due to water and food availability. Experimental grazing treatments at the Konza Prairie LTER represent an excellent opportunity to study stream channel response to grazing impacts. Twelve watersheds were evaluated in a paired watershed geomorphological assessment, with 3 grazed by native bison, 3 grazed by cattle, and 6 ungrazed watersheds, to enable cross-watershed comparative analysis to quantify how do stream morphology and sediment characteristics vary between ungrazed, cattle-grazed and bison-grazed watersheds. Geomorphological measurements included hydraulic geometry, pebble counts, habitat unit mapping, and pool fines storage (V*). Preliminary results show significant differences between grazing treatments on the geometry of the cross sections (width to depth ratio), and V*while riffle sedimentology and habitat unit distribution do not seem to be significantly affected by differences in grazing treatment. This research addresses the substantial gaps in knowledge regarding the fluvial geomorphic implications of grassland management in the Great Plains.

Relevance of Research to State-related Topic(s)

To the best of the authors knowledge all studies of grazing impacts on stream bank erosion have been done in the arid Southwest where grazing is common, and humid regions in the South East. Our current understanding on the impact of large grazing animals on stream bank morphology is at best limited for prairie ecosystems. The current experimental treatment set up and several upcoming experimental changes in treatments and management at Konza Prairie biological station represent excellent opportunities to study stream channel and riparian morphological responses to various grazing practices in a tall grass prairie environment. A direct impact from grazing can be seen by evaluating the geomorphology of a landscape with bison grazed, cattle grazed, and ungrazed watersheds. Once the impact from grazing on bank morphology is understood the knowledge can be used to incorporate best management practices.

6

COUPLING PYRAZOLE TO PYRIDINE: STEPS TO ENGINEERING A BETTER AGRICULTURAL CHEMICAL AND PREDICTING BINDING PREFERENCES THROUGH CO-CRYSTAL SYNTHESIS

Evan P. Hurley, Christer B. Aakeroy, John Desper
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Kansas is a leader in the agricultural industry, harvesting large amounts of very important crops each year. To protect crops from harmful insects and rodents, a chemical insecticide or herbicide is typically applied to the surface of the crop or to the surrounding area. Among recent promising candidates for new insecticides and herbicides, pyrazole- and pyridine-based compounds have emerged as leading candidates. However, there are a few examples of species that have both components. Thus, understanding where other molecules found in nature, such as potential carboxylic acids, preferentially bind is paramount to understanding the inherent selectivity and chemistry occurring in these agrochemicals. To potentially control and modulate the physical properties of various pyrazole/pyridine based agricultural chemicals, we have chosen two initial steps. First is to synthesize and characterize various ditopic compounds with both pyrazole and pyridine functionalities. The second step is to probe the binding preferences of incoming carboxylic acids. To accomplish this, co-crystals of the as-prepared ditopic compounds and various carboxylic acids are synthesized. The resulting crystal structures are then examined to help determine any reliable and predictable interactions between donor (carboxylic acid) and acceptor (pyrazole/pyridine) compound. We believe that this approach will potentially help engineer a better agrochemical candidate.

Relevance of Research to State-related Topic(s)

For Kansas to continue economic development in the agricultural industry, the crop yields each year are critical. By developing new and better chemicals to protect the crops from harmful insects or unwanted weeds, yields can be higher, which in turn leads to more income for farmers as well as increased development of the agricultural industry. Our research hopes to have an impact in the field of agrochemicals, where we can potentially provide useful information for companies wanting to develop better agrochemicals for applications as pesticides and herbicides.

7

EFFECTS OF CONTROLLED INTERVENTION STRATEGIES ON THE QUANTITIES OF A CEFTIOFUR RESISTANCE GENE (*bla*$_{\text{CMY-2}}$) IN THE FECES OF FEEDLOT CATTLE

Neena Kanwar[1], Harvey Morgan Scott[1], Bo Norby[2], Savvanah Moore[3], Javier Vinasco[1], Guy Loneragan[4]
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Antibiotics are widely used in animal agriculture. They can favor resistance in bacteria. This resistance may spread to humans and pose public health risks. Efforts should be focused to assess the dynamics of antibiotic resistance and evaluate intervention strategies that may mitigate its dissemination in farms. This study investigates the effects of two intervention strategies (i.e., feeding chlortetracycline (CTC) following ceftiofur treatment and mixing of ceftiofur-treated with untreated steers) on ceftiofur resistance in bacteria. In a controlled field trial, 176 steers were randomly allocated to 16 pens of 11 steers each. Ceftiofur was given on day 0 to all steers in 8 pens and only 1 steer in another 8 pens; 4 among each 8 pens received three 5-day regimens of CTC in their feed starting at day 4. Fecal samples were collected every other day to 26 days. Community DNA from 200mg feces was extracted via the Qiagen Stool Kit. The ceftiofur resistance *bla*$_{\text{CMY-2}}$ gene copies/µl of DNA was determined using quantitative real time PCR. Total DNA concentration was assayed using Nanodrop®. The relationship between the quantity of *bla*$_{\text{CMY-2}}$ gene (ln of the ratio to total DNA) and explanatory variables (CTC and mixing in a full factorial design interacting with period (DAY)) was assessed using multi-level mixed model. CTC increased the gene copies consistently across other factors ($P<0.0001$). Mixing had an inconsistent period-specific effect of decreasing the gene copies. Results (gene copies) normalized to 16s gene for all bacteria or total aerobic bacteria c.f.u. count will be presented.

Relevance of Research to State-related Topic(s)

Antibiotic resistance research has a major impact on healthcare. Antimicrobials used as growth promoters, preventive or therapeutic agents can selectively favor resistant bacteria. Further, these resistant bacteria may spread to humans resulting in potential public health risks. There is a need to understand factors that contribute to dissemination and propagation of antimicrobial resistance and also to design intervention strategies that will help control this global problem. Ceftiofur was licensed in North America for veterinary use in 1988 and the first report of it's resistance was documented in 1998. Ceftiofur is categorized as the critically important antibiotic by WHO. Ceftiofur is widely used in veterinary practice; ceftriaxone, a closely related human drug is used in humans to treat salmonellosis. Goal of this research is to evaluate the effects of two practical intervention strategies (chlortetracycline treatment after the ceftiofur treatment and mixing ceftiofur- treated with untreated animals) on ceftiofur resistance.

8

THE EFFECTS OF INTAKE ON STEERS ADMINISTERED ANABOLIC GROWTH IMPLANTS

Tiffany Lee[1], Daniel Thomson[1], Stephane Guillossou[2], B.W. Wileman[2], C.D. Reinhardt[3]
[1]Department of Clinical Sciences, College of Veterinary Medicine; [2]Department of Diagnostic Medicine and Pathobiology, College of Veterinary Medicine; [3]Department of Animal Sciences and Industry, College of Agriculture

The objective of this study was to evaluate the impact anabolic implants may have on animals in either a restricted nutritional state or in an immunocompromised state. Sixteen crossbred steers were trained to individual Calan gates, and then randomly assigned to one of four treatments in a 2x2 factorial arrangement : (1) administration of an anabolic growth implant, and fed at 2 × maintenance on a starting cattle diet; (2) administration of an implant, but fed the with aforementioned diet at 1.0 × maintenance; (3) no implant administered, and 2 × maintenance diet; (4) no implant and fed a 1.0 × maintenance diet. Animals were weighed on days 0, 14, and 28 of the trial, and gain, average daily gain, and feed efficiency were determined for each time point. Blood samples were taken from each animal at day 0, 14, and 28 of the trial and used in determining levels of IGF-1 and plasma urea nitrogen (PUN). There was a significant effect of diet, and diet and time, on weight ($P < 0.0001$). Diet and implantion also had a significant effect on weight ($P < 0.02$). Time and diet had a significant effect on PUN ($P < 0.01$). Time, and diet and time, had an effect on IGF-1 ($P < 0.2$, and $P < 0.001$, respectively). These results show that implantation, which has previously been shown to improve gain, average daily gain, and feed efficiency, may not be as beneficial in cattle fed a restricted diet.

Relevance of Research to State-related Topic(s)

Implanting feedlot cattle with anabolic growth hormones has been proven to increase weight gain due to increased metabolism. Effects of implantation also include the shifting of the composition of gain toward muscle instead of fat deposition. These tend to be positive effects in the feedlot, as long as the metabolism needed for maintenance of the animal's normal health and behavior is met and exceeded. However, when animals first arrive in a feedlot, many are stressed and have not yet become accustomed to the environment, feeding routine, etc. In such cases, it has been suggested that implanting cattle upon arrival at the feedlot could be detrimental to the performance of those cattle. Because the cattle and feedlot industries are vital to the Kansas economy, such issues should be put in the forefront of our research endeavors.

9

DEVELOPMENT OF A MULTIPLEX PCR FOR THE DETECTION OF MAJOR SEROTYPES OF SHIGA-TOXIN PRODUCING *E. COLI* IN BOVINE FECES

Zachary D. Paddock, X. Xiaorong, T. G. Nagaraja, and J. Bai
Department of Diagnostic Medicine and Pathobiology

Shiga-toxin producing *E. coli* (STEC), particularly O157:H7, are major food borne pathogens. Recently, non-O157 serotypes have also become a major public health concern. Unlike O157:H7, detection procedures for non-O157 have not been fully developed. Confirmation of non-O157 strains is generally based on agglutination with serotype-specific antisera, which is labor intensive and often nonspecific. Our objective was to develop a multiplex PCR to distinguish the seven major STEC serotypes (O45, O103, O121, O111, O145, O157 and O26) and evaluate whether the procedure could be used to screen fecal samples before subjecting them to cultural procedures. Published sequences for the O-specific antigen coding genes, *rfbE* (O157), and *wzx* and *wfqB* (non-0157), were analyzed to design primers to amplify serotype-specific regions. The specificity of the procedure was tested with pure cultures of STEC strains (n=94). Fecal samples spiked with different concentrations of a mixture of seven STEC strains were tested before and after 6 h enrichment in *E. coli* (EC) broth. Additionally, fecal samples (96 from feedlot and 96 from dairy cattle) were collected, enriched in EC broth, screened by the multiplex PCR and further validated for STEC. All seven serotypes were specifically amplified in spiked feces with a detection limit of 8.0×10^1. The screened fecal samples results were in agreement with validation procedures, these results will be presented in the poster. The multiplex PCR will be a useful screening test for isolates of the seven STEC.

Relevance of Research to State-related Topic(s)

Shiga-toxin producing *E. coli* (STEC), particularly O157:H7, are major foods borne pathogens, with cattle being the primary reservoir. Recently, non-O157 serotypes have also become a major public health concern. Kansas has many links to the cattle industry, whether it is directly through producers or indirectly through grain farmers. When outbreaks of STEC are reported there are direct financial implications for the cattle and other industries associated with it. Furthermore increasing interest in bio-fuels has increased the distiller's grains being fed to cattle which have been shown to increase *E. coli* O157:H7 shedding. Research into the epidemiology, transmission, and prevention of STEC in cattle can greatly reduce the risk to general public and prevent costly outbreaks. This molecular test will allow researchers to investigate STEC across Kansas, whereas before it was not feasible.

10

MOLECULAR EPIDEMIOLOGY OF VANCOMYCIN-RESISTANT ENTEROCOCCUS FAECIUM ISOLATED FROM A SEMI-CLOSED AND INTEGRATED AGRI-FOOD SYSTEM

Raghavendra Amachawadi[1], H. M. Scott[1], J. Vinasco[1], R. B. Harvey[2], T. L. Poole[2], T. G. Nagaraja[1]
[1]Department of Diagnostic Medicine and Pathobiology, College of Veterinary Medicine; [2]Southern Plains Agricultural Research Center, Agricultural Research Service, USDA, College Station, Texas

Enterococci have emerged as important nosocomial pathogens and rank as the second most common cause of nosocomial infections, both in the United States and worldwide. The purpose of the present study was to characterize the virulence genes in enterococci that are often associated with *vanA* type resistance, perform multilocus sequence typing for between-host comparisons, determine the transferability of the *vanA* gene to host-specific or non-host-specific susceptible enterococcal isolates via conjugation, and compare these traits with vancomycin-susceptible *E. faecium* (VSE) isolates. A total of 1,252 enterococci isolated from human wastewater samples for the presence of vancomycin resistance; when identified, the presence of *vanA* and *vanB* genes were assessed. A total of 63 human isolates were positive for the *vanA* gene and one isolate was positive for *vanB* gene. Out of 63 VRE isolates, 57 were positive for the *esp* (enterococcal surface protein) gene, a potent virulence factor among VRE clones. All the VRE isolates were negative for *asa1*, *gelE*, *cylA*, and *hyl* genes. Conjugation studies via both broth and filter mating revealed ready transfer of *vanA* gene to susceptible strains arising from both hosts.

Relevance of Research to State-related Topic(s)

The potential link between the *vanA* gene and other antibiotic resistance determinants coupled with *esp* gene may exert pressure for biofilm formation by VRE when hosts are treated with antimicrobials. The results of our study will help us to better identify and test opportunities to prevent and intervene against resistance among enterococci in animal agriculture; preferably, by developing readily adoptable and cost-effective management practices suited to production systems in the State of Kansas.

11

A COMMERCIALLY AVAILABLE SIDEPHORE-RECEPTOR AND PORIN-BASED VACCINE REDUCED THE PREVALENCE OF E. COLI O157:H7 IN THE FECES OF BEEF CATTLE UNDER FIELD CONDITIONS IN 10 COMMERCIAL FEEDLOTS

Brooks Butler, Dan Thomson, Ben Wileman
College of Veterinary Medicine

Beef cattle located in 10 commercial feedlots were used to determine the efficacy of the Sidephore Receptor and Porin (SRP) E. coli O157:H7 vaccine to decrease prevalence of E. coli O157:H7 in the feces of beef cattle under field conditions. Feedlots were randomly assigned to one of two treatments: 1) all cattle received an SRP E. coli O157:H7 vaccination at arrival and re-implant or 2) all cattle received a placebo. Pen floor fecal samples (20 samples per pen) were taken from five random pens within each feedlot once per month. Pens sampled contained cattle shipping out for harvest during the week samples were collected. Samples were collected at two different times (May 2010 and June 2010, n=2,000 samples). E. coli O157:H7 was recovered from the fecal samples using anti- E. Coli magnetic beads and was then harvested using CT-CHROMagar plates. Suspect colonies were confirmed using a remel latex agglutination test. There was no vaccine status by month interaction for prevalence of E. coli O157:H7 in the feces of cattle ($P = 0.33$). The prevalence of E. Coli O157:H7 was lower in the feces from vaccinated cattle (9.7%) when compared to feces from cattle that received the placebo control (16.7%; $P < 0.01$). Cattle sampled in June had higher fecal prevalence of E. Coli than cattle sampled in May ($P = 0.01$). The E. Coli O157:H7 SRP vaccine effectively reduced the burden of E. Coli O157:H7 in cattle at the time of harvest.

Relevance of Research to State-related Topic(s)

Escherichia Coli O157:H7 is a common pathogen harbored in feedlot cattle. The E. coli O157:H7 bacteria is shed in feces of the cattle and is a source of contamination at harvest. Contaminated product is unsafe, and can lead to serious foodborne illness. In order to safeguard consumer confidence and protect the economic viability of the beef industry, reseaerchers have developed several methods for pre and post harvest intervention. The results of this study will have lasting implications, so it is important that data be collected accurately and in a large enough quantity, as well as analyzed appropriately. This field trial had a budget of over 1 million dollars and a sample size of 250,000 head of cattle. A study of this magnitude makes drawing conclusions from the data relatively safe.

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DIELECTROPHORETIC CAPTURE OF *E. COLI* CELLS AT NANOELECTRODE ARRAYS

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Rapid detection of pathogens like bacteria and viruses is of great importance for monitoring water and food quality, the early detection and diagnosis of diseases, countering bioterrorism attacks, and other applications. Successful detection requires the manipulation and capture pathogenic particles for further analysis. In our study we use alternating current (AC) based dielectrophoresis (DEP) and electrochemical impedance spectroscopy (EIS) techniques using a nanoelectrode array (NEA) in a microfluidic chip for bacteria capture. A nano-DEP device was fabricated using photolithography. This device employs a vertically aligned carbon nanofiber (VACNF) NEA vs. a macroelectrode of indium tin oxide (ITO) coated glass in a "points-and-lid" configuration. A high-frequency AC field was applied to generate "positive DEP" (p-DEP) at the tips of exposed CNFs. Enhanced electric field gradient generated at the CNF tips due to reduction in electrode size down to nanometer scale helps to overcome large hydrodynamic drag force on *E. coli* at high flow velocities. A significant number of *E. coli* cells were captured at flow velocity of 1.6 mm/sec. A noticeable change in absolute impedance (|Z|) value at the NEA was observed in EIS experiments. The capturing efficiency is being assessed and optimized for future applications.

Relevance of Research to State-related Topic(s)

Early detection is the key to prevent or reduce the damage of pathogenic bacterial contamination in food, water and other resources. A recent outbreak of *E.coli* O157:H7 in packed steak was reported by USDA which lead to a recall of 248,000 pounds of steak products distributed nationwide including Kansas. This is just one of the thousands of instances that take place every year. Such instances cause a significant economic loss and disruption to the human life. The current pathogen detection methods are too laborious and time consuming, taking several hours to days to get a test result. We are putting our efforts in developing a reliable electronic detection method, which will be faster than traditional techniques. Kansas is a leading state of USA in meat processing and agriculture. It is very important that pathogenic outbreaks are prevented at an early stage to avoid significant financial loss and human health damage.

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RENEWABLE ENERGY AND THE RURAL COMMUNITY

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Rural communities in Kansas are almost entirely dependent on large energy corporations. These corporations, in turn, are completely dependent on fossil fuels for energy production. Three major problems emerge from these dependencies: 1) dependence on large corporations for energy creates a reduction in a local economy's potential to support itself; 2) dependence on fossil fuels is a contributing factor of global climate change; 3) fossil fuels are non-renewable energy resources and will inevitably be exhausted. Rural Kansas communities have resources necessary to achieve energy independence; however, little has been done to explore the localized capacity of these resources. Several questions must be addressed to determine the feasibility of each locally available energy source, the first and most important being: What renewable energy resources are available to a rural Kansas community and are they sufficient for the community to achieve energy independence? Because this question's answer affects and leads to future questions, a decision tree is the most viable method for the project's analysis and development. Research into the technology and science associated with each resource provides a general knowledge of the definitions associated with and processes necessary to determine the feasibility of the resource. For resources receiving a positive feasibility rating, analysis continues with a cost/benefit analysis that compares potential costs and funding involving implementation and maintenance with the payback, offsets, and incentives involved in utilizing each resource. Analysis of each feasible resource continues with site suitability analysis for a specific Kansas community.

Relevance of Research to State-related Topic(s)

Research into small local renewable energy implementation could have a profound impact on the state of Kansas. If a community can support itself with renewable energy resources, it reduces the need for non-renewable imports which currently send millions of dollars out of state each year. Renewable energy would also create a variety of jobs ranging from initial construction to long-term maintenance. This would help to stimulate local economies which would have a positive effect on the state economy. In addition to monetary gains, new renewable investments, in addition to initiatives already in place, would place Kansas as a frontrunner nationwide in renewable energy production.

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THEORETICAL INVESTIGATION ELECTROCHEMICAL MECHANISM OF WATER SPLITTING REACTIONS IN TITANIUM OXIDE CLUSTERS

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The electrochemical mechanism of water splitting is investigated by examination of the reaction of water with Ti_2O_4. B3LYP energies of all possible intermediates formed after losing protons and electrons have been calculated in gas phase and aqueous phase and compared with CCSD energies. Oxygen-oxygen bond formation at the terminal or bridging position initiates after the release of two electrons. All reaction steps are calculated to be endothermic in gas phase; they are predicted to be less endothermic in the aqueous phase using the PCM method. Energies with respect to standard hydrogen electrode have been calculated which shows that the release of third proton is the hardest step. Triplet state pathways have also been investigated which are higher energy than the singlet ones. Reactions with hydroxide have been examined to simulate alkaline media, which are interestingly found to be exothermic. The pKa values of hydrogen atoms in the reaction have been studied to probe the proton transfer mechanism.

Relevance of Research to State-related Topic(s)

Trapping solar energy as an alternative source of energy will be the collective goal of the world using sustainable source. Water splitting into hydrogen and oxygen absorbing sun radiation could be one of the best way to get solar energy. This is a challenging process because the process requires high energy ultra violet radiation. It would be really better if one would find lower energy pathway so that omnipresent visible radiations could dissociate water. We are trying to probe the electrochemical mechanism of water splitting reactions on titanium oxide surface so we would be able to suggest the low energy photochemical pathway so that solar energy could be stored in the form of hydrogen trapping visible radiation.

15

SYNTHESIS AND CHARACTERIZATION OF PHOTOCATALYTICALLY ACTIVE SiO_2/TiO_2 MIXED OXIDE SYSTEMS DOPED WITH VARIOUS TRANSITION METAL IONS

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Various photocatalytic systems have been reported for the degradation of harmful air pollutants. Most of the reported catalysts are based on well known semiconducting material, Titanium Dioxide (TiO_2) while some are based on Insulating Silicon Dioxide (SiO_2). However, in spite of their different conducting properties, both have been successfully used in photocatalysis of air pollutants. Thus, to understand the actual role of each major component present in these reported systems, new photocatalytic systems were prepared containing SiO_2 based, TiO_2 based and systems with mixed SiO_2 and TiO_2. These systems were doped with Chromium ions and Vanadium ions and we ended up with 6 different systems. All the systems have significantly higher surface areas compared to systems reported in literature. All the prepared samples were characterized by X-ray diffraction, diffusive reflectance UV spectroscopy, UV and visible absorption spectroscopy and BET surface analysis methods. Further, the kinetics of photocatalytic degradation of a model pollutant, acetaldehyde, was performed using a Shimadzu GCMS-QP 5000 instrument and a glass reactor with a quartz window. Change in photocatalytic activity was found with various molar ratios of SiO_2 to TiO_2. From all the systems, SiO_2 based systems showed higher activity towards acetaldehyde degradation compared to mixed systems and TiO_2 based systems. Further, chromium ions doped systems show higher UV and visible light activity compared to vanadium ions doped systems. Further characterizations will be carried out to understand the positions of energy levels and to determine the lifetime of generated electron-hole pairs of these catalysts.

Relevance of Research to State-related Topic(s)

Fossil fuels,the major energy source today, is not a renewable energy source and is not sufficient enough to support the demanding energy requirement of the world. Therefore, lots of research is being carried out to develop new energy sources. Solar energy is a very important energy source because it is in fact the main energy source that powered up the whole world. On the other hand, air pollution, both indoor and outdoors, is an important issue that has to be taken in to immediate attention because of global and local problems such as green house effect, health problems, etc. Specially, according to the ?Air Quality Report? by Kansas department of health and environment, natural gas compressor stations, petroleum refineries and grain processing facilities have been reported as main sites in Kansas and found CO,NOx, SOx and VOCs as main pollutants. Considering above facts, we are going to synthesize novel nano scale materials that is capable of destroying harmful air pollutants using solar energy as the energy source.

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CHARACTERIZATION OF ICOSAHEDRAL BORON ARSENIDE ($B_{12}As_2$) EPITAXIAL FILM: A NOVEL SEMICONDUCTOR FOR BETA-CELL AND NEUTRON DETECTOR

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Icosahedral boron arsenide ($B_{12}As_2$) is a wide bandgap semiconductor with extraordinary radiation resistance and neutron absorption capability. Therefore, it is highly attractive in radioisotope batteries, such as beta-voltaic cells, devices capable of converting nuclear energy into electrical power. The energy density available from radioisotopes can be four to five orders of magnitude higher than what is available from chemical sources, such as lithium-ion batteries or even gasoline, thus the power available from a radioisotope can last for many years, decades even. The high thermal neutron capture cross-section of the boron-10 (~4000 barns) can be exploited for solid-state neutron detectors, providing an effective alternation for current detectors, which is highly demanded to improve the homeland security. To fabricate a device, high quality single crystalline $B_{12}As_2$ films with controlled electrical properties are necessary. In this study, epitaxial $B_{12}As_2$ films were deposited on SiC substrates with 7°off-cut towards (1-100) by chemical vapor deposition from diborane (B_2H_6) and arsine (AsH_3). This specific orientation is largely free of rotational twins that plague films on other SiC substrate orientations. Doping with silicon was achieved by adding small amount of silane (SiH_4) in the reactant gases. The Si concentration in the $B_{12}As_2$ was increased to $1.5x10^{21}cm^{-3}$, two orders of magnitude than the undoped one. The resistivity, hole concentration and hole mobility of the doped sample was characterized via temperature variable Hall effect measurements.

Relevance of Research to State-related Topic(s)

This research work focuses on developing methods to improve the quality of a new semiconductor for electronic devices. Applications for this semiconductor include more sensitive neutron detectors for improved homeland security, and long-lived nuclear batteries for powering remotely located, difficult to maintain environmental sensors. To help prevent nuclear terrorism, such as the smuggling of radioactive materials, synthesizing and characterizing a new semiconductor with potential applications in neutron detectors and long-life power supplied was carried out. The detectors made from this semiconductor will offer more efficient performance, be more compact, operate on minimal power, and are low cost. Such devices could be widely distributed near airports, other points of entry, and potential terrorist targets, to provide the earliest warnings possible.

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HYDROGEN GAS FROM ACIDIC WATER UNDER VISIBLE LIGHT: PHOTOCATALYSTS PRODUCED BY NITRIDING TITANIUM DIOXIDE AND INDIUM OXIDE INTIMATE MIXTURES

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Our research goal is to offer the world a new clean and green energy by applying H_2. Photocatalystic production of hydrogen gas from acidic water was accomplished with Ti-In nitride composites. These materials were produced by nitriding TiO_2-In_2O_3 mixture with ammonia at high temperature. The catalysts are quite active, producing H_2 gas at 242 μmole·h^{-1}·g^{-1} under UV-vis light, and 37 μmole·h^{-1}·g^{-1} under visible light. However, after several hours of use with visible light, catalyst activity decreased. After 60 hours, the photocatalytic activity stabilized, and continued to produce H_2 gas at 11 μmole·h^{-1}·g^{-1} for over 320 hours. The result shows that we have successfully synthesized a photocatalyst which can generate H_2 by using sun-light as the energy source and provide a new pathway for the fuel-cell application.

Relevance of Research to State-related Topic(s)

The green chemistry and energy issues are always important questions for the world. Especially, energy makes a great impact to the economic reason. There are diverse avenues to approach the answer to the sources of future energy. Hydrogen gas from water and using solar energy is one of the best choices. In our researches, we demonstrate how we can apply the light to generate hydrogen gas from water by the assistance of the photocatalyst. Therefore, it is critical for Kansas, who is a member of the world, to put more effort on the research of the future energy. Moreover, Kansas has wide land and most cloudless weather as advantages. It will be such a waste for Kansas not supportting research and development for new energy sources.

18

RELIABLE AND SECURE NETWORKS FOR THE COMMUNICATION OF THE POWER GRID

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The need for reliable and quick communication in power grid is growing and becoming very critical. With the Smart Grid initiative, an increasing number of intelligent devices, such as smart meters and new sensors, are being added to the grid. The current communication network architecture needs to be evaluated and improved. In this poster, we present a simulation model to evaluate the communication system. The simulation model is written in c plus plus and models the components of the network. The simulation results provide insight on how to design the network in order for the system to be robust from failures. We are using the simulation model to evaluate the interdependency between the communication network and the power grid. Security of the network is a very important aspect. Without the implementation of security protocols, there is a risk of attacks on the network. Attacks can come from malicious users of the network or from entities outside the network. These attacks may lead to damage to equipment, loss of power to consumers, network overload and loss of data, and loss of privacy. The poster will present some of the major issues related to the security of the communication network.

Relevance of Research to State-related Topic(s)

The demand for energy in the State of Kansas is increasing. Also, the implementation of renewables, such as wind energy and solar energy is increasing in Kansas. The added demand and generation will create more data for the utility companies to process. Added to this is the push for the Smart Grid initiative that many utilities are facing. All of this new information being generated needs to be reliably and securely transmitted back to the control centers of the utility companies. Utility companies, including ones in Kansas, are expressing interest towards improving their communication networks. With the new NERC CIP standard many of the utilities need to improve the security of their networks. If the security of their networks does not meet the standard these utilities could be facing financial repercussions from the damage attacks could have on their networks.

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LES AND RANS SIMULATION OF TURBULENT AIRFLOW AND TRACER GAS INJECTION IN A GENERIC AIRCRAFT CABIN MODEL

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This study is a continuation of a previous research in simulating turbulent airflow in a generic aircraft cabin model. Particularly, the purpose is to use Computational Fluid Dynamics (CFD) to simulate transport of a tracer gas that is injected into the generic cabin. This research work is composed of three parts. First, both Large Eddy Simulation (LES) and Reynolds averaged Navier Stokes (RANS) methods are used to simulate a full-nozzle-height aircraft cabin. The computational results are validated by comparing with Particle Image Velocity (PIV) data and published CFD predictions available in the literature. Through these comparisons, the capability of using the CFD methods in this study to predict unsteady as well as time-averaged velocity for a generic aircraft cabin model is examined. Second, airflow characteristics are studied by reducing the cabin nozzle height to one half of its original size but keeping the total volumetric airflow rate the same as that of the full-height cabin. Accuracy of the LES approach in predicting airflow in the half-height-nozzle cabin is evaluated by comparing prediction results with the PIV measurement data. Third, simulation of a tracer gas injection through the injecting tube placed in different locations in the half-height-nozzle cabin is investigated. In this part, carbon dioxide (CO_2) is chosen as the tracer gas. The LES method is used to solve the equations of motion and the unsteady species transport equation for tracer gas concentration.The predictions are compared with corresponding experimental data.

Relevance of Research to State-related Topic(s)

Airplane industry is important for the state of Kansas because of at least two economical reasons: first the activity and business of airliners in Kansas and the second is the settling of different companies and manufacturers in Wichita working in design and manufacturing passenger airplanes. One of the threats can potentially have a destructive influence on this industry, not only in this state but also in the whole country, is spreading the deceases through the transport of bacteria, germs, viruses and other infectious micro-organisms in the cabins of commercial airliners. In order to find approaches to control or prevent of spreading deceases through airplane passengers during flights, the performance of aircraft cabin's air- conditioning systems should be investigated. For this purpose it is important to get more knowledge about the physics of airflow in the aircraft cabin through the simulation of turbulent airflow as well as other transport phenomena like particle dispersion and gas diffusion.

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DISTRIBUTED SOURCES AND ISLANDING TO MITIGATE CASCADING FAILURES IN POWER GRID NETWORKS

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Distributed renewable generation includes the application of small generators such as wind turbines, scattered throughout a power system to provide for the electric power needed by the consumers. In general, the term distributed generation refers to all the small electric power generators which are located on the utility system, at the site of a consumer. However, in this work, we deal with distributed generation at the transmission side to enable islanding (intentional splitting) of the transmission grid in the event of critical faults which may lead to a cascading failure. This intentional splitting allows the system to accomodate the overloading because it not only reduces the total load on the main grid but presence of distributed renewable sources also helps to continue powering the different islands of the grid. We perform a topological analysis of the power grid as a complex network and partition the grid using a two-step optimization process, followed by load shedding, if required. The first step uses a quality function called modularity which gives basic optimal islands based on power flow but without differentiating between sources and other nodes. The second step combines islands to form superislands such that atleast one distributed renewable source is present in every island to achieve load balancing. This strategy helps to minimize the number of links that are disconnected to form islands, and at the same time, achieves the purpose of protecting the transmission network by reducing stress on the main grid.

Relevance of Research to State-related Topic(s)

Power grids are among the largest and most complex technological systems ever developed. Recently, there has been a growing concern about the excessive usage of power grid networks and the increasing possibility of cascading failures. Research in this area gained much importance after the 2003 blackout in the United States. This work is a part of the research funded by the Energy and Power Affiliates Group (EPAP) consisting of Westar Energy, Burns and McDonnell, Omaha Public Power District and Nebraska Public Power District, at ECE department of Kansas State University. Kansas has a very good supply of wind which makes it a perfect candidate for implementation of islanding using distributed renewable sources such as wind farms.

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TREND ANALYSIS AND COMPARISON OF FACTORS ASSOCIATED WITH RUN-OFF-ROAD AND NON-RUN-OFF-ROAD CRASHES IN KANSAS

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Run-off-road (ROR) crashes in recent times have become a major cause of serious injuries and fatalities in Kansas. Data from Kansas Accident Reporting System (KARS) database during the period from 1999 to 2008 is used in this study to examine the trends in run-off-road and non-run-off-road crashes as well as finding out the characteristics, and contributory causes related to ROR and NROR crashes. Likelihood ratios of these factors for ROR crashes with respect to NROR crashes are assessed using the Bayesian Statistical Approach. It is found that alcohol has a tremendous influence on male drivers, age groups between 16 and 34 years, involved in run-off-road crashes as compare to non-run-off-road crashes. Night time, weekends, adverse weather conditions, rural, gravel and curved roads, higher speed limits, wet, and icy road surface, and utility vehicles are found to be the important characteristics of run-off-road crashes; whereas daylight, week days, good weather conditions, urban, straight and level roads, dry, and blacktop road surface, lower speed limits, and automobiles are common factors in the occurrence of non-run-road crashes. Various driver, vehicle, road, and environmental-related contributory causes such as fell asleep, ill or medical condition, DUI, too fast for conditions, exceeded posted speed limit, tires and wheels, strong winds, sleet, hail, freezing rain, shoulders, ruts, holes, and bumps are found to have the greatest likelihood ratios and as such have a greater predominance in contributing to ROR crashes than NROR crashes.

Relevance of Research to State-related Topic(s)

The research which focuses on transportation safety, concerns with drifting off a large number of vehicles from the road each year in Kansas as well as in the United States. Fatalities and severe injuries resulting from run-off-road (ROR) crashes are associated with very high economic costs. As the research aims to investigate the characteristics and contributory causes of ROR crashes, potential countermeasures would be possible to implement which is expected to have a very high payoff potential. By identifying the causes and issues related to ROR crashes, the research will be able to provide recommendations for addressing transportation needs and improving safety, which will in the short and long run benefit the population of Kansas.

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PERCEIVED AVAILABILITY OF AND ATTITUDES TOWARD HEALTHY FOOD CHOICES IN ASSISTED-LIVING FACILITIES IN KANSAS

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The purpose of this project was to assess perceived availability of healthy food choices and examine relationships between attitudes, subjective norms (SN), perceived behavior control (PBC), and behavior intention to consume healthy food at assisted-living facilities using Theory of Planned Behavior (TpB). Twenty-six directors of assisted-living facilities in Kansas were contacted and requested participation in the project, and eight agreed to participate (30.8%). An instrument based on the theory of planned behavior (TpB) was developed and tested with 115 elderly residents in eight facilities in Kansas. Descriptive statistics and linear and multi-regression analyses were conducted to evaluate the relationships between variables and to test the TpB model. The results showed that attitudes toward healthy food and SN were positively associated with consumption intention. However, perceived behavioral control among residents was not a significant predictor of the intention to select healthy food choices. This could be because elderly assisted-living residents may feel they are not in control of their food offered in their facility, therefore PBC did not affect their intention to consume healthy food items. The results of this study reconfirmed that elderly population living in elder care facilities desires and are willing to choose healthy food choices. Managers from these facilities may utilize this data to recognize their residents' needs, investigate ways to improve residents' diets, and potentially increase healthy food consumption of their elderly clients.

Relevance of Research to State-related Topic(s)

According to U.S. Census Bureau (2000), 35 million people were aged 65 and older in 2000. 13% of total population in Kansas was 65 years old and over in 2009 and the elderly population will continue to increase in the next twenty years. This increase in the elderly population will have an impact on many aspects of our society, and meeting the needs the elderly will become increasingly important. The results of this study confirmed that elderly population living in elder care facilities desires and are willing to choose healthy food choices but feel the lack of their control over food choices. Managers from these facilities in Kansas may utilize this data to recognize their residents' needs, investigate ways to improve residents' diets, and potentially increase healthy food consumption of their elderly clients.

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FOOD AND SAFETY TRAINING NEEDED FOR ASIAN RESTAURANTS: LONGITUDINAL REVIEW OF HEALTH INSPECTION DATA IN KANSAS

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The purpose of this study was to assess the frequencies and types of food code violations at Asian restaurants in Kansas using longitudinal review of health inspection data. A total of 326 restaurant inspection reports from 156 Asian restaurants in 10 Kansas counties were reviewed. Descriptive and inferential statistics were calculated using SPSS. The findings of this study suggested the focus areas for food safety training in Asian restaurants: temperature control of PHF; employee personal hygiene; and employee hand washing practices. Also, our results indicated that behavior-related violations, especially behavior-related critical violations, occurred more during the routine health inspection than other inspection types. In the future, research projects could identify the effective ways to overcome barriers to food safety training in Asian restaurants. Through this investigation, Asian restaurant owners and managers may gain insights on what food handling practices related to code violations they should emphasize when training their employees.

Relevance of Research to State-related Topic(s)

This study was conducted to examine multiple health inspection data of Asian independent restaurants in Kansas over a 12-month period (i.e., January 1 to December 31, 2009) to identify if there were persistent food-handling challenges and to investigate the food safety training needs for Asian restaurant employees. Specific objectives were to identify the frequencies and types of food code violations using longitudinal review of health inspection data for Asian ethnic restaurants in Kansas. Kansas Department of Agriculture (KDA) publishes the restaurant health inspection reports online with specific code violations indicated. Through this investigation, ethnic restaurant owners and managers may gain insights on what food handling practices related to code violations they should emphasize when training their employees. At the same time, health department employees may use this information to address continual challenges as they observe during Asian restaurant inspections.

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YOUTUBE IN THE CLASSROOM

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The proliferation of micro-miniature cameras coupled with high speed internet and online digital video allows an unprecedented look into the world's educational institutions. Each day from all over the world, students, educators and the schools in which they work and learn are video recorded and uploaded to video websites such as YouTube. This phenomenon has major implications for the privacy of students and educators, but also signals a transformational shift in how the world communicates and what it means to be a literate person in the digital age. This digital ethnographic study explores what can be learned by viewing school-oriented online videos and interacting with the video creators. Themes of student boredom, sensation seeking, privacy, global community as well as digital literacy and scholarship are addressed. Drawing from over 1,000 publicly available online videos that depict students and teachers in their day to day lives at school, the researcher has created a ten minute documentary film entitled "YouTube in the Classroom" highlighting these issues. (http://www.youtube.com/watch?v=5z_3sflVBA8) This ethnographic study breaks new ground relating the story of online video in educational institutions by using the very medium and environment being studied.

Relevance of Research to State-related Topic(s)

This research has direct implications for the quality and cost of education in our state. Digital literacy is an important aspect of our daily lives, but our educational institutions are slow to recognize the changes that are taking place. Inexpensive cameras, editing software and high speed internet have turned anyone with access to these tools into potential communicators with a global audience. With regularity there are news stories being broadcast about a teacher, a student or a school that have been captured on video and put online for the world to see, and these stories are typically not positive. However, many schools are simply opting out of the great global conversation. Many schools are blocking the technologies that teachers and students need to take advantage of the great promises of the digital age. With these tools, teachers can easily and inexpensively share teaching techniques and lessons. Students can communicate with peers across the state, nation and world. Parents & family can even participate as well.

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CREATIVE PLAY: INTEGRATING ART INTO PLAYGROUNDS

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Children are at an age group that is imaginative, creative, and active. Children at all age groups are influenced by their surroundings, particularly in school-aged children (Frost, 2009). At this age, physical, emotional, social, and intellectual developmental characteristics are advancing in relation to their surrounding environments. Currently, uniform playgrounds have diminished the opportunities for today's youth to develop their personal creativity and imagination through play (Thompson 2007, Solomon 2005). By integrating art into playgrounds, these environments will offer children greater opportunity for developmental enrichment through their interactions with the site. Researched cases of art and play have inspired the development of typologies. A typology is a collection of quintessential ways that settings for play can be visually and experientially enriched by art. The six develped typologies include 'Site Design as Art' illustrating artful play environments through landform and 'Art as Classic Play Elements' which reinvents the classic play elements of swinging, sliding, and climbing as sculptural forms. This process began with a collection of 22 precedents that demonstrated art in a play setting categorized by designer. Followed by analysis matrices identifying primary and if applicable, secondary placement for each of the precedents in the six developed typologies. Also classified was type of art, high or vernacular, for each precedent. These typologies can be used by communities, designers, and educators as inspiration for renovation of old and designing of new play spaces. The research methodology was an iterative process of literature and precedent research followed by the distillation of types, further research, and refinement of framework.

Relevance of Research to State-related Topic(s)

It is well understood that the foundations of education come from the quality and type of education children have during elementary school. However, these foundations for childhood development lie both within and beyond the classroom. While play has some obvious benefits towards children's physical health and development, it is important to realize the greater benefits art and play has to a child's emotional, social, and intellectual development. Art integrated playgrounds are critical in fostering children's attitudes and habits towards creativity and play as they gain the opportunity to experience art first hand while interacting with site and sculptural form. Through creative play children gain a greater appreciation for art and culture, in turn becoming more well rounded individuals.

DIETARY INTAKES OF OMEGA-3 FATTY ACIDS AMONG SOLDIERS DEPLOYING TO COMBAT

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Background: Psychological health problems and human error are leading causes of death and disability among military service members. One theory gaining acceptance is the postulation that omega-3 fatty acids are deficient and that ensuring adequate intakes may mitigate the growing psychological health crises in the US military. Objective: To evaluate dietary intakes of omega-3 fatty acids among soldiers prior to deployment to combat areas. Procedure: Two hundred fifty-four soldiers scheduled for deployment to Iraq completed a food frequency questionnaire designed to measure consumption of foods rich in long-chain omega-3 fatty acids. Soldiers were from Ft. Riley, Kansas (n = 95) and the Texas National Guard (n = 159). Results: Intakes of long-chain omega-3 fatty acids ranged from 0 to 2,320 mg/day with a mean of 297.8 mg/day. Overall, 43.7% (n = 111) consumed seafood at least twice per week, 11.8% (n = 30) reported taking an omega-3 supplement, and 16.5% (n = 42) reported they had eaten an omega-3 enriched food. Frequent seafood consumption was more common among the Texas soldiers, with 49.1% (n = 78) consuming seafood at least twice weekly compared to only 34.7% (n = 33) among the Ft. Riley soldiers; $X (1, N = 254) = 4.956$, $p = .026$. Consumption of omega-3 supplements, omega-3 enriched foods, and sushi did not differ by location. Conclusion: Many deploying soldiers are consuming seafood less frequently than recommended. In addition, soldiers from Ft. Riley consumed seafood less frequently than the soldiers from the Texas National Guard.

Relevance of Research to State-related Topic(s)

Military related psychological health problems and human error are leading causes of death and disability among service members. As a result of the mounting evidence supporting their role in neurological functioning, omega-3s are believed to play a critical role in cognitive performance and psychological resilience. Unfortunately, little is known about the omega-3 intakes of military service members. This is especially true, as numerous new supplements and omega-3 enriched food products become available. Kansas is home to three major military installations and numerous National Guard and Army Reserve Units. Issues that affect the military, ultimately impact the state. The objectives of this study are to: 1) measure soldiers' dietary intakes of omega-3s and 2) advance the body of knowledge related to the cognitive and neuroprotective benefits of omega-3 fatty acids. This research is relevant and timely with regard to the health and well-being of Kansas's service members and veterans.

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USING DATA-MINING TO CLASSIFY STUDENT BEHAVIORS

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The main objective of the study is to identify the general characteristics of groups within a typical Studio College Algebra class and then adapt aspects of the course to best suit their needs. In a College Algebra class of 1,200 students, like those at Kansas State University, the greatest obstacle to providing personalized, effective education is the anonymity of the students. Data mining provides a method for describing students by making sense of the large amounts of information they generate. Instructors may then take advantage of this expedient analysis to adjust instruction to meet their students' needs. Using exam problem grades, attendance points, and homework scores from the first four weeks of a Studio College Algebra class, we were able to identify five distinct clusters of students: Overachievers, Underachievers, Employees, Rote Memorizers, and Sisyphian Strivers. Several targeted interventions are currently being developed to benefit underperforming groups of students. By identifying students who are likely to struggle within the first month of classes, instructors can intercede in time to improve performance. In order to improve placement of incoming students, new student services and student advisors across campus have been given profiles of the student clusters and placement suggestions. Currently, work is being done to automate the process by adding a small section to the online placement exam that helps identify student characteristics and preferences before they enroll.

Relevance of Research to State-related Topic(s)

With the current economy and financial difficulties, state governments have had to make difficult decisions regarding educational spending. In an ideal world, every college student would be guided through their studies with individual expert attention from a highly qualified, empathetic instructor. When colleges and universities are unable to provide this personal attention, using Data Mining techniques to understand large groups of students can provide a reasonable alternative. With technological advances, we can continually discover new ways to learn about students, provide instant feedback, adapt instruction and placement, and generally offer a high quality educational experience to all scholars

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AN INVESTIGATION OF WATER USAGE IN CASUAL DINING RESTAURANTS IN KANSAS

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Hospitality operations are considered the heaviest consumers of energy and water per square foot of building space among commercial industries. Water and its processing may make up more than 80% of hospitality operations' utility costs, and will continue to increase due to infrastructure upkeep, higher demand, and climate change effects. Implementing water efficiency in Kansas restaurants could save two billion gallons of water each year. Studying the current water usage in Kansas restaurants may result in decreased costs, increased awareness and more sustainable water use. The purposes of this study are to (1) identify water usage via metrics employing water and sales data from a sample of Kansas' casual dining restaurants (CDR's) and (2) determine whether the antecedents of behavioral intent can predict owner intent to reduce water use using the Theory of Planned Behavior (TpB). Objectives include:

1. Establish how much water is currently used across multiple metrics in CDR's.
2. Understand differences of water use metrics in CDR's between location, type of food, type of ownership, kitchen equipment, and revenues.
3. Using TpB, ascertain owner's intent to decrease water usage.

Relevance of Research to State-related Topic(s)

Water levels of aquifers in Western Kansas are decreasing at alarming rates jeopardizing economic stability for agriculture, livestock operations, manufacturing, energy production, and domestic supply. Climate change is increasingly affecting surface water which primarily provides water for the Eastern half of Kansas and approximately two-thirds of the population. This study determines the benchmarks of water use in restaurants and provides a springboard into determining potential water use efficiencies for Kansas. By involving restaurant owners and understanding their attitudes toward water use it is possible to develop methods for marketing water efficient methods to the controllers of the industry. Decreasing water use by Kansas restaurants directly impacts local economies by reducing energy consumption, infrastructure needs, and water demand. Additionally, because restaurants are able to reach an overwhelming percentage of Kansans, they may be used to market water education by educating public consumers.

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