17TH ANNUAL
K-STATE RESEARCH FORUM

THURSDAY, MARCH 8, 2012
K-STATE STUDENT UNION

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

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Awards Ceremony

4:00 – 5:00 Big XII Room

The awards ceremony will include a keynote address by Dr. Stephen Higgs, Associate Vice President for Research, Biosecurity Research Institute Research Director, and Virginia and Perry Peine Biosecurity Chair in the Department of Diagnostic Medicine and Pathobiology.

Oral Session Schedules

Graduate Interdisciplinary Research
Big XII Room
9:00AM – 12:15PM

9:00 **A FIELD EVALUATION OF LEAD TRANSFER FROM URBAN SOILS TO VEGETABLES**
Chammi Attanayake

9:15 **COMPARISON OF TWO PLANTS FOR AZO DYE DECOLORIZATION**
Rohit Kamat

9:30 **NUTRITIONAL ENHANCEMNET OF SOYBEAN MEAL**
Liyan Chen

9:45 **TILLING WHEAT FOR FUNCTIONAL FOOD APPLICATIONS**
Anupama Joshi

10:00 **INTENSE RAINFALL EVENTS DISTRIBUTION PATTERN IN THE STATE OF KANSAS**
Vahid Rahmani

10:15 **EFFECT OF SURFACE PRETREATMENT ON Al_2O_3/ N-GaN METAL OXIDE SEMICONDUCTOR CAPACITORS**
Tashfin Hossain

BREAK

10:45 **INFLUENCE OF TEMPERATURE ON ALD TITANIUM OXIDE AS THE GATE DIELECTRIC MATERIAL ON N-TYPE SILICON METAL-OXIDE-SEMICONDUCTOR (MOS) CAPACITORS**
Daming Wei

11:00 **ADHESION INTERACCTIONS OF PROTEIN-BASED FUNCTIONAL GROUPS WITH CELLULOSE USING THE JKR TECHNIQUE**
Nassim Rahmani

11:15 **THE GEOGRAPHY OF NATURE ACCESS: HOW SOCIOECONOMIC FACTORS AND HOUSING CHOICE INFLUENCE A CHILD'S ACCESS TO NATURE**
Jonathan Knight

11:30 **STUDY OF ORGANIZATIONAL IDENTITY: OFFERING STUDENT INTERNSHIP PROGRAM FOR POSITIVE ORGANIZATIONAL IDENTITY EFFECT**
DaJung Woo

11:45 **VIOLENCE AND RESISTANCE: AN INTERSECTIONAL STUDY OF LESBIANS AND QUEER WOMEN AND STREET HARASSMENT**
Laura Logan

12:00 **SELF-ASSEMBLY PEPTIDE HYDROGEL AS INJECTABLE 3D CELL CULTURE WITH QUICK CELL RECOVERY FROM HYDROGEL MATRIX**
Hongzhou Huang

Graduate Agricultural Sciences
Flinthills Room
9:00AM – 12:15PM

9:00 **PROSTAGLANDIN E_2 SYNTHASE IN THE BLACKLEGGED TICK, *IXODES SCAPULARIS***
Joshua Urban

9:15 **EFFICACY OF SYSTEMIC INSECTICIDES AGAINST THE CITRUS MEALYBUG, *PLANOCOCCUS CITRI* (HEMIPTERA: PSEUDOCOCCIDAE)**
Amy Willmott

9:30 **INTEGRATED PEST MANAGEMENT STRATEGIES FOR A TERRESTRIAL ISOPOD, *ARMADILLIDIUM VULGURE*, IN NO-TILL SOYBEAN PRODUCTION**
Serine Alfaress

9:45 **WITHIN FIELD SPATIAL DISTRIBUTION OF *DECTES TEXANUS* (COLEOPTERA: CERAMBYCIDAE) IN KANSAS SOYBEAN (*GLYCINE MAX* L.)**
Alice Harris

10:00 **EFFECT OF SALT REDUCTION ON GROWTH OF *LISTERIA MONOCYTOGENES* IN MEAT AND POULTRY SYSTEMS**
Nigel Harper

10:15 **OPTIMIZATION OF SINGLE CELL OIL PRODUCTION FROM OLEAGINOUS YEAST USING FED-BATCH FERMENTATION**
Kyle Probst

BREAK

10:45 **MIXING BEHAVIOR AND STRUCTURAL PROPERTIES OF DOUGH SYSTEMS AT CONSTANT AND OPTIMIZED WATER ABSORPTION LEVELS**
Hyma Gajula

11:00 **HYDRATION KINETICS AND MECHANICAL DEFORMATION PROPERTIES OF WHEAT KERNELS**
Paul Mitchell

11:15 **COMMINGLING LEVELS OF STORED-GRAIN INSECT POPULATIONS IN WHEAT AND CORN FROM BUCKET ELEVATOR BOOTS**
Dennis Tilley

11:30 **THERMOMECHANICAL TREATMENT OF FUNCTIONAL WHEAT FLOUR FRACTIONS**
Moses Khamis

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Lauren Brewer

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Qingyu Wu

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9:30AM – 11:00AM

9:30 **THE ROLE OF NEURONAL NITRIC OXIDE SYNTHASE IN CARDIOVASCULAR CONTROL**
Gabrielle Sims

9:45 **REGULATION OF GAP JUNCTIONS IN COLON CANCER CELLS**
Kristina Bigelow

10:00 **FUNDRAISING PROJECT PROVIDES FOOD PRODUCTION EXPERIENCE FOR FRESHMAN**
Daniel Neely

10:15 **COMMERCIAL SCALE APPLE BUTTER PROCESSING PROVIDES REAL WORLD LEARNING EXPERIENCE FOR UNDGRADUATE FOOD SCIENCE STUDENTS**
Alex Maxwell

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Josh Sinning

10:45 **DEVELOPMENT OF CHOCOLATE TRUFFLES FOR THE FOOD SCIENCE CLUB**
Sarah Falke

Graduate Engineering/Math/Physical Sciences
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12:15 **AN ULTRASENSITIVE CHEMILUMINESCENCE METHOD FOR TRACE BLOOD DETECTION USING LUMINOL-LABELED GOLD NANOPARTICLES**
Lateef uddin Syed

12:30 **SYNTHESIS OF METAL SALEN COMPLEXES WITH CYCLOBUTYL BACKBONE**
Smita Patil

12:45 **WHEAT FIBER FOR MORE SUSTAINABLE CEMENT MORTAR**
Mohammed Albahttiti

1:00 **A COMBINED SOFT COMPUTING-MECHANICS APPROACH TO INVERSELY PREDICT DAMAGE IN BRIDGES**
Ahmed Al-Rahmani

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Dulan Weerasinghe

1:30 **MID-MIOCENE SILICIC VOLCANISM IN THE OWYHEE MOUNTAINS (ID): LOCAL PHYSICAL AND GEOCHEMICAL CHARACTERISTICS AND IMPLICATIONS FOR REGIONAL MAGMATISM LINKED TO THE INCEPTION OF THE YELLOWSTONE HOTSPOT**
Zachary Hasten

BREAK

2:00 **THE ROLE OF BASALTIC MAGMATISM IN THE EVOLUTION OF THE CAMBRIAN SOUTHERN OKLAHOMA AULACOGEN: GEOCHEMICAL AND ISOTOPIC CONSTRAINTS ON THE MAFIC ROCKS IN THE ARBUCKLE MOUNTAINS, OK**
Casey Bulen

2:15 **STUDY OF HIGH FLUORIDES IN GROUNDWATER IN PARTS OF EASTERN INDIA: GEOCHEMICAL AND HEALTH IMPLICATIONS.**
Sankar Manalilkada Sasidharan

2:30 **CHEMICAL HYDROGEOLOGIC INVESTIGATION OF TUNGSTEN IN GROUNDWATERS - AN EMERGING CONTAMINANT**
Chad Hobson

2:45 **DESIGNING PITCH AND TORQUE CONTROLLERS FOR WIND TURBINES USING FUZZY METHOD**
Pourya Shahmaleki

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Andrew Jones

Graduate Biological Sciences
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12:15 **EFFICACY OF NITRIC OXIDE TREATMENTS TO IMPROVE PERIPHERAL VASCULAR FUNCTION: IMPLICATIONS FOR CHRONIC HEART FAILURE**
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Samuel Molina

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Sriram Varahan

1:00 **ECM29 ACTS AS A NEGATIVE REGULATOR OF THE PROTEASOME**
Alina De La Mota-Peynado

1:15 **MICROBIAL COMMUNITY ASSEMBLY IN A PRIMARY SUCCESSIONAL GLACIER FOREFRONT**
Shawn Brown

1:30 **CONTRIBUTION OF ALTERNATE SIGMA FACTOR (RpoN) TO ENTEROCOCCAL INFECTIVE ENDOCARDITIS**
Vijayalakshmi Iyer

BREAK

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Daniel Carter

2:15 **OXYGEN DEPRIVATION LEADS TO PHOSPHOLIPID BILAYER DISRUPTION AND PRODUCTION OF EICOSANOIDS IN ENDOTHELIAL CELLS**
Emily Archer Slone

2:30 **PROTEASE ASSAYS FOR THE DETECTION OF CANCER**
Dinusha Udukala

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Ranjni Chand

3:00 **VACCINE INDUCED IMMUNITY IN A PORCINE CIRCOVIRUS TYPE 2 AND PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS CO-INFECTION MODEL**
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Allison Bryan

Graduate Social Sciences/Humanities/Education
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12:30 **THE ESSENCE AND OUTCOMES OF EFFECTIVE INTERNSHIP LEARNING EXPERIENCES**
Kerri Keller

12:45 **U.S. STATE-LEVEL IMPACTS OF VARIOUS ENERGY PRICE SHOCKS ON ECONOMIC ACTIVITY**
Mark Melichar

1:00 **TOWARD NON-TRADITIONAL GENDER ROLES IN FARMING HOUSEHOLDS IN KANSAS?**
Sarah Beach

1:15 **ROUTINE JUSTICE: A MULTIVARIATE ANALYSIS OF POLICE ACTIONS IN ROUTINE TRAFFIC STOPS USING NATIONAL DATA**
Jeremy Briggs

1:30 **PRIVACY IN THE WORKPLACE THROUGH A CULTURAL LENS**
Nadia Aguayo

BREAK

2:00 **FOUR GENERATIONS, ONE WORKPLACE**
Felicia Balestrere

2:15 **IMPACT OF LIGHT AND COLOR IN OFFICE DESIGN**
Joshua Burkhart

2:30 **A REVIEW OF SUSTAINABLE MECHANICAL SYSTEMS AND ITS CONTRIBUTIONS TO THE OFFICE ENVIRONMENT**
Darra Draheim

2:45 **A FRESH INSIGHT INTO OFFICE ERGONOMICS**
Kristin Henry

3:00 **IMPORTANCE OF WAYFINDING AND SIGNAGE IN CORPORATE DESIGN**
Alexis Kiel

Poster Titles and Presenters

Graduate Student Posters
KS Ballroom
On display 9:00AM – 5:00PM
Judging: 10:00AM – 12:00PM, 1:00PM – 3:00PM

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   Lorena Gomez

2. **A SINGLE HISTIDINE RESIDUE IN THE NUCLEAR EXPORT SEQUENCE OF THE GATA TRANSCRIPTION FACTOR AreA IS REQUIRED FOR NUCLEAR EXPORT**
   Damien Downes

3. **THE GATA TRANSCRIPTION FACTOR AreA HAS MULTIPLE NUCLEAR LOCALIZATION SEQUENCES SUFFICIENT FOR NUCLEAR ACCUMULATION.**
   Cameron Hunter

4. **CELL-MEDIATED MAGNETIC HYPERTHERMIA OF PRECLINICAL TUMORS**
   Sivasai Balivada

5. **IMPROVED SOIL AGGREGATE CRUSHING-ENERGY METER**
   Jeremy Meeks

6. **STUDY OF FRACTAL AGGREGATES USING SMALL ANGLE LIGHT SCATTERING**
   Raiya Ebini

7. **FLUX GROWTH OF CUBIC BORON PHOSPHIDE CRYSTALS**
   Ugochukwu Nwagwu

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   Chelsey King

9. **HEIRLOOM TECHNIQUES AS SUSTAINABLE TEXTILE DESIGN SOLUTIONS: LOCAL NATURAL DYE SOURCES AND HAND-WOVEN TEXTILES**
   Erin Monfort-Nelson

10. **FITNESS GAINS FROM A SUMMER YOUTH CONDITIONING CAMP**
    Pratik Patel

11. **COOLING FOODS IN SCHOOL FOODSERVICE OPERATIONS**
    Amber Grisamore

12. **DESCRIPTIVE ANALYSIS OF MEAT RECALLS FROM 1982-2009 IN THE U.S.**
    Sandra Contreras

13. **AID OR CONFLICT? A GAME THEORETIC APPROACH**
    Katherine Kidder

14. **CREATING INCLUSIVE ADVISING/MENTORING FOR *BICULTURAL AFRICAN-AMERICAN PERSONALITIES IN A MAJORITY MAINSTREAM HIGHER EDUCATION ENVIRONMENT***
    Grizelda MacDonald

15. **THE LONGITUDINAL ASSOCIATION BETWEEN CHILD TEMPERAMENT, PARENTAL ENGAGEMENT, AND PARENTAL STRESS IN A POPULATION OF SINGLE MOTHERS**
    Micha Berryhill

16. **THE IMPACT OF SMALL TOWN/RURAL COMMUNITY YOUTH DEVELOPMENT PROJECTS ON YOUTHS' PERCEPTION OF SOCIAL CAPITAL AND COMMUNITY HEALTH STATUS**
    Sean Jefferson

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    Joelyn Foy

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    Nathan Keep

19. **SUPPRESSION OF SOIL FUNGI ON BIOPHYSICAL PROPERTIES INVOLVING CARBON DYNAMICS**
    Priscilla Mfombep

20. **MICROBIAL ECOLOGY OF STABLE FLIES: EFFECT OF BACTERIAL COMMUNITY OF AGING HORSE MANURE ON STABLE FLY OVIPOSITION AND LARVAL DEVELOPMENT**
    Thais Albuquerque

21. **PYRETHRIN AEROSOL FOR PEST CONTROL IN FOOD FACILITIES**
    Kabita Kharel

22. **ESTIMATING EVAPOTRANSPIRATION IN TURFGRASS: COMPARISON AMONG MEASUREMENT TECHNIQUES**
    Kenton Peterson

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    Anthony Goldsby

24. **VARIATION IN SUSCEPTIBILITY OF INSECTS ASSOCIATED WITH KANSAS FARM-STORED GRAIN TO INSECTICIDES RECOMMENDED FOR EMPTY BIN TREATMENTS**
    Blossom Sehgal

Undergraduate Student Posters
KS Ballroom
On display 9:00AM – 5:00PM
Judging: 1:00PM – 3:00PM

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Yingnan Zhao

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Johanna Diaz

27. LIGHT SCATTERING FROM AEROSOLS INCLUDING SOOT AND EFFECTS ON CLIMATE
Matt DeCapo

28. EFFECT OF REDUCED-SODIUM SALT IN BREAD BAKING
Juhui Jeong

29. A QUALITATIVE STUDY OF SINGLE-TRAUMA AND DUAL-TRAUMA MILITARY COUPLES
Sara Devine

9th Annual Capitol Graduate Research Summit posters
KS Ballroom
On display 9:00AM – 5:00PM
Judging: 1:00PM – 3:00PM

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Miguel Arango

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Vuyiswa Bushula

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Ximena Cibils Stewart

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Steven Klankowski

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Jingqun Ma

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Ayomi Perera

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Stephanie Shishido

37. FEASIBILITY OF USING LIGNIN- A PLANT DERIVED MATERIAL FOR INCREASED SUSTAINABILITY OF RURAL TRANSPORTATION LIFELINES
Wilson Smith

38. SHELF LIFE OF FIVE MEAT PRODUCTS DISPLAYED UNDER LIGHT EMITTING DIODE OR FLUORESCENT LIGHTING
Kyle Steele

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Theresa Young

Oral Presentation Abstracts

Graduate Interdisciplinary Research

A FIELD EVALUATION OF LEAD TRANSFER FROM URBAN SOILS TO VEGETABLES

Chammi Attanayake[1], Ganga Hettiarachchi[1], Phillip Defoe[1], Sabine Martine[2], and Gary Pierzynski[1]
[1]Department of Agronomy, College of Agriculture; [2]Center for Hazardous Substance Research, College of Engineering

Development of urban gardens can be complicated by the contaminants in urban soils. Lead (Pb) is one of the most abundant contaminant in urban soils. A field experiment was conducted on a community gardening site in Kansas City, Missouri to assess potential risk from both direct (i.e., ingestion) and indirect exposure (i.e., food-chain transfer) to soil Pb. Tomato, swiss chard and carrot were grown to evaluate plant Pb uptake. The experimental design was a randomized complete block with split plot arrangement. The main plot factor was compost addition (28 kg/m^2). Lead in edible portions was determined after following two cleaning procedures which represent sub plot factors: cleaning with (1) tap water only (2) 5 g/L sodium lauryl sulfate, followed by deionized water (laboratory cleaning). Lead concentration in soils ranged from 60 to 385 mg/kg. Compost addition diluted soil Pb concentration by ~59%. In compost added plots, Pb concentrations were 59% lower in swiss chard and 20% lower in carrot compared to controls, respectively. Laboratory cleaned swiss chard and tomato had 67 and 73% lower Pb concentration, respectively compared to swiss chard and tomato cleaned with tap water, while method of cleaning was not significant for Pb concentration of carrot. Compost addition did reduce bioaccessible Pb (to humans) as determined by physiologically based extraction test (an in vitro bioaccessibility test) at pH 2.5. Addition of compost and thorough cleaning of vegetables reduce potential for both food-chain transfer of Pb and direct transfer of soil Pb to humans.

COMPARISON OF TWO PLANTS FOR AZO DYE DECOLORIZATION

Rohit B. Kamat and Lawrence C. Davis
Department of Biochemistry, College of Arts and Sciences

Azo dyes are known to be major human carcinogens besides causing water pollution. Use of these dyes is banned in the EU countries and US but the release of these dyes into water bodies is still a cause of concern in the developing nations. Enzymes namely laccases and peroxidases isolated from fungi, are presently being explored in decolorizing these dyes while rarely employing whole plants. The goal of our work is to identify and characterize the groups of enzymes from the roots of plants, Arabidopsis thaliana and sunflower (Helianthus annuus), which are involved in the breakdown of the azo dyes, methyl red and methyl orange. Hydroponically cultivated Arabidopsis thaliana and sunflower plants were treated with 20 mg/L solutions of methyl red or methyl orange prepared at two pH values, 4.6 and 6.3 in the presence or absence of added hydrogen peroxide. We have found out that both the plants were able to efficiently decolorize 80-90% of methyl red in two days. Presence of peroxide did not accelerate the decolorization of the dye, hinting towards the possibility of laccase being involved. Methyl orange on the other hand required a mediator like ABTS [2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid)] and peroxide to achieve around 50-60% decolorization within two days, signifying the presence of peroxidase. These observations point towards the possibility of the plant employing two different pathways to decolorize dyes, depending on the substrate available in the environment. Regulation of the genes involved in the dye decolorization are some of the other objectives being explored.

NUTRITIONAL ENHANCEMNET OF SOYBEAN MEAL

Liyan Chen and Praveen V. Vadlani
Department of Grain Science & Industry, College of Agriculture

Soybean meal is the residue of soybean oil processing and it is mainly used for monogastric animal. Soybean meal is high in protein content (around 50%) and rich in lysine, which makes it a good protein source for feeding. But the antinutritional factors, trypsin inhibitor and oligosaccharides, in soybean meal influence its nutritional value. Large molecular weight makes the protein harder to be digested. Phosphorous in the phytate form is not available for monogastric animals. In the current research, soybean meal is fermented by *Aspergillus oryzae* and *Rhizopus oligosporus*. Trypsin inhibitor, oligosaccharides, protein molecular size and phytic acid content will be analyzed. Trypsin inhibitor and oligosaccharides contents are expected to be decreased. Protein will be hydrolyzed to smaller peptides, and available phosphorous will be released from phytic acid.

TILLING WHEAT FOR FUNCTIONAL FOOD APPLICATIONS

Anupama Joshi, Nidhi Rawat, Duane L.Wilson, and Bikram S. Gill
Department of Plant Pathology, College of Agriculture

Around 2,500 years ago, Hippocrates stated, "Let food be thy medicine and medicine be thy food". Wheat is a staple food and source of 22% calories for the world's population. Wheat food components such as starch can be modified to provide health benefits beyond being sources of energy such as high amylose 'resistant starch' wheat. Resistant starch has many physiological benefits. Unlike other fiber containing foods, resistant starch does not have any effect on taste and texture of food. We are using TILLING (Targeting Induced Local Lesions IN Genomes) for development of wheat lines with high resistant starch content. We have an EMS induced M2 mutant population of 1296 individuals (4x pooled) in a popular hard red winter bread wheat variety 'Jagger' which is being used to screen for mutations in the important genes of starch synthesis pathway namely, *Starch branching enzyme* (*SBE*), *Starch synthase I* (*SSI*), *Starch synthase II* (*SSII*), *Waxy* (*Wx*), *Sucrose transporter* (*Sut*), and *ADP glucose pyrophosphorylase L & S subunit* (*ADPgpL/S*). We have developed genome specific primers and their specificity was confirmed by aneuploid stocks. Standard TILLING method of heteroduplexing, Cel-I endonuclease digestion followed by visualization using agarose gel electrophoresis was used. We have observed an average mutation rate of ~ 1/50 kb for the genes studied. Sequencing of the mutants is being done to identify knock-outs and functional mis-sense mutants. Homozygous mutants will be studied for starch functional analysis and for producing homozygous lines at all three homoeoloci for each target gene.

INTENSE RAINFALL EVENTS DISTRIBUTION PATTERN IN THE STATE OF KANSAS

Vahid Rahmani[1], Stacy L. Hutchinson[1], Shawn Hutchinson[2], A. Swamy[3]
[1]Department of Biological & Agricultural Engineering, College of Engineering; [2]Department of Geography, College of Arts & Sciences; [3]Department of Agronomy, College of Agriculture

Since 1961, no updated rainfall distribution analyses have been completed for Kansas. With growing concern about the impacts of global climate change and the predictions of more extreme weather events, it is necessary to explore rainfall distribution patterns with the most current and longest data available. In this study, the extreme rainfall frequency was analyzed using daily precipitation data (1920 to 2009) from 24 stations in KS, 4 stations in CO, 4 stations in OK, 4 stations in MO, and 3 stations in NE. The Weibull distribution was used to calculate the probability distribution frequency at each site. All point data was spatially interpolated using kriging in ArcGIS10. The overall analysis showed an increase in extreme precipitation events with a precipitation trend from Southeast to Northwest, higher extreme event values to lower. On average, an increase of approximately 3% was found for the period of 1980-2009 compared to 1920-1949 for the 2-year return period events, and 6% for the period of 1980-2009 compared to 1920-1949 for the 100-years return period events. When comparing results with the original 1961 analysis, there was an increase of around 7% for the period of 1980-2009 for 2-year return period, and a decrease of around 16% for the period of 1980-2009 for the 100-year return period. This is most likely a result of the short data period used to calculate the 1961 probability distribution frequency. The data showed a shift in rainfall distribution patterns across both time and space. This shift changes the design criteria for water management systems, both runoff control and storage structures.

EFFECT OF SURFACE PRETREATMENT ON Al_2O_3/ N-GaN METAL OXIDE SEMICONDUCTOR CAPACITORS

Tashfin Hossain, Daming Wei, and J.H. Edgar
Department of Chemical Engineering, College of Engineering

In recent years, there has been tremendous interest on GaN based III–V semiconductors to fabricate high speed, high temperature and high power electronic devices due to its remarkable properties: a wide bandgap (3.4 eV) and high breakdown voltage (3MV/cm). However, the performance of these devices is affected by the dielectric-semiconductor interface quality and the reliability of its insulating dielectric, typically Al_2O_3, and its ability to reduce gate leakage currents. In this study, the electrical properties of Al_2O_3 on GaN were analyzed as a function of the oxide's synthesis conditions. The impact of two process parameters were examined: (1) the GaN surface pretreatment and (2) the post Al_2O_3 deposition annealing temperatures (600°C, 700°C) in nitrogen ambient on Al_2O_3/ n-GaN MOS capacitors. Al_2O_3 was grown thermally by atomic layer deposition at 280°C. The n-GaN surface was varied and included Piranha etch (H_2O_2:H_2SO_4 =1:5), $(NH_4)_2S$ and 30% HF etches. The piranha pretreatment produced the lowest hysteresis in capacitance-voltage (C-V) characteristics. The leakage current density was on the order of 10^{-5} A/cm^2 at 0V from current–voltage (I-V) measurement with Piranha and HF pretreatment. X-ray photoelectron spectroscopy (XPS) revealed that the piranha pretreatment led to the lowest carbon concentration at the oxide-semiconductor interface and that annealing the samples reduced surface contamination. The Piranha pretreatment led to the minimum Al_2O_3 surface roughness of 0.4 nm, as determined by atomic force microscopy (AFM). GaN power devices can hugely improve the performance of future generations of wireless and satellite communications, military electronics and hybrid electric vehicles.

INFLUENCE OF TEMPERATURE ON ALD TITANIUM OXIDE AS THE GATE DIELECTRIC MATERIAL ON N-TYPE SILICON METAL-OXIDE-SEMICONDUCTOR (MOS) CAPACITORS

Daming Wei, Tashfin Hossain, and James Edgar
Department of Chemical Engineering, College of Engineering

Metal oxide semiconductor field effect transistors (MOSFETs) are important to electronics such as integrated circuits in computers and cell phones. According to Moore's Law, to continually improve the performance of these devices, their size must decrease by half every 2 years. To realize this, the device's gate oxide (traditionally SiO_2) must be reduced to thinner and thinner thicknesses, but once it reaches 5nm, it fails to adequately insulate the transistor's gate from the channel. Consequently, a new insulator material is required that can further minimize the gate and storage capacitor size while keeping capacitance and leakage current values at a tolerable level. With its high dielectric constant, ~25, TiO_2 is a candidate dielectric as an alternative to SiO_2 in the gate dielectric of MOSFET. This paper reports on the influence of the deposition temperature on the structure, composition, and electrical properties of TiO_2 thin films on silicon, as prepared by atomic layer deposition (ALD). TiO_2 layers around 20nm thick were deposited at different temperatures ranging from 100 to 300°C. Samples deposited at 250 and 200°C had the most uniform coverage as determined by atomic force microscopy. Furthermore, for 200°C, the average carbon concentration through out the oxide layer and TiO_2/Si interface was lower than the other samples. Also, the transition from accumulation to depletion was sharp and without any hysteresis, as profiled by C-V measurement. Thus, the best quality ALD TiO_2 was at the 200°C deposition temperature.

ADHESION INTERACCTIONS OF PROTEIN-BASED FUNCTIONAL GROUPS WITH CELLULOSE USING THE JKR TECHNIQUE

Nassim Rahmani[1], Eve Metto[2], Kevin Lease[1], and Christopher T. Culbertson[2]
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The objective of this research was to utilize the Johnson-Kendall-Roberts (JKR) technique of contact mechanics to characterize adhesion behavior of candidate bio-polymeric wood adhesive systems. In general, the JKR technique consists of bringing a hemispherical probe in contact with a smooth surface followed by pushing the probe against that surface and then retracting the probe until separation. Because of the complexities involved with using wood in a contact mechanics based study, a model material system was used. This system consisted of a cellulose substrate to represent the wood and a surface functionalized PDMS lens. These functional groups were chosen to represent key structures in protein-based bio-polymers that may be candidate bio-adhesives for use with wood. JKR tests were performed using a total of 4 functional groups including both hydrophilic and hydrophobic groups, such as amine, carboxylic acid, thiol, and hydrocarbon groups. Baseline results (non-functionalized PDMS lens) show that removing free chains in the PDMS by extraction increases adhesion hysteresis on cellulose surfaces compared to un-extracted PDMS. It is expected that the functional groups attached to the PDMS lens surfaces will further alter adhesion hysteresis in the way that polar groups increase adhesion hysteresis while non-polar groups reduce it. The final results of this study will assist the development/evaluation of protein-based bio-adhesives for use in the forest products industry.

THE GEOGRAPHY OF NATURE ACCESS: HOW SOCIOECONOMIC FACTORS AND HOUSING CHOICE INFLUENCE A CHILD'S ACCESS TO NATURE

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Experiences in natural environments are perceived as a human necessity. Additionally, studies show that nature access has emotional, cognitive, and psychological benefits for children. This geospatial analysis employs Geographic Information Systems (GIS) technology and site analysis to assess whether or not socioeconomic factors, and their influence on housing choice, affect a child's access to nature. The study includes measures of socioeconomic status and how these factors influence a child's access to nature within private spaces, parks/open space, and neighborhood school grounds. The implication is that communities can focus public resources and planning efforts in areas lacking access to nature for children. This leads to geographically less segregated neighborhoods and improved equity in nature access across a community.

STUDY OF ORGANIZATIONAL IDENTITY: OFFERING STUDENT INTERNSHIP PROGRAM FOR POSITIVE ORGANIZATIONAL IDENTITY EFFECT

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Organizations offer student internship programs to mentor and attract valuable future employees. Further, educational institutions incorporate internship experiences into curriculum to prepare students for paid labor. Although most believe that internship programs are beneficial, less is known about how student interns influence organizational identity. Organizational Identity is the "concept that organizations use to characterize aspects of themselves" (Albert & Whetten, 1985, p. 264). This study contributes to theoretical understanding of organizational identity by considering the influence of interns on organizations. Additionally, cultural aspects are considered by including US and South Korea organizations using quantitative and qualitative methodologies. Research questions ask: Does organizational identity change as a result of student internship programs? How are future employees' affected by organizational identity throughout their internship tenure? Does organizational identity influence student interns' desire to apply to the organization? Expected results are, (H1) organizations offering student internship programs view their identity to be *younger*, *more vibrant/diverse*, and *open/engaging* than before having internship programs, (H2) student interns consider/expect future employers to be similar to the organizational identity experienced as an intern, and (H3) student interns are more likely to identify with the organization for which they interned, in turn, desiring permanent employment. This interdisciplinary study extends scholarly understanding of organizational identity by including research from communication, business, and cultural studies, considering the mutual influence of interns and organizations, and contributing to understanding of intern expectations based on organizational identity. Further, practical applications of this information could enhance an organization's ability strategically build beneficial internship programs.

VIOLENCE AND RESISTANCE: AN INTERSECTIONAL STUDY OF LESBIANS AND QUEER WOMEN AND STREET HARASSMENT

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Street harassment of women is a pervasive but little examined mechanism through which gender inequality is maintained in public spaces. Few scholars have observed how identities and social forces related to race, gender, class, and sexuality have intersected to influence street harassment and resistance. Using qualitative data from interviews with 28 lesbians and 2 bisexual women, I apply an intersectional lens to explore how multiple axes of oppression and/or privilege shape street harassment and resistance for lesbians and bisexual women. The data reveal racialized, gendered, and sexualized messages about public space and suggest that street harassment operates to serve gender, race, class, and sexuality inequalities.

SELF-ASSEMBLY PEPTIDE HYDROGEL AS INJECTABLE 3D CELL CULTURE WITH QUICK CELL RECOVERY FROM HYDROGEL MATRIX

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Development of *in vitro* three-dimensional (3D) systems for more realistic and relevant analysis results is important in regenerative medicine, controlled drug release, and other innovative medical technologies. We produce a self-assembling peptide hydrogel by directly mixing peptide solution with a cell medium. The hydrogel performs specific shear-thinning and quick reassembly rheological properties, which allow the multiple times delivery of this hydrogel via pipette without permanently destroying the hydrogel architecture. Human epithelial cells, MCF-7, are encapsulated homogeneously in the hydrogel matrix and grow as colony-like clusters in 3D, reminiscent of a tumor *in vivo*. The cell growth rate in the hydrogel matrix is much slower than that in a 2D plastic plate and controlled by peptide concentrations. More crucially, through a simple diluting and centrifuging procedure, cell clusters can be effectively and safely isolated from the 3D hydrogel matrix, after their 1-7 days incubation. This peptide hydrogel has a high potential as biological material for 3D cell culture and other biomedical applications.

PROSTAGLANDIN E_2 SYNTHASE IN THE BLACKLEGGED TICK, *IXODES SCAPULARIS*

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Ticks are obligatory ectoparasites that feed exclusively on the blood of vertebrates and often transmit a number of pathogens, including viruses, bacteria, and protozoa. Tick-borne diseases result in substantial economic loss in the animal industry and present risks to human health. The blacklegged tick, *Ixodes scapularis,* is known to transmit the most important tick-borne pathogen, *Borrelia burgdorferi*, the causative agent of Lyme Disease. Tick salivary glands, and their secretions, contain various bioactive components that aid in the manipulation of hosts' defenses. Ticks secrete large amounts of prosaglandin E_2 (PGE_2) into the host, where it impacts the host's haemostatic response and facilitates blood feeding. PGE_2 is also known to have an autocrine or paracrine function in the tick salivary glands, likely through a PGE_2 receptor, leading to the secretion (exocytosis) of other salivary proteins. We were interested in the biosynthetic pathway of PGE2 in the tick salivary glands. We have identified and cloned a gene encoding a PGE synthase (*PGES*) ortholog in *I. scapularis*. The expression pattern, examined by quantitative reverse transcription PCR and immunohistochemistry, supports that this gene is expressed in the tick salivary glands constitutively throughout tick feeding. RNA interference suppressing the expression of the *PGES* gene resulted in the ticks' inability to successfully complete their feeding. The identification and functional study of *PGES*, along with the description of its expression patterns, provides critical information into the biosynthetic pathway of PGE_2 in the tick salivary glands, and opens the door to future studies into the disruption of tick feeding.

EFFICACY OF SYSTEMIC INSECTICIDES AGAINST THE CITRUS MEALYBUG, *PLANOCOCCUS CITRI* (HEMIPTERA: PSEUDOCOCCIDAE)

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The citrus mealybug (CMB), *Planococcus citri* is one of the most commonly encountered insect pests in greenhouse and interior plantscape environments. In order to mitigate CMB populations, systemic insecticides are applied due to a number of advantages over non-systemic insecticides. However, there is limited information available on the efficacy of commercially available systemic insecticides against mealybugs. As such, three experiments were conducted to determine the efficacy of systemic insecticides on CMB. Azadirachtin and spirotetramat were applied as both preventative (experiment 1) and curative (experiment 2) drench applications to the growing medium of red and green coleus (*Solenstemon scutellarioides*), which were inoculated with approximately 20 2^{nd}-instar CMB. Efficacy was evaluated 7, 14, and 21 days after treatment (DAT). Imidacloprid, dinotefuran, and thiamethoxam were applied at labeled rates as preventative drench applications to the growing medium of green coleus in experiment 3. Plants were inoculated with 18 2^{nd}-instar CMB one week before destructive sampling. Efficacy was evaluated 14, 21, 28, 35, 42, and 49 DAT by assessing mortality and observing CMB feeding location on each plant. Results indicated that preventative treatments of azadirachtin and spirotetramat provided minimal control based on low percent morality (<20%). Although the curative treatments provided higher percent mortality; these values were still <50%. Results from experiment 3 indicated that the systemic insecticides provided the highest CMB mortality 21 DAT. Overall, thiamethoxam had the highest percent morality (77%) compared to the other treatments. This is the first study to evaluate the efficacy of these systemic insecticides against CMB.

INTEGRATED PEST MANAGEMENT STRATEGIES FOR A TERRESTRIAL ISOPOD, *ARMADILLIDIUM VULGURE,* IN NO-TILL SOYBEAN PRODUCTION

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No-till management of soybean benefits producers by lowering input costs and retaining soil moisture, but may also provide optimal conditions for increasing populations of soil-inhabiting pests. For Kansas soybean, damaging populations of soil-inhabiting isopods (Malacostraca: Isopoda) have been observed in fields under no-tillage management. To control damage to soybean stands from feeding isopods, current management strategies need to be evaluated. Field studies were conducted in consecutive years (2009 and 2010) in two separate soybean fields within each year. All fields were under no-till management and had a history of damaging isopod populations. We evaluated the effects of chemical and cultural control combinations (seed treatment and seeding rate) on soybean stand densities exposed to natural isopod populations. Also, we evaluated the effects of burning crop residue on isopod populations and emergence rates in soybean under no-tillage management. We demonstrated that seed treatment with an insecticide is not a reliable strategy. Doubling normal seeding rates can potentially reduce the number of trips a grower makes across a field (single, high-density versus multiple, low-density plantings). In doing so, growers may save time and money (e.g., fuel). We also found burning to be an effective strategy to directly influence isopod populations but its overall effect on soybean stands needs further investigation.

WITHIN FIELD SPATIAL DISTRIBUTION OF *DECTES TEXANUS* (COLEOPTERA: CERAMBYCIDAE) IN KANSAS SOYBEAN (*GLYCINE MAX* L.)

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The soybean stem borer, *Dectes texanus* Leconte (Coleoptera: Cerambycidae) is a species native to North America that has recently become an importnant pest in soybean (*Glycine max* L.). *D. texanus* has one generation per year. Tunneling and feeding in the pith by individual larvae can account for as much as 10% in yield reduction. Monitoring adult activity within fields is important in order to gain understanding of the occurrence of larvae and for effective chemical applications to manage adults. Therefore, the objective of this study was to examine the within-field spatial distribution of adult *Dectes texanus* in several individaul soybean fields found throughout central Kansas. Soybean fields were scouted at the beginning of adult activity (late June to early July) during 2010 and 2011. Eleven fields were infested with *D. texanus* and were used for examining the spatial distribution of adults across a soybean production field. Geostatistical software was used to produce sampling grids (1 to 165 points per field) for all fields. Fields were sampled using a sweep net by performing 20 sweeps in each cardinal direction for each waypoint on the sample grid. The number of waypoints was determined by the size and shape of the field. Preliminary results suggest that there is great variation between individual fields and year depending on previous and current sourrounding crop types. Higher densities of adult *D. texanus* may depend heavily on where the previous years soybean crops were planted. Implications from these results on current management strategies will be discussed.

EFFECT OF SALT REDUCTION ON GROWTH OF *LISTERIA MONOCYTOGENES* IN MEAT AND POULTRY SYSTEMS

Nigel M. Harper and Kelly J. K. Getty
Food Science Institute

Reducing sodium in food and replacing NaCl with other types of salt could have an effect on food safety. The main objective was to determine differences in salts and salt substitutes on growth of *Listeria monocytogenes* meat and poultry systems. Fresh ground beef, pork, and turkey with NaCl, KCl, $CaCl_2$, $MgCl_2$, sea salt, and replacement salt (2.0%) were inoculated with *Listeria monocytogenes* to determine growth/survival during 5 d at 4 °C to simulate a pre-blend process. *Listeria monocytogenes* populations significantly decreased (0.41 log CFU/g) during storage time of beef, however no differences (P>0.05) were observed over time of pork or turkey. Salt type did not affect (P>0.05) *Listeria monocytogenes* populations during pre-blend storage. However, salts ($MgCl_2$ and NaCl) showed growth (P<0.05) of aerobic populations during storage. Emulsified beef and pork products were processed with NaCl, KCl, sea salt and a NaCl/KCl blend (2%) and post-processed surface inoculated with *Listeria monocytogenes* to determine growth/survival at 4 °C for 28 d. Pork products showed greater (P<0.05) *Listeria monocytogenes* population growth at all sampling times than beef products; whereas salt type had no effect on *Listeria monocytogenes* populations with all times being pooled for data analysis. Although salt types were not shown to have an impact on *Listeria monocytogenes* growth/survival in pre-blend and emulsified post-processed surface inoculated meat products, pork and turkey pre-blends and emulsified pork had greater *Listeria monocytogenes* populations compared to beef products. These studies demonstrate that sodium reduction or replacement may not affect safety of these meat and poultry products.

OPTIMIZATION OF SINGLE CELL OIL PRODUCTION FROM OLEAGINOUS YEAST USING FED-BATCH FERMENTATION

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As concerns over the increased production of renewable products (e.g. biofuels) from food crops continue, viable and non-edible resources are being sought. One potential resource may be single cell oils (SCOs) produced from yeast. Oleaginous yeast are species capable of producing high yields of SCOs, up to 70% oil (wt/wt), from non-edible feedstocks such as lignocellulosic biomass. Preliminary data showed that the SCO fatty acid profile for the oleaginous yeast *Lipomyces Starkeyi* is similar to oil-seed crops, consisting of 57% (wt/wt) C18:1, 15% C18:2, 12% C16:0, and 10% C16:1. Due to this, yeast SCOs can serve as intermediate chemicals for numerous value-added products (fuels, foods, cosmetics, lubricants, and textiles). While yeast SCOs may be a viable option for the production of non-crop based oils, various set-backs prevent SCO commercialization such as the high-cost of substrates needed for growth. The goal of this study is to optimize the growth and SCO production from the oleaginous yeast *Lipomyces Starkeyi* using low-cost nutrient sources. Results from a 2L batch fermentation under normal growth conditions resulted in a cellular biomass concentration of 12.23 g L^{-1}, a maximum growth rate of 0.29 g L^{-1} hr^{-1}, a substrate uptake rate of 0.24 g L^{-1} hr^{-1}, and an SCO yield of 7.77 % (g/g). It is anticipated that the SCO yield can be increased further using response surface methodology to optimize the fermentation conditions. The optimal conditions will be scaled up to a 7.5L lab-scale fermenter to maximize cellular biomass concentration, substrate utilization, SCO yield and SCO productivity.

MIXING BEHAVIOR AND STRUCTURAL PROPERTIES OF DOUGH SYSTEMS AT CONSTANT AND OPTIMIZED WATER ABSORPTION LEVELS

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Phytochemicals associated with the bran portion of the cereal grains have been proven to have significant health benefits like type 2 diabetes risks. The inclusion of the bran in dough systems, however, presents technological challenges. The effects of bran on dough physical properties, which are attributed to disruption of the gluten protein matrix, are not well understood on a fundamental level. The objective of this study was to investigate the effects of bran size (coarse, medium and fine) and inclusion level (0, 5, 10%) on mixing behavior and uniaxial extensional properties of dough systems of different strength and their bread quality and texture at constant and optimized water absorptions. Karl 92 (13% protein), Karl 92 diluted (10% protein) wheat flours and HRW bran was used to study the water absorption rates, mixing behavior and uniaxial extensional properties of the dough systems using Mixograph and Kieffer Rig test. Water absorption increased with increased bran percentage irrespective of bran size (62-57%) both in Karl 92 and Karl 92 diluted flours at optimized water absorption. Dough development time of Karl 92 diluted flour systems decreased with increased bran percentage (7.3-5.5 min) at constant and optimized water absorptions. The loaf volume of Karl 92 and Karl 92 diluted breads decreased up to 27.2% and 23.2% with bran addition at constant and optimized water absorptions, respectively. Significant differences were observed with respect to bran size. The bran addition decreased the texture quality of breads.

HYDRATION KINETICS AND MECHANICAL DEFORMATION PROPERTIES OF WHEAT KERNELS

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Proper tempering of wheat prior to milling is a major contributor to milling efficiency and high yields of low ash flour. Well-tempered wheat will have tougher more plastic bran, weaker interactions between endosperm and aleurone, and a softer endosperm. Since milling is essentially a physical process involving fracture and separation of bran from endosperm it is important to study factors affecting kernel hardness in terms of standardized and measurable mechanical properties. Water penetration during tempering is an important step. Achieving optimum final moisture and using the proper time and temperature during tempering will ensure maximum yield of low ash flour, and conserve energy by minimizing the force required by the break and reduction rolls during milling. Objective of this work was to study hydration kinetics and mechanical deformation behavior of wide range of wheat varieties with different SKSC hardness value. To determine how the structural properties of wheat kernels vary with respect to moisture content wheat kernels were soaked in water at multiple temperatures (20/30/40°C). Changes in total moisture over time were determined by air oven. Data fit into Peleg's equation to model the sorption behavior of the kernels. The effects of hydration conditions on the absorption rate, saturation moisture content and saturation time were evaluated. Soaked kernels were crushed (at 1 mm/sec speed to 80% deformation) immediately after soaking using a TA.XT2 texture analyzer to determine effects of moisture on the compressive deformation behavior of individual wheat kernels.

COMMINGLING LEVELS OF STORED-GRAIN INSECT POPULATIONS IN WHEAT AND CORN FROM BUCKET ELEVATOR BOOTS

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Grain elevator boot and pit areas contribute to commingling of insects with grain that moves through the elevator leg. A novel removable slip-boot design was developed to measure the magnitude of commingling as a function of stored-grain insect density in wheat and corn. Insect species used included two species that develop within kernels (lesser grain borer & rice weevil) and three that develops outside kernels (red flour beetle, sawtooth grain beetle and rusty grain beetle). Slip-boots were loaded with infested residual grain and remained undisturbed for 0, 8, 16, or 24 weeks. At each of these time periods, clean, uninfested grain was transferred over the infested slip-boot. Adult insects that commingled with the clean grain transfer were sifted and enumerated. The commingled infested lots were examined after 8-wk to count adult progeny produced. Insect density levels in the infested bucket elevator leg boots affected the level of insects transferred through the elevator leg to other locations. Insect density in clean wheat or corn transferred over infested boots was 1 insect/kg immediately transfer; this density increased to 2 insects/kg when the infested boot was reexamined after 8 wk. Large numbers of internally-developing insects were picked-up by clean grain flowing over the infested grain in the boot compared to pick-up of externally developing insects. Additionally, insecticide treatment of the elevator boot reduced insect infestations. These results shed light on methods to minimize or prevent cross contamination of clean grain by residual infested grain in the boot areas at elevators and feed mills.

THERMOMECHANICAL TREATMENT OF FUNCTIONAL WHEAT FLOUR FRACTIONS

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Flour with ash content greater than 0.55% is considered inferior for baking therefore a low economic value. The objectives of this study were to develop thermo-mechanical treatment techniques to modify intrinsic properties of low quality mill fractions to improve their functionality, and to characterize the resulting functional wheat flours for their mixing, pasting, and other performances. Hard red winter wheat was milled in K-State Hal Ross Mill to obtain 15 flour fractions of varying quality. Flour fractions were grouped into low, medium and high ash content. Three hydration levels and three extrusion temperature profiles were studied. A pilot scale TX 52 twin screw extruder was used. Extrudates were ground and flour with particle size less than 240μm were used for all proximate, rapid visco-analysis (RVA), phase transition analysis (PTA). Protein and fiber content increased from low to high ash fractions. Expansion ratio and specific length decreased with increasing moisture and temperature which is supported by piece density data, whereas with high ash there was more longitudinal expansion. High ash flour, lower in-barrel moistures and lower extrusion temperatures resulted in smaller particle size distribution during grinding. Moisture, temperature and ash content influenced pasting properties. For in-barrel moisture and temperature effect, PTA data supported the inference made from RVA analysis. Functionality of wheat flour components can be improved through thermal-mechanical treatments in a systematic manner. Understanding of underlying mechanisms leading improved functionality can be used as a powerful design tool in processing.

PHENOLIC AND ANTIOXIDANT CONTRIBUTION OF WHEAT FRACTIONS AND MILL STREAMS PRODUCED FROM THE SAME KERNELS

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In an effort to provide better ingredients for health and wellness, we are studying the chemical and structural contributions of cereal grains that could better provide satiety and nutritional benefit. Flour milling separates the major components of wheat: endosperm, bran, and germ, and provides multiple streams that are chemically different. However, the distribution of phenolic compounds and antioxidants in each mill stream has not been well documented. In this study, we applied methods to evaluate antioxidant activities of wheat, namely, DPPH radical-scavenging activity, ferric reducing/antioxidant power (FRAP) assay and total antioxidant capacity; and determined phenolic compounds (total, flavonoid and anthocyanins) and phytochemical contributions in each fraction. It was noted that germ accounted for the majority of antioxidant properties, while the bran contained a substantial portion of phenolic compounds and anthocyanins. Significant differences in phenolic and phytochemical concentrations were observed between the fractions of germ, flour, and bran milled from the same kernel. Mill feed was comparatively high in phenolic acids (0.78 mg FAE/g), antioxidant capacity (1.28 mg/g), antioxidant activities (75.21% DPPH inhibition and 278.97 μmol $FeSO_4$/g) and lutein (176.57 μg/100g). The investigated mill streams, with prospected chemical and physical modifications for nutritional improvement and palatability, could provide avenues for future human consumption of traditional by-products from flour milling.

ECTOPIC EXPRESSION OF *ARABIDOPSIS* GLUTAREDOXIN *ATGRXS17* ENHANCES TOLERANCE TO MULTIPLE ABIOTIC STRESSES IN TOMATO

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Crop plants are continuously exposed to numerous abiotic stresses, such as drought, cold, and heat stress, which adversely affect plant growth, development, and seeding. Thus, the abiotic stresses pose a serious challenge for agricultural production worldwide, causing annual losses estimated at billions of dollars per year. In the present study, we report introducing the *Arabidopsis* glutaredoxin *AtGRXS17* into tomato plants enhances tolerance to multiple stresses including heat, cold, drought, and oxidative stress. The results suggest AtGRXS17 fusion proteins initially localized in the cytoplasm and the nuclear envelope but migrated to the nucleus during heat stress. Ectopic expression of *AtGRXS17* in tomato plants minimized photo-oxidation of chlorophyll and reduced oxidative damage of cell membrane systems under heat stress. This enhanced thermotolerance correlated with increased catalase (CAT) enzyme activity and reduced H_2O_2 accumulation in *AtGRXS17*-expressing tomatoes. Furthermore, during heat stress, expression of the heat shock transcription factor (HSF) and heat shock protein (HSP) genes was up-regulated in *AtGRXS17*-expressing plants compared to wild-type controls. Under cold, drought, and oxidative stress condition, the *AtGRXS17*-expressing plants displayed more vigorous growth and less physiological damaging than those of wild-type controls. Quantitative real-time PCR results suggest expression of *AtGRXS17* influenced the dynamic changing of endogenous stress defense signaling. Given all the information, we conclude GRXS17 plays a central role in abiotic stress adaptation, and manipulation of GRXS17 may be a useful approach to improve crop stress tolerance and understand the plant signaling under abiotic stress conditions.

THE ROLE OF NEURONAL NITRIC OXIDE SYNTHASE IN CARDIOVASCULAR CONTROL

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Neuronal nitric oxide synthase (nNOS) mediates vascular control in health and dysfunction of the NOS system likely mediates vascular and muscle impairments in disease states such as heart failure and diabetes. When nNOS is blocked at rest using S-methyl-L-thiocitrulline (SMTC) blood flow and vascular conductance to hind-limb muscles decrease and mean arterial pressure (MAP) increases (Copp et al. *J Physiol. 588: 1321-31, 2010*). However, it is not known whether this effect is mediates by central neural processes and evoked through the sympathetic nervous system or, alternatively, whether it reflects local (i.e., muscle) vascular control. This investigation tested the hypothesis that nNOS blockade with SMTC would increase lumbar sympathetic nerve discharge (SND) in parallel with an increased MAP in baroreceptor-denervated rats consistent with centrally-mediated SMTC effects. However, contrary to this hypothesis, after SMTC infusion lumbar SND did not increase ($P>0.05$) whereas MAP did ($+40\pm8.3\%$, $P<0.05$) and there was no correlation between these variables. In contrast, renal SND ($+17.6\pm6.5\%$, $P<0.05$) correlated significantly with MAP ($r=0.66$, $P<0.001$). In the absence of increased lumbar SND, SMTC-induced resting skeletal muscle blood flow must be mediated by peripheral (i.e., muscle) rather than central (via SND) nNOS blockade. Furthermore, renal sympathetic vasoconstriction likely contributes to the elevated MAP seen with nNOS blockade.

REGULATION OF GAP JUNCTIONS IN COLON CANCER CELLS

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Colon cancer is one of the most common cancers in the United States with a high predisposition to metastasize. Cancer cells exhibit many deficiencies in cell-to-cell communication, particularly gap junctional intercellular communication (GJIC). Gap junctions are involved in the regulation of cell cycle, cell differentiation, and cell signaling. The goal of this study is to restore GJIC in colon cancer cells. Recently, substituted quinolines (PQs), gap junction enhancers, have been shown to increase gap junction activity. The level of gap junction protein, connexin43 (Cx43), is low in human colon cancer cells (SW480). Transfection of Cx43 in SW480 cells have a 6-fold increase of gap junction activity compared to control using gap junction activity assay. Western blot analysis confirmed that a significant level of Cx43 was expressed in transfected Cx43 cells compared to control. This suggests that overexpressing Cx43 can restore GJIC. 200 nM PQ causes a 4-fold increase of gap junction activity as well and subsequently causes a decrease in cell proliferation. However, GJIC inhibitor, phorbol ester (TPA), can reverse the gap junction activity of transfected Cx43 or treated PQ cells. Overall, the results show that substituted quinolines can directly enhance gap junction activity. Currently analysis of xenograft tumors of SW480 cells in Nu/Nu mice , treated with control, DMSO, 1mg/kg and 10mg/kg, is being performed, examing the level of Cx43, 32, 26 as well as Caspase 3, 6, and 8. The findings provide an important implication in which restoration of gap junction activity can be targeted in colon cancer.

FUNDRAISING PROJECT PROVIDES FOOD PRODUCTION EXPERIENCE FOR FRESHMAN

Daniel J. Neely, Alex Maxwell, and Kelly J.K. Getty
Department of Animal Sciences & Industry and Food Science Institute

The objective of this project was to provide a learning experience in product development and food processing for freshmen in Kansas State University's Food Science Club. The "Holiday Jam" project included product formulation through a series of trials, scale-up to commercial production, development of a label, and implementation of a marketing strategy. Holiday Jam ingredients included cranberries, strawberries, and oranges with cinnamon and cloves. The jam's pH level was 2.96, its Brix degree was 66.2, and water activity was 0.798. The jam was packaged in a glass jar with a principle display panel and a nutrition facts panel. Processing procedures included rehydrating dried cranberries, comminuting fruit ingredients, heating fruit mixture with spices to 38°C, adding sugar and then bringing mixture to a boil. Liquid pectin was then added to bring the mixture to 100°C, jars were filled, and placed in a boiling water bath for 10 min. From an educational standpoint, this project served as a useful introduction to food processing and provided a first-hand, product development experience. Students gained knowledge of good manufacturing practices including sanitization of materials, contamination avoidance, and use of hairnets and frocks. The product gave participants a better understanding of label design and nutrition facts. Students learned the importance of recordkeeping practices to ensure accurate scale-up and processing procedures. Finally, freshmen lead other members of the Food Science Club during commercial production of over 200 jars of Holiday Jam which were sold in Kansas State's Dairy Bar.

COMMERCIAL SCALE APPLE BUTTER PROCESSING PROVIDES REAL WORLD LEARNING EXPERIENCE FOR UNDGRADUATE FOOD SCIENCE STUDENTS

Alex Maxwell, Josh Sinning, Daniel Neely, Kyle McLean, and Kelly J.K. Getty
Department of Animal Sciences & Industry, College of Agriculture

The purpose of processing apple butter in a pilot plant was to give undergraduate food science students the opportunity to experience how commercial food processing works on a small-scale as well as using real world problem solving skills needed for their future careers in the food industry. The overall goal was to produce apple butter for the Food Science Club and a local apple orchard. The students developed a bench-top formulation and then scaled-up the formula for a 40 gallon steam kettle. Apples were obtained from a local apple orchard. Commercial processing steps included cutting and cooking apples, removal of apple skins, cores, and seeds, cooking to a Brix degree of ≥43.0, hot filling at ≥85ºC, and packaging. Students tested apple butter for the fruit to sugar ratio, pH (<3.4), soluble solids (>0.48), and temperature control (>85°C) during filling. Students developed labels for the club and local orchard. Over 800 jars were produced during two production runs. Students also developed good manufacturing practices, standard operating procedures, sanitation procedures, and a food safety plan that assisted in obtaining a State of Kansas commercial processing license. Apple Butter was sold at K-State's Dairy Bar and by three other commercial operations. Consumers (28 participants) rated the overall appearance, flavor, and texture using a scale of 1-10 with 10 being the best. The Apple Butter was rated at 6.4 with 7 being very acceptable.

DEVELOPMENT OF A SUGAR-FREE COOKIE FOR HOME-USE

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With an increase in diabetes and perceived impact of sugar on health, demand for sugar-free products has increased. The objective was to develop a sugar-free cookie for home-use, using Truvia and Splenda, from a basic drop sugar cookie. Formulations were analyzed using different combinations of cake flour, baking soda, salt, Truvia, Splenda, whole milk, butter, all-purpose shortening, whole eggs, egg yolks, and vanilla. A final formulation was made in triplicate and cookies were measured for thickness, width, and color. A consumer panel (58 participants) evaluated cookies appearance, color, flavor, sweetness, texture, aftertaste, and overall acceptability using a scale of 1 to 7 with 7 being very acceptable. A home-use survey was conducted to determine ease of baking and product acceptability. Five individual batches were prepared by five participants that collected evaluations from 10 others. Ease of baking was evaluated on a 1 to 5 scale with 5 being acceptable. Acceptability was evaluated on a 1 to 7 scale with 7 being very acceptable. Average cookie thickness and width was 2.92 cm and 7.29 cm, respectively and average color scores were L*=77.38, a*=2.21, and b*=28.19. For consumer panel evaluation, all attribute scores ranged from 4.7 to 5.0 except aftertaste (4.5). For home-use survey, all overall appearance, flavor, and texture scores ranged from 5.13 to 5.18 except aftertaste receiving a 4.8. Scores for ease of baking attributes ranged from 4.0 to 4.6. Results showed that using Truvia and Splenda as sugar substitutes in cookies makes an acceptable sugar-free cookie for home-use.

DEVELOPMENT OF CHOCOLATE TRUFFLES FOR THE FOOD SCIENCE CLUB

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Product development involves reformulation to optimize flavor and texture. The objective was to develop a unique chocolate truffle. Initially, a formula was developed that included melting of multiple chocolates with sweetened condensed milk followed by freezing. Truffle mixture was then tempered and hand-rolled into balls before being coated with powdered sugar or colored granulated sugar. Although the product was well-received during preliminary sampling, the process was labor intensive and did not yield uniform shape and weight for each truffle. It was determined that two flavors (peanut butter pretzel and raspberry) truffles could be developed using a streamlined process. The chocolate mixture was reformulated to include cream rather than sweetened condensed milk, and was poured into Teflon moulds to reduce process time and ensure uniformity. Peanut butter, almond bark, and pretzels were used in the top layer of the peanut butter pretzel variety. Powdered raspberry flavor was blended with almond bark and drizzled over plain truffles to create the raspberry variety. The Food Science Club collected sensory data from 110 consumer participants on the reformulated truffles. Truffles were evaluated on a scale of 1 to 7 where 1 indicated an “unsatisfactory” product and 7 indicated a “very satisfactory” product. The peanut butter pretzel truffles averaged 6.0 and 6.2 for overall flavor and texture, respectively while the raspberry truffles scored 5.7 and 6.2. Our results indicate that these two products would be acceptable to use for retail or as a fundraising project for the Food Science Club.

AN ULTRASENSITIVE CHEMILUMINESCENCE METHOD FOR TRACE BLOOD DETECTION USING LUMINOL-LABELED GOLD NANOPARTICLES

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Chemiluminescence (CL) is a process in which visible light is emitted as a result of chemical reactions. CL is a much more sensitive and convenient analytical technique than commonly used fluorescence methods due to high quantum yield, no need of excitation light sources, and low background. We developed a facile method to covalently attach luminol (5-amino-2,3-dihydro-1,4-phthalazine-dione) molecules onto gold nanoparticles (~10 nm diameter) for ultrasensitive CL applications. Here, CL has been studied under two schemes, gold nanoparticle-limited and catalyst-limited conditions (with catalyst being $Fe(CN)_6^{3-}$ or red blood cells). The CL signal measured in the standard catalyst solution (1.0 mM $Fe(CN)_6^{3-}$) was found to correlate with the number of luminol-labeled gold nanoparticles across eight orders of magnitude from $1x10^3$ to $1x10^{10}$ gold nanoparticles in a 12 μL reaction well. The ability to obtain chemiluminescence signal from as small as $1x10^3$ gold nanoparticles indicates high detection sensitivity for gold nanoparticles functionalized with luminol, which is several orders of magnitude higher than that by UV-visible absorption. We have applied this chemiluminescence method on the detection of highly diluted blood samples, in both intact and lysed forms, which releases Fe^{3+} containing hemoglobin to catalyze the luminol chemiluminescence. Particularly, the lysed blood sample can be detected even after 10^8 dilution (corresponding to ~0.18 cells/well). The results of this study suggests the possibility of developing a portable biosensing device for rapid and ultrasensitive point-of-care applications.

SYNTHESIS OF METAL SALEN COMPLEXES WITH CYCLOBUTYL BACKBONE

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Chiral salen ligands normally incorporate a backbone derived from a resolved diamine. The diamine is condensed with salicylaldehydes to produce ligands that have significant flexibility and phenol sidearms that do not overlap or interact sterically when complexed. The absence of overlap prevents the formation of helical complexes with locked conformations. Even when extended sidearms are present the chiral backbone is critical in determining whether there is selectivity for the formation of one helical type (clockwise or counterclockwise) over the other. We have found that backbones derived from (1R,2R)-diaminocyclohexane do not effectively select one helical type over the other because they are too flexible and the N-C-C-N torsion angle is too small. Other backbones derived from (*R*)-1,1'-binaphthyldiamine have a much larger N-C-C-N torsion angle and effectively select for *M* (minus) helices. The electron-withdrawing nature of this backbone is problematic for carrying out further reactions, particularly reductions, so we sought a twisted aliphatic diamine that would still show high fidelity in helix formation. Computational studies suggest that the (1*R*,2*R*)-cyclobutyldiamine unit can produce highly twisted salen ligands with a large barrier between the *M* and *P* helical forms. To test this prediction, the tartrate salt of (1*R*,2*R*)-cyclobutyldiamine was synthesized and condensed with a series of saliclaldehydes to produce novel salen ligands. The salicylaldehydes chosen have extended phenanthryl or benz[a]anthryl sidearms to encourage formation of helical coordination complexes. The ligands were metallated with zinc and manganese salts to produce salen metal complexes. These were characterized by NMR analysis, high-resolution mass spectrometry, and IR spectroscopy.

WHEAT FIBER FOR MORE SUSTAINABLE CEMENT MORTAR

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The technology of using synthetic fibers in reinforced concrete structures continues to mature. This research is intended to address the use of sustainable fibers derived from wheat straws for reinforcing mortar specimens. In order to study the properties of mortar reinforced with wheat fibers, 156 specimens were tested in uniaxial compression and flexure. The compression tests were conducted on 2 in (50.8 mm) cubes, while the flexural tests were conducted on 40x40x160 mm prisms. Several lengths of fibers and percentages in the range of 0.5% to 5% by volume of the specimens were tested in order to determine which would yield the highest strength and stiffness. Specimens reinforced with polypropylene fibers were tested in order to benchmark the results. The average uniaxial compression strength of the specimens reinforced with 0.5% long wheat fibers (20-30 mm) exceeded that of their counterparts reinforced with 0.5% polypropylene fibers (19mm) by 15%. The highest average strength increase compared to the control specimens was about 27% in compression, at 0.5% of long wheat fiber, and 30% in flexural, at 0.75% long wheat fiber.

A COMBINED SOFT COMPUTING-MECHANICS APPROACH TO INVERSELY PREDICT DAMAGE IN BRIDGES

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This study aims to facilitate damage detection in concrete bridge girders without the need for visual inspection while minimizing field measurements. Beams with different material and cracking parameters are modeled using ABAQUS finite element analysis software in order to obtain stiffness values at specified nodes. The resulting database is then used to train an Artificial Neural Network (ANN) model to inversely predict the most probable cracking pattern. The aim is to use the ANN approach to solve an inverse problem where a unique analytical solution is not attainable. Accordingly, simple span beams with 3, 5, 7 and 9 stiffness nodes and a single crack were modeled in this work. To confirm that the ANN approach can characterize the logic within the databases, networks with geometric, material and cracking parameters as inputs and stiffness values as outputs were created. These networks provided excellent prediction accuracy measures (R^2 values > 99%). For the inverse problem, the noted trend shows that better prediction accuracy measures are achieved when more stiffness nodes are utilized in the ANN modeling process. It was also observed that decreasing the number of required outputs immensely improves the quality of predictions provided by the ANN. Overall, the ANN's predictions were reasonable and showed good agreement with the actual values. This indicates that using ANNs is a viable approach to obtain the, analytically unattainable, solution of this inverse problem.

MAXIMIZING RENEWABLE DISTRIBUTED WIND GENERATION AND STORAGE IN A DISTRIBUTION SYSTEM WITH NON-LINEAR OPTIMIZATION

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The ideal dream is a power system completely supplied by renewable energy generation and storage. We are studying how to optimize this ideal solution under real world constraints. The first phase of our research consists of addressing the optimized penetration of renewable distributed generation (DG) and storage (DS) in a distributed system considering dynamic load and generation patterns. We made the necessary changes to a software package by Eminoglu et al. to accept dynamic load and generation data. Real-world dynamic load data (acquired from Virginia Polytechnic Institute), generation data (Northwind100 wind turbine data) and storage data were considered in order to make this model as realistic as possible. The second phase focuses on the sizing and siting of renewable DGs through a non-linear optimization problem. The optimization problem aims at maximizing the amount of DG penetration while minimizing the real losses. One of the major advantages of this optimization problem is that it allows us to identify multiple locations of DG placement with the percentage penetration at that location at the same time. The next step is to incorporate time-varying loads and generation in the optimization for achieving maximum load satisfaction with the high penetration of renewable DG. After verifying the fact that with the existing distribution network losses DG (wind) penetration can be pushed up to 74% of the total generation, we tested 12, 30 and 69 node systems. We were able to achieve minimum system losses with a high penetration of DG at multiple locations in a distribution system.

MID-MIOCENE SILICIC VOLCANISM IN THE OWYHEE MOUNTAINS (ID): LOCAL PHYSICAL AND GEOCHEMICAL CHARACTERISTICS AND IMPLICATIONS FOR REGIONAL MAGMATISM LINKED TO THE INCEPTION OF THE YELLOWSTONE HOTSPOT

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The Silver City mining district (SCD), Owyhee Mountains, ID, experienced a period of extensive magmatism in the mid-Miocene that is associated with inception of the Yellowstone hotspot. This study focuses on local silicic volcanism and its relationship to contemporary silicic magmatic systems (Santa Rosa-Calico volcanic field, SC; Jarbidge Rhyolite, JR) that are located in the northern Great Basin and Oregon Plateau. The SCD magmatic suite compositionally varies from locally erupted Steens Basalt to high-Si rhyolite. The Silver City rhyolite (previous workers and this study) has been mapped as the upper-most stratigraphic member of the mid-Miocene volcanic package. New geochemical data allows us to evaluate the major and trace element characteristics of the Silver City rhyolite and compare it to other local and regional, coeval, silicic magmatism. Trace elements show that the Silver City rhyolite samples are chemically distinct from another extensive SCD silicic unit (Tql of Panze, 1975). Other major and trace elements often show overlap between these two groups and a third, smaller unit that is transitional between the larger groups. The chemical variations, field relationships and physical characteristics, indicate that silicic magmatism in SCD was primarily effusive and sourced from at least two distinct magma reservoirs. However, the SCD rhyolites closely resemble those erupted from SC and JR which appear to have formed via middle/upper crustal melting of quartzofeldspathic rocks. This is in contrast to younger rhyolites of the central and eastern Snake River Plain that are characterized by greater mantle input.

THE ROLE OF BASALTIC MAGMATISM IN THE EVOLUTION OF THE CAMBRIAN SOUTHERN OKLAHOMA AULACOGEN: GEOCHEMICAL AND ISOTOPIC CONSTRAINTS ON THE MAFIC ROCKS IN THE ARBUCKLE MOUNTAINS, OK

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The presence of surficial mafic igneous rocks in the Arbuckle Mountains of southern Oklahoma are limited to Cambrian-aged diabase dikes, that most likely resulted from the initial stages of continental rifting related to the formation of the Southern Oklahoma Aulacogen. A 1982 drill test in the region penetrated thick packages of basaltic lava flows interlayered with silicic intrusive bodies and volcanics. These basaltic lava flows became the first described subsurface mafic rocks in the Arbuckle Mountains. Additional wells throughout the Arbuckle Mountains have also revealed a substantial package of mafic lava flows. Major and trace element whole-rock geochemical analyses have been completed on three wells in the region (Pan-Am Williams D-2, Pan-Am Jarman 1-19, Pan-Am Newberry 1). These analyses will be used to create first-order petrogenetic constraints on basaltic volcanism in southern Oklahoma. In addition, the analyses will help to better understand the tectonic evolution of the Southern Oklahoma Aulacogen. Initial results indicate that the mafic rocks range in composition from basalt to andesite that are dominantly subalkaline to mildly alkaline. They are geochemically similar to ocean-island basalts and flood basalts exposed in other large igneous provinces. The volume of lava extruded in the Southern Oklahoma Aulacogen is probably comparable to what is present in other flood basalt provinces.

STUDY OF HIGH FLUORIDES IN GROUNDWATER IN PARTS OF EASTERN INDIA: GEOCHEMICAL AND HEALTH IMPLICATIONS.

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The present study is undertaken to investigate the nature and distribution of high fluorides in groundwater and determine its probable source in two regions in eastern India. The endemicity of fluoride related problems in humans starts with mottling of teeth, disorder in skeletal and bone structures and later massive degeneration of bones with high consumption of fluoride from drinking water. This work involves study of remote sensing data coupled with field observations, to account for the source and pathway of fluoride migration in this region. Groundwater/Drinking water samples were collected from 75 hand pumped tube wells (covering~1000 km^2area), with emphasis on the sectors previously reported to have high fluoride incidence. In the current study 13 locations are identified with high fluoride (Indian standard~1.5mg/l, WHO standard rages from0.6mg/l to 2 mg/l) and varies from 0.25 to 5.4mg/l. The concentration of other elements in these waters (mg/l) associated with similar mineral phases that houses and controls fluoride distribution and mobility are Ca (10 to 346), Na (2.2 to 36), Mg (0 to 97), K (0.3 to 144), Fe (< 0.2 to 8), and HCO_3^- (45 to 530). The total hardness of these waters in terms of $CaCO_3$ varies from 60 to 1000 mg/l. The pH range is 6.8 to 8 and specific conductivity is in the range of 138 to 2640µs/cm. From this study it is emphasised that a combination of hydrogeochemistry, landuse pattern and structural orientation of the source rocks, aid in the release and mobilization of fluoride from the granitic rocks/pegmatite to the deep groundwater (~60m). Low fluoride areas have also seen to cause fluorosis among adults due to chronic exposures of low concentration during high water intake in this dry arid climate.

CHEMICAL HYDROGEOLOGIC INVESTIGATION OF TUNGSTEN IN GROUNDWATERS - AN EMERGING CONTAMINANT

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The element tungsten was until recently, thought to be stable and benign in the environment. However, it has recently come under scrutiny following a CDC investigation of a leukemia cluster in Fallon, Nevada, in 2001 which implicated high levels of tungsten in the drinking water as a probable cause. Tungsten is widely used in many industrial, military, and domestic uses, because of its useful and unique chemical and physical properties. Tungsten has not been widely researched in the past because its presence is below background levels in nature. Only recently have advancements been made in analytical techniques to allow for the sensitivity and accuracy needed for detecting tungsten. Along with other geochemical extraction procedures one of the most effective tools is synchrotron aided microprobe. Where μXRF mapping with μXANES and μXRD on mineral/sediment grains, is an important tool in understanding the association of W with other elements (Ca, Fe, Mn …). These relationships can factor into understanding tungsten's mobility in sediment and groundwater. Tungsten, potentially, has higher mobility when bound as thiotungstates. In this study, three sites have been chosen for biogeochemical and mineralogical analysis and their role on controlling bioavailability of W. Two sites of high W concentrations (Fallon and Sierra Vista, AZ) and one site of low concentration (Carrizo aquifer, Texas) were chosen. Sediment samples from Fallon were analyzed for bulk W concentration and oxidation states. Sequential extractions are also being done to understand the partitioning of sediment fractions and preference of W to bind with other elements.

DESIGNING PITCH AND TORQUE CONTROLLERS FOR WIND TURBINES USING FUZZY METHOD

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The wind is one of the interminable energy sources. Today, many wind farms have been installed all over the world for the purpose of producing economic clean power. Increasing the size of the wind turbine in order to capture more wind energy increases the loading on the drive-train and tower. By utilizing an intelligent control system in the wind turbine, it is possible to achieve better efficiency and to reduce the aerodynamic and mechanical loads. Thus, the control system has an important impact on wind turbine efficiency and the cost of generated electricity. In this study, we focus on torque and blade pitch control in order to maintain the power captured at a peak level and to improve the efficiency of wind turbine. This investigation examines a fuzzy logic control system for a large scale wind turbine (1.5 MW) with a doubly fed induction generator. The structure of the control system consists of two fuzzy controllers to maintain the rotor tip speed ratio and the blade pitch at desired values regardless of the variations in the wind speed. Fuzzy logic is useful in the frame of control problems when there are uncertain models and when only qualitative information is available. Fuzzy control has strong robustness independent of the system mathematical model and it can compensate for the influence of unmodeled dynamics and uncertainties. Simulation results of the wind turbine and the control system show that the applied control systems can manage the wind turbine at different wind speeds with safe operating conditions and with better performance.

EFFICIENT MID-INFRARED LASERS FROM OPTICALLY PUMPED GAS-FILLED HOLLOW-CORE PHOTONIC CRYSTAL FIBER

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Laser sources operating at mid-infrared (mid-IR) wavelengths have become increasingly popular. This eye-safe region of the spectrum between ~ 3 and 8 μm contains several windows of high atmospheric transmission, well suited to applications like remote sensing, freespace communications, and range finding. Additionally, the mid-IR spectral region coincides with fundamental rotational-vibrational transitions in many molecules including hazardous pollutants and greenhouse gases like NO, NO_2, CO, CO_2, N_2O, and CH_4. Mid-IR sources are a natural choice for applications involving trace gas detection and molecular fingerprinting such as breath analysis and stand-off explosives detection. By taking hollow optical fibers, filling them with molecular gases like C_2H_2 and HCN and optically exciting the gas, we have created a new type of laser which produces mid-IR wavelengths at ~ 3 μm. These special microstructured optical fibers have hollow core diameters of less than 100 μm, roughly the diameter of a human hair. We have demonstrated that these lasers can operate with efficiencies of nearly 20%, which is very near the theoretical limit for our three-level molecular system. Work is ongoing to characterize the laser dynamics and to produce a continuous wave variant of the laser capable of coherence generation, i.e. producing a single coherent output from many separate and mutually incoherent pump sources.

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Graduate Biological Sciences

EFFICACY OF NITRIC OXIDE TREATMENTS TO IMPROVE PERIPHERAL VASCULAR FUNCTION: IMPLICATIONS FOR CHRONIC HEART FAILURE

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Chronic heart failure (CHF) patients suffer from exercise intolerance resulting, in part, from impaired skeletal muscle vascular function induced by reductions in nitric oxide (NO; an important vasodilator) bioavailability. Dietary fish oil (FO) and beetroot juice (BRJ) supplementation may augment NO bioavailability. Whether these treatments augment muscle blood flow during exercise in CHF is unknown. **Purpose:** We tested the hypotheses that both NO-based FO and BRJ treatments augment rat hindlimb skeletal muscle blood flow during treadmill exercise versus control. **Methods:** FO: Rats with surgically-induced CHF consumed a FO (n=8) or control (n=6) diet for 6-8 weeks. BRJ: Healthy rats were administered RBJ (n=8) or tap water (control; n=8) for 3 days. Mean arterial pressure (MAP, carotid artery catheter connected to a pressure transducer) and hindlimb muscle blood flow (radiolabelled microspheres) were determined during treadmill running (20 meters/min, 5% grade). **Results:** FO: MAP (FO: 138±4, control: 132±3mmHg, $p>0.05$) and hindlimb blood flow (FO: 92±7, control: 113±15ml/min/100g, $p>0.05$) were not different between groups. BRJ: BRJ reduced MAP (BRJ: 123±6, control: 136±3 mmHg, $p<0.05$) but hindlimb blood flow was not different between groups (BRJ: 116±10, control: 114±8 ml/min/100g, $p>0.05$). **Conclusions:** Despite well-known cardiac antiarrhythmic effects, FO did not augment muscle blood flow during exercise in CHF rats. In rats provided BRJ, blood flow and O_2 delivery were maintained despite reductions in driving pressure which is indicative of improved vascular

function. Whether BRJ improves vascular function and exercise tolerance thereby promising an improved quality of life in CHF patients is worthy of further investigation.

THE PROMOTER ACTIVITY OF THE GAP JUNCITON PROTEIN CONNEXIN 46

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Connexins, or gap junction protein subunits, assemble into functional protein channels and connect the cytoplasm of adjacent cells together. Connexin 46 (Cx46) is a unique connexin being only expressed in high functional amounts in the mammalian lens. Without Cx46, lenses develop cataracts due to loss of lens homeostasis. We hypothesize that Cx46 is necessary in tissues without access to blood vessels acting as a passive transporter of nutrients and metabolites as well as serving as a means of metabolic waste removal during periods of growth under hypoxia (low oxygen content). We have found unnatural expression of Cx46 in solid breast and retinoblastoma tumor tissues. When Cx46 expression is inhibited by RNAi *in vivo*, these tumor tissues halt growth, suggesting Cx46 is involved in the growth process of solid tumors. To date, the expression profile of Cx46 is not well understood. Current work in our human lens cell model indicates that Cx46 is strongly upregulated during hypoxia (17-fold) and expression remains higher than normal until the hypoxia is relieved. However, the Cx46 promoter region does not contain the canonical hypoxia response elements necessary for direct upregulation by the HIF transcription factors. The Cx46 gene promoter does indeed contain many regulatory sequences which are currently being identified and validated in our lab. By studying the promoter of Cx46, we will be able to better understand the role that Cx46 plays in hypoxic tumor tissues and will be able to design potential anti-tumor treatments.

AN ABC TRANSPORTER IS REQUIRED FOR SECRETION OF PEPTIDE SEX PHEROMONES IN *ENTEROCOCCUS FAECALIS*

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Enterococci are now the 3rd leading cause of hospital-acquired infections in the United States and display an ever increasing resistance to commonly used antibiotics. One of the hallmarks of enterococcal biology is the exchange of genetic information through the process of conjugation. Genetic exchange between a donor cell harboring a pheromone responsive plasmid and a recipient cell is initiated by the recipient's production of peptide sex pheromones to which the donor cell responds. The pheromones are generally derived from the signal sequence of bacterial lipoproteins that undergo proteolytic processing to yield the 7-8 amino acid peptide pheromones. Using a novel bacterial killing assay (Deferred Antagonism Assay) dependent on the presence of sex pheromones, we screened a transposon mutant library for additional factors that contributed to the production of pheromones. Here we describe a mutant that is significantly altered in its ability to kill *Enterococcus faecalis* indicator cells. We confirmed through mass-spectrometry analysis that the wild-type recipient cells secreted a significant amount of the inhibitory peptide while the mutant cells did not secrete this peptide at all. In addition, this mutant showed a broader defect in its ability to mediate conjugation with 3 unique pheromone responsive plasmids, suggesting a global role in the secretion of peptide pheromones.

ECM29 ACTS AS A NEGATIVE REGULATOR OF THE PROTEASOME

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The proteasome is a large complex protease formed by 66 polypeptides. Structurally it can be subdivided into the Core Particle (CP) and the Regulatory Particle (RP). The RP contains six AAA-ATPases (Rpt1-Rpt6) that are essential for proteasome function. The C-terminal tails of these Rpt proteins dock into the CP and are important for proper CP-RP interactions. Using *Saccharomyces cerevisiae* as a model organism we studied how disturbing the CP-RP interface by deletion of the three terminal amino acids of the tail (rpt5-Δ3), would affect assembly and function of the proteasome. Purified proteasomes from the rpt5-Δ3 strain showed a strong enrichment of Ecm29, a proteasome-associated protein whose function is not well understood. Surprisingly, Ecm29 inhibits proteasomes *in vitro*, as our Ecm29 containing proteasomes showed reduced cleavage of a peptide substrate. Additionally, our mutant strains showed reduced proteolysis of an unstable model substrate *in vivo*. This reduced degradation could be rescued by the deletion of ECM29, suggesting that Ecm29 is directly responsible for the inhibition. These biochemical data were supported by phenotypic analysis showing that the deletion of ECM29 rescued the temperature and canavanine sensitivity of rpt5-Δ3 strains. Furthermore, an *in vitro* assay using purified proteasomes and recombinant Ecm29, suggests that Ecm29 binds preferentially to the faulty proteasomes. In sum, our data indicates that Ecm29 is recruited to defective proteasomes, and acts as a negative regulator to prevent proteolytic activity by these faulty proteasomes. Next, we want to map where in the proteasome Ecm29 is binding and identify what triggers this binding.

MICROBIAL COMMUNITY ASSEMBLY IN A PRIMARY SUCCESSIONAL GLACIER FOREFRONT

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Understanding the dynamic processes that accompany microbial community assembly in a primary successional environment can aid understanding of initial colonization of newly exposed substrates. We examined a recently deglaciated forefront in Washington State using a chronosequence approach to elucidate patterns of microbial colonization and community assembly. Soils were sampled from 0m to 750m distance from the glacier terminus and included soil from rhizospheres of plants with different mycorrhizal habits and from non-vegetated bare areas. The communities of Fungi and Bacteria were 454-pyrosequenced (Titanium). Based on Poisson distribution estimators, approximately 15% of the Fungal and 6% of the Bacterial Operational Taxonomic Units (OTUs) were non-randomly distributed across the sample space. There is strong evidence for community clustering and distinction among Fungi and Bacteria over distance suggesting the importance of these communities for the establishment of successional plants. A similar pattern was observed for Bacteria across vegetation types indicating a strong vegetation effect dictating bacterial community composition. Biomass estimators using quantitative real-time PCR (qPCR) suggest that fungal and bacterial biomasses increase with successional age at similar rates but no evidence of vegetation type influencing taxon specific biomasses. There is no evidence of taxon specific biomass dominance across successional age. Microbial communities, especially mycorrhizal Fungi, are essential for the primary succession of plants. Understanding microbial processes gives insight to the complex nature of higher order ecosystems.

CONTRIBUTION OF ALTERNATE SIGMA FACTOR (RpoN) TO ENTEROCOCCAL INFECTIVE ENDOCARDITIS

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The ability to form biofilms is an important virulence property of the nosocomial pathogen *Enterococcus faecalis.* Biofilm formation is crucial to establish surgical site infections and urinary tract infections both of which form the foci to establish blood stream infections. Biofilm formation is a multistep complex process and extracellular DNA (eDNA) is one of its matrix components. We have recently shown that a functional alternate sigma factor, RpoN, is essential for autolysis and eDNA release and negatively regulates proteinaceous biofilm formation in *E.faecalis* (Iyer & Hancock J.Bacteriol 2011). Being a transcription regulator, RpoN is known to regulate the expression of different subsets of genes in different organisms. In *E.faecalis*, four sugar uptake systems are regulated by RpoN. This study shows that eDNA defective phenotype of *rpoN* mutant is independent of its influence on the sugar uptake system. Deletion of *rpoN* also protects *E.faecalis* from lysis in the absence of protective cell wall modifications such as O-acetylation and D-alanylation. However, in-vivo the *rpoN* mutant is attenuated by approximately two-logs in virulence as shown using a rabbit endocarditis model of infection. Our data suggests that there is a role for RpoN in enterococcal biology beyond just the regulation of aforementioned sugar uptake systems. Identifying other genes regulated by RpoN and their effect on biofilm biology is the focus of our ongoing study. Using microarray analysis of planktonic and biofilm grown enterococci, we aim to reveal the differential gene expression profiles in these two lifestyles of both the wild-type and *rpoN* mutant.

SEED SOURCE AND SITE AFFECT GRASSLAND PLANT COMMUNITY ESTABLISHMENT ACROSS RECIPROCAL COMMON GARDENS IN THREE STATES

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Humankind is undertaking an unprecedented manipulation of the globe's climate, land cover, and species distributions. This is especially true for temperate grasslands, where the disparity between habitat loss and protection is vast. Agriculture, urban development, invasive species, and woody encroachment continue to replace or transform native grassland ecosystems, and restoration has become increasingly critical for the conservation of biodiversity and ecosystem functioning in temperate grasslands. However, the feasibility of restoration, which traditionally targets historical conditions, is questionable in the context of anthropogenic alteration of biophysical conditions. This is the focus of my research, which investigates the effects of propagule source and variation (mixing among propagule sources) on restoration establishment and the generality of restoration outcomes across variable environments using reciprocal common gardens in three states (Nebraska, Kansas, Oklahoma), which differ markedly in their biophysical conditions. After two growing seasons, the productivity and density of native, seeded plants differed among sites and among seed sources within the Kansas site. Seed sources local to individual sites did not exhibit a general establishment advantage. Sown species exhibited differential establishment patterns, yielding plant communities that differed in structure, even where overall establishment densities were similar. Sourcing propagules across geographical gradients may ensure that seed mixtures possess traits both within and among species for establishment under altered and changing biophysical conditions.

OXYGEN DEPRIVATION LEADS TO PHOSPHOLIPID BILAYER DISRUPTION AND PRODUCTION OF EICOSANOIDS IN ENDOTHELIAL CELLS

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Ischemia, a lack of blood flow, initiates cellular injury which is exacerbated by reperfusion, the return of blood flow. Ischemia/reperfusion (IR) events, including heart attack and stroke, are a major human health concern. The mortality rate associated with IR of the intestine is currently 60 to 80%. This high mortality rate is due to: 1) the sensitivity of the intestine to IR, 2) systemic activation of the innate immune response resulting in damage to other organs, and 3) the lack of suitable therapeutic targets. Previous studies indicated involvement of a lipid or lipid-like moiety in intestinal IR-induced pathology. The immune-mediated damage intensified by the return of blood flow in IR studies led us to hypothesize that endothelial cells are the link between a lipid neoantigen and damage-inducing antibodies. We further hypothesize that the phospholipid bilayer is disrupted by oxygen deprivation, such as during ischemia. An *in vitro* cell culture system using endothelial cells and a hypoxia chamber is being used to explore these hypotheses. Mass spectrometry analysis of the mouse endothelial cell line, MS-1, revealed a significant increase in free arachidonic acid following recovery from hypoxia treatment. MS-1 cells also up-regulate transcription of cyclooxygenase enzymes and production of the eicosanoid prostaglandin E_2 following hypoxia treatment. The production of prostaglandin E_2 by the endothelial cells is a significant finding as prostaglandin E_2 has been shown to be a necessary component for IR-induced pathology. Future studies will determine whether hypoxia or the recovery from hypoxia induces the results observed.

PROTEASE ASSAYS FOR THE DETECTION OF CANCER

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Cancer cells are well-known to over express various matrix metalloproteinases (MMPs) as well as urokinase-type plasminogen activator (uPA). The goal of the research is to develop a Fe/Fe_3O_4 nanoparticle-based system, which has the potential to recognize the existence of these proteases in cancer cells and tissue. This nanoplatform for protease recognition consists of aminosilane coated Fe/Fe_3O_4 nanoparticles to which cyanine dye 5.5 is directly attached and TCPP is attached by means of specific peptide sequences. These consensus (cleavage) sequences can be cleaved in the presence of the correct protease, thus releasing the fluorescent dye that is linked via the consensus sequence. Upon escape from the Fe/Fe_3O_4 nanoparticle, the emission intensity of the organic dye will significantly increase, which can be detected using fluorescence spectroscopy, in blood, tissue or urine samples. This diagnostic nanoplatform can be applied for the recognition of different stages of various solid tumors. Whereas MMP2 is over expressed in early stages of cancer, urokinase is dominant in later stages. Urine samples from canine cancer subjects were used to demonstrate the protease assay for recognition of several enzymes. A distinct relationship was observed between the stage of the cancer and the fluorescence intensities of the assay. The results obtained to date are very promising and may lead to a simple assay for the early diagnosis of various cancers.

INVESTIGATION OF MODEL SYSTEMS FOR THE STUDY OF RECOMBINATION IN PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS (PRRSV)

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Sources of genetic variation in PRRSV include substitutions, insertions-deletions and recombination. The overall goal of this research is to develop *in-vitro* models to study recombination. The first step in investigating recombination is to determine if cells can be infected by two different PRRS viruses. Two identical viruses were constructed which contained GFP or RFP expressed as a subgenomic fragment. These viruses were used to co-infect MARC-145 cells. Confocal microscopy identified dual-fluorescent cells. Flow cytometry showed that dual-infected MARC cells constituted approximately 17% of the infected population. Two models were developed to investigate recombination. The first involved the construction of a non-fluorescent virus that contained a mutated GFP gene(sg-nfGFPv). A stable green fluorescent MARC cell line was created that expressed the wild-type GFP gene. nfGFPv was used to infect the GFP-MARC cells. The presence of recombination within the GFP gene region would result in fluorescence being restored to the non-fluorescent virus. The GFP-MARC cells were productively infected; however, several experiments failed to yield a green virus. We developed a second approach to closely mimic natural recombination. We constructed a defective sg-GFPv(def-sg-GFPv) that lacked ORFs 2-6. Transfection of 293T cells with def-sg-GFPv resulted in green fluorescence. To study recombination, 293T cells were co-transfected with sg-nfGFPv and def-sg-nfGFPv. The supernatant virus was recovered after three days and placed on MARC cells. Even though MARC cells were productively infected, they were negative for infection by a green virus. Various modifications of this model approach are being tested to determine the conditions necessary for recombination.

VACCINE INDUCED IMMUNITY IN A PORCINE CIRCOVIRUS TYPE 2 AND PORCINE REPRODUCTIVE AND RESPIRATORY SYNDROME VIRUS CO-INFECTION MODEL

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Porcine circovirus associated disease (PCVAD) encompasses a group of complex, multi-factorial syndromes linked to infection with porcine circovirus type 2 (PCV2). The inability to faithfully reproduce PCVAD experimentally has hindered the investigation of pathogenesis and vaccine development. In this study, a dual infection disease model incorporating PCV2 and porcine reproductive and respiratory syndrome virus (PRRSV) was used to study immunity, virus replication, and disease protection in pigs vaccinated with PCV2 capsid protein (CP). The experimental model included 49 conventional pigs divided into 7 groups: Group1 - mock challenge, Group 2 - PCV2 vaccine only, Group 3 - PRRSV only, Group 4 - PCV2 only, Group 5 - PCV2 vaccine-PCV2 challenge, Group 6 - PCV2 +PRRSV challenge, and Group 7-PCV2 vaccine-PCV2+PRRSV challenge. During the 77 day study, vaccinated groups received a commercial PCV2 CP product on days 0 and 21, and virus challenge occurred on day 35. The principal effect of PRRSV infection was to increase peak PCV2 viremia by almost 40-fold; however, PCV2 did not show a reciprocal effect on PRRSV replication. In vaccinated pigs, there was no evidence of PCVAD or PCV2 replication following virus challenge. Immunity following vaccination favored neutralizing antibody; whereas, PCV2 infection produced high levels of non-neutralizing antibody, primarily directed against a polypeptide in the C-terminal region of the CP. These results demonstrate both qualitative and quantitative differences in antibodies produced during infection and vaccination. By all available measurements, vaccination produced sterilizing immunity.

CHARACTERIZATION OF IMMUNE ACTIVATION IN HEALTHY FOALS WHEN VACCINATION IS INITIATED AT 3-MONTHS OF AGE

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Neonatal foals acquire maternal antibodies and leukocytes via colostral absorption. This process is termed passive immunity and is important to sustain neonatal immunity. Passive immunity wanes with time, necessitating immunization of young animals to initiate active immunity that provides long lasting memory. American Association of Equine Practitioners guidelines recommend that immunizations begin at 6 months of age, after maternal antibodies have declined below a protective level. Our study aimed to determine if maternal antibodies interfere with active neonatal immunity when immunizations are initiated at 3 months of age. Peripheral blood mononuclear cells (PBMCs) containing lymphocytes and monocytes were isolated and cultured for four days in either media, T-lymphocyte mitogen (Phytohemagglutin) or with vaccine antigens. Using flow cytometry and immunolabeling techniques, expression of intracellular cytokines (IL-4 and IFN-γ), granzyme B, and surface expression of major histocompatibility complex class II molecules in CD2+/CD4+/CD8+ lymphocytes were compared among treatments. Our hypothesis was we would detect antigen-specific T-lymphocyte responses (CD4+ and CD8+) in foals receiving colostrum and vaccinated at 3 months of age based on the detection of intracellular IL-4 and/or IFN-γ expression. The latter component of this investigation will compare this response to a similarly managed group of foals that were vaccinated at 6 months of age. Intracellular cytokine analysis enabled us to determine antigen specific cellular immune responses to vaccine antigens. This data has enhanced our understanding of the role that passive immunity plays with regard to the induction of active immunity in foals vaccinated prior to complete catabolism of maternal antibody.

THE ESSENCE AND OUTCOMES OF EFFECTIVE INTERNSHIP LEARNING EXPERIENCES

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Colleges and universities across the United States seek new, creative, and impactful ways to enhance student engagement. The study of student engagement has led to the identification of several "high-impact" educational practices that appear to generate higher levels of student performance, learning, and development than the traditional classroom experience (Brownell & Swaner, 2010). While many high-impact activities are appealing, they must be done well to effectively engage students at significant levels (Kuh, 2008). Internships – when done well – are among the recommended high-impact educational practices. Particularly guided by Astin's (1984; 1993) student involvement theory, this qualitative study investigates internships when they are done well by better understanding the individual inputs that contribute to effective student internship experiences. This study also examines effective internships by understanding the environment – the programs, faculty, peers, and educational experiences – to which the student is exposed. Futhermore, this study examines the student outcomes that result from internship experiences when they are done well. Utilizing interviews, this phenomenological study reconstructs students' internship experiences. For the triangulation of data collection, faculty and employers are also interviewed about their observations regarding student internships. This study potentially helps universities, employers, and students identify the essential components of internship experiences that result in meaningful outcomes. Moreover, the findings can help everyone in the campus community – faculty, advisors, and career development professionals – help students fulfill their learning and career development goals (O'Neill, 2010).

U.S. STATE-LEVEL IMPACTS OF VARIOUS ENERGY PRICE SHOCKS ON ECONOMIC ACTIVITY

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What are the macroeconomic effects of an energy price shock? Previous studies have addressed this question by examining the effects of oil price shocks at the aggregate level. The United States, however, is a diverse country with diverse economies in each state. Therefore, this study analyzes the effects of different energy price shocks, such as gasoline, diesel, heating oil, natural gas and electricity, at the U.S. state-level. It should then be apparent which sources of energy have the most significant impact on each state or region of the country. Using disaggregate economic activity data and multiple energy price shocks will provide more variation and will hopefully better explain the energy price-macroeconomy relationship. Granger-causality tests will show for which states energy price shocks help predict future economic activity, and impulse response functions will show which states have a positive or negative reaction to energy price shocks as well as the magnitude of the reaction. I anticipate that the state-level approach will provide supporting evidence of certain theories explaining how energy price shocks affect the economy, and provide useful information on the effects of energy price shocks at the U.S. state-level.

TOWARD NON-TRADITIONAL GENDER ROLES IN FARMING HOUSEHOLDS IN KANSAS?

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Seven interviewers, who are part of a NSF Kansas EPSCoR project, called Biofuels and Climate Change: Farmers' Land Use Decisions, interviewed 149 Kansas farmers regarding their land use decisions, their families, and their communities. Although they were not directly questioned about the roles of women in farming, a discourse analysis of a sample of the interview transcripts reveals how they talk about farming and how women are positioned within that context. Brandth (2002) identifies three discourses in the academic literature on gender in family farming: (1) the discourse of the family farm where family farming is patriarchal and females are secondary, (2) the discourse of the masculinization of farming which notes how farming activities have increasingly been dominated by males which leaves women out or they decide to leave, and (3) the detraditionalization and diversity discourse which sees farming roles as diverse and not characterized by patriarchy. Brandth concludes that in the literature, the discourse of the family farm is dominant. Here the analysis consists of noting when and how women are discussed and when gendered speech is used, such as in making references to farmers as men. Overall, the discourse apparent across 30 transcripts is more characteristic of detraditionalization and diversity. Even though males are the primary operators in farming, overall, females were not portrayed as meek homemakers. Rather, women's roles were viewed as essential to farm operations, with some women aiding in decision making, some driving machinery, and others contributing substantially to the household by working off-farm.

ROUTINE JUSTICE: A MULTIVARIATE ANALYSIS OF POLICE ACTIONS IN ROUTINE TRAFFIC STOPS USING NATIONAL DATA

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Racial profiling by police on the nation's streets and highways has attracted significant attention over the past two decades from scholars, media figures, politicians and police administrators. Some have even argued it has become "the most important issue facing American policing" today (Withrow 2006:4). There has been considerable emperical attention directed at the problem over the last 15 years, but many questions linger. Previous research has examined the effect of extralegal and legal factors on discrete traffic stop outcomes (e.g. police decisions to stop, cite, search, or arrest drivers). One limitation in such work is that traffic stop outcomes are not necessarily discrete; multiple outcomes are possible in any given traffic stop. For example, a driver stopped may not only receive a traffic ticket, but may also be searched and arrested. Another driver may be searched and warned, but not arrested, another ticketed, handcuffed, but nothing else. Prior work has not tested whether the same independent factors retain their relative influence when considering multiple stop outcomes simultaneously. Using multinomial logit statistical techniques and national data, I examine the multiple pathways in traffic stop outcomes, paying particular attention to the effects of race/ethnicity and other important extralegal and legal factors. This work adds to the literature by considering a fuller range of possibilities in police decisions to resolve traffic stops.

PRIVACY IN THE WORKPLACE THROUGH A CULTURAL LENS

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A sense of privacy and security is a basic human need. Privacy is defined as being free from public view or scrutiny. Perceived privacy in the designed environment is imperative to user wellbeing. While privacy is most often associated with withholding information, rights, or emotions; security is often considered the channel to retain privacy. Authors believe that privacy is easily understood related to the governing system. In countries governed by privacy laws; certain levels of privacy are restricted or maintained. As our community shifts towards global integration, it is vital to acknowledge cultural differences and similarities in regards to privacy. Within the US we value a strong sense of privacy. However, the privacy is not a primary need of many other cultures. To understand the relationship between privacy and security, the authors researched documented evidence and employed personal observation, analyzed the need for privacy among multi-cultural workforce in the US and compared the data gathered to understand how it impacts different office workers' behaviors and productivity. By gaining an understanding of the need for privacy within the multi-cultural work environment, a knowledge base can be developed for the global design community. Based on the results of analyzed data, authors developed an organic guideline for accommodating privacy needs of the multicultural workforce which can break down the barriers of cultural ignorance and assist designers in developing culturally appropriate harmonious workspace. In this presentation, authors will share their research findings on the need for privacy in the work environment in the USA.

FOUR GENERATIONS, ONE WORKPLACE

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The workforce currently consists of members of several different generations, all with vastly different psychological and cultural needs. The predominant generations currently working together in the United States are: the Baby Boomers (born between 1945 and 1964); Generation X (born between 1965 and 1979); and Generation Y, or Millennial (born between 1980 and 1999). Baby Boomers, having held established positions in the workforce for some time now, are commonly seen as goal-oriented, independent, competitive, and work-centric. In contrast to this, the Millennials are just entering the workforce and are seen as team oriented, achievement driven, and tech-savvy. These conflicting characteristics can create tension and conflicts among employees, specifically in areas where collaboration is essential. Through this study, the psychological needs of each generation are evaluated in order to identify their preferred work styles. Literature review and precedent analysis as well as informal interviews were utilized as the primary research methods to collect relevant data. The collected data was analyzed to draw conclusions. The results disclosed how employers can avoid these generational conflicts. A guideline based on this research was developed to help resolve conflicts in the workplace. This guideline offers suggestions any employer can adapt to avoid generational conflicts in today's workforce and will be beneficial to those aiming to design functional and effective work environments for multi-generational workforce. In their presentation, the authors will share their research methods and findings and how the guideline they have developed can assist any employer and designers.

IMPACT OF LIGHT AND COLOR IN OFFICE DESIGN

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This paper is an examination of the impact artificial and natural light have on the work environment, focusing especially on how light can be combined with color to maximize the appeal and productivity of the office. In this paper authors examine the advantages and disadvantages of various sources of light, in addition to their interactions with color in work environment. Research focused on office lighting suggests that office workers prefer natural light over artificial lighting. Research on color choices in offices reveals that office workers prefer natural blue and green colors. However, there seems to be a dearth of research combining the ways light and color can work together for optimal benefit. To understand how light and color combined can affect social changes in the work place, authors conducted literature reviews and precedent analysis and also examined the scientific methods of sociological research pertaining to both light and color. The analysis of data collected through these qualitative research methods revealed that individually lighting and color are very important in the work place, but the combination of the two can provide a more holistically pleasing work environment and promote office workers' productivity and happiness. Authors developed a guideline based on their findings that designers can adapt to create holistically pleasing office environment. Currently these authors are implementing their findings in their design project to test their research results. In this presentation, the authors will share their research efforts and discuss how they are implementing their findings in their project.

A REVIEW OF SUSTAINABLE MECHANICAL SYSTEMS AND ITS CONTRIBUTIONS TO THE OFFICE ENVIRONMENT

Darra Draheim, Tiffany Hoffman, and Ryan Goetsch
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Sustainability has become ubiquitous within building design in recent years. This is due to the environmental impact and the inevitable initial cost payoff one can gain from the lower energy use. To understand how sustainable mechanical systems can affect office design and its consumers, it is necessary to show how the workspace benefits from the use of sustainable design strategies. In this paper the authors explain the role of both passive and mechanical systems in the development of a sustainable design solution for the office environment. To understand the importance of these systems, the authors conducted literature reviews and analyzed existing buildings that were renovated to examine the effectiveness of such strategies. They also compared the strategies suggested in the existing literature with the results available through the renovated projects, and were able to identify some of the design strategies that contributed to sustainable design solutions. This comparative analysis indicated how to best utilize these systems and equipment to develop sustainable and green solutions. Based on their findings, these authors developed a guideline that other designers can utilize to develop sustainable solutions. In this presentation the authors will discuss their research methods and findings and will share some of the suggestions based on their research that can lead to sustainable solutions.

A FRESH INSIGHT INTO OFFICE ERGONOMICS

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Recently, there has been a significant increase in the incorporation of ergonomic functions into office systems furniture. Ergonomics as a science was introduced after the Second World War and was considered as a complex science, wherein a solution to a real task was reached through empirical methods (Franus, 1991). The unique relationship between actions and objects form the perfect opportunity to establish ergonomics properly and thoroughly throughout an entire setting. Task and object analysis is vital to success when applying ergonomics in the design of furniture systems. The need for ergonomically effective furniture exists in many places, especially those that use systems furniture. This is a category of furniture that is used in a variety of settings: corporate, healthcare, academic and other types of office. Addressing any issue will involve the aforementioned analysis of task and object, as well as how humans interact with both. A common error in ergonomics is the lack of knowledge and training on the subject. Ergonomic furniture can be easily misunderstood or over-thought by the user. The authors reviewed history and recent applications to understand the direction ergonomics have taken, and to predict where it will go in the future. Their research suggested that innovation and improvements are inevitable and research, inventive design, and new perspectives on ergonomics will be implemented in order to continue improving in the future. In this presentation the authors will share their findings and discuss how ergonomics can improve office workers performance.

IMPORTANCE OF WAYFINDING AND SIGNAGE IN CORPORATE DESIGN

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Whether discovering new places or navigating familiar territory, proper way finding is a means of achieving a successful user experience in any designed environment. Way finding, simply put, is the act of navigating oneself through a space to a desired destination. In order to move effectively and intentionally to another location, one must gain an understanding of where they are relative to their surrounding environment. Architectural and graphic organization of the space prompts users to engage their cognitive mapping abilities to navigate through the space. The authors wanted to understand the importance of way finding and well designed signage in the corporate office environment and employed various research methods to determine the most effective strategy and procedure for way finding. A design guideline, specifically for law firm design, was derived from review of documented evidence, case studies, and evaluation of existing concepts in way finding. The data analysis indicated that in all way finding strategy, underlying organization is essential. Underlying organization utilizes geometrical relationships within a building or place, establishes correct spatial orientation methods, provides concise directional information, and clearly marks destination identification to lead the user through the space. Based on their findings, the authors developed a way finding guideline that they will share along with their research methods and findings.

Poster Abstracts

Graduate Student Posters

1
FUNGAL AND BACTERIAL COMMUNITY RESPONSES TO FALLOW PERIOD IN THE BOLIVIAN HIGHLANDS

Lorena Gomez-Montano[1], Ari Jumpponen[2], Miguel A. Gonzales[3], Jorge Cusicanqui[4], Corinne Valdivia[5], Peter Motavalli[6], Michael Herman[2], Karen A. Garrett[1]

[1]Department of Plant Pathology, College of Agriculture; [2]Division of Biology, College of Arts & Sciences; [3]Fundacion PROINPA, Bolivia; [4]Universidad Mayor de San Andres, Bolivia; [5]Department of Agricultural Economics, University of Missouri; [6]Division of Plant Sciences, University of Missouri

Traditional fallow periods in the Bolivian highlands are being shortened in an effort to increase short-term crop yields, with potential long-term impacts on soil communities. Using 454-pyrosequencing, we characterized fungal and bacterial community responses to (1) the length of fallow period and (2) the presence of the plants *Parasthrephia* sp. or *Baccharis* sp. (both locally known as 'Thola'), widely considered by farmers as beneficial to soil health. Nevertheless, Thola is frequently used as a source of fuel by farmers. The two study regions, Umala and Ancoraimes, differ in their soil characteristics, which may be a fundamental reason for the inherent differences in regional management practices. Soils in Ancoraimes have higher levels of organic matter, nitrogen and other macronutrients. In our analyses, Ancoraimes soils supported more diverse fungal communities, whereas Umala had more diverse bacterial communities. Unexpectedly, the longer fallow periods were associated with lower fungal and bacterial diversity. Fungi such as *Bionectria, Thelebolus, Acremonium* and *Chaetomidium,* and bacteria such as *Thermofilum, Paenibacillus, and Gemmata* decreased in abundance with longer fallow period. The presence of Thola did not significantly affect overall soil fungal or bacterial diversity, but did affect the frequency of some taxa such as *Alternaria* (often pathogens) and *Bradyrhizobium* (often important in nitrogen fixation). Our results suggest that fallow period has a wide range of effects on microbial communities, and that the removal of Thola from the fields impacts the dynamics of the soil microbial communities.

2
A SINGLE HISTIDINE RESIDUE IN THE NUCLEAR EXPORT SEQUENCE OF THE GATA TRANSCRIPTION FACTOR AreA IS REQUIRED FOR NUCLEAR EXPORT

Damien J. Downes, Kendra S. Siebert, and Richard B. Todd

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GATA transcription factors are highly conserved eukaryotic zinc finger DNA binding proteins that regulate gene expression in plants, animals and fungi. GATA factors control a wide array of important pathways including, hematopoiesis and cardiac development in humans and zebrafish, seed germination and chlorophyll synthesis in Arabidopsis and light response, iron homeostasis and nitrogen nutrient utilization in fungi. The correct expression of target genes in these pathways requires controlled regulation of GATA transcription factor activity. We use the model fungus *Aspergillus nidulans* to study the regulation of GATA transcription factor activity. In *A. nidulans* the GATA transcription activator AreA controls the preferential utilization of nitrogen nutrients and the response to nitrogen starvation. During nitrogen starvation AreA accumulates in the nucleus, and target gene expression is elevated. Regulated nuclear export via the CRM1 exportin ortholog is the control point for nuclear accumulation of AreA. Nuclear export of AreA in nitrogen-starved cells occurs in response to a range of nitrogen compounds. We have mutated residues within the AreA Nuclear Export Sequence and identified point mutations of a single histidine residue that result in constitutive AreA nuclear accumulation. We are using a novel mutant screen approach and mutational analysis of candidate protein histidine modifiers to identify proteins involved in the regulation of AreA nuclear export.

3

THE GATA TRANSCRIPTION FACTOR AreA HAS MULTIPLE NUCLEAR LOCALIZATION SEQUENCES SUFFICIENT FOR NUCLEAR ACCUMULATION.

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Department of Plant Pathology, College of Agriculture

The GATA DNA-binding transcription factor AreA from the genetic model eukaryote *Aspergillus nidulans* activates genes for uptake and metabolism of nitrogen nutrients. AreA nuclear accumulation occurs during nitrogen starvation but does not occur in the presence of nitrogen nutrients. The AreA protein contains five putative classical SV40 large T antigen-type nuclear localization sequences (NLSs) and one putative non-canonical bipartite NLS conserved with mammalian GATA4. We established which of the putative NLSs are functional. We made constructs encoding Green Fluorescent Protein (GFP) fused to individual wild type or mutant NLSs. These constructs were targeted to the *A. nidulans wA* gene. GFP-NLS fusion protein subcellular distribution was analyzed in the transformants using UV-fluorescence microscopy during both nitrogen sufficiency and starvation. The noncanonical bipartite NLS confers strong GFP nuclear localization and one classical NLS confers weak GFP nuclear localization. The other four classical NLSs, when fused together, result in strong localization of GFP to the nucleus.

4

CELL-MEDIATED MAGNETIC HYPERTHERMIA OF PRECLINICAL TUMORS

Sivasai Balivada[1], Rajashekhar Rachakatla[1], Matthew T.Basel[1], Hongwang wang[2], Gwi Moon Seo[1], Tej B. Shrestha[†], Marla Pyle[1], Viktor chikan[2], Stefan H Bossmann[2], Deryl L Troyer[1]
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Magnetic hyperthermia using magnetic nanoparticles (MNPs) to absorb alternating magnetic field (AMF) energy as a method of generating localized hyperthermia has been shown to be a potential cancer treatment. Many attempts have been made to increase the localization of MNPs, for example attaching antibodies recognizing tumor-specific epitopes or peptides binding receptors on tumor cells or neovasculature. Several research groups have shown reliable results using tumor homing cells as delivery cells for different therapeutics. Here we hypothesized that tumor homing cells can carry MNPs specifically to the tumor site, and tumor burden will decrease after AMF exposure**.** To test this hypothesis, first we loaded Fe/Fe_3O_4 bi-magnetic NPs into neural progenitor cells (NPCs), which were previously shown to migrate towards melanoma tumors. We observed that NPCs loaded with MNPs travel to subcutaneous melanoma tumors. After AMF exposure, the targeted delivery of MNPs by the NPCs resulted in a significant decrease in tumor size. Second, Monocytes/macrophages (Mo/Ma) are known to infiltrate tumor sites, and also have phagocytic activity which can increase their uptake of MNPs. To test Mo/Ma-mediated magnetic hyperthermia we transplanted Mo/Ma loaded with MNPs into a mouse model of pancreatic peritoneal carcinomatosis. We observed that MNP-loaded Mo/Ma infiltrated pancreatic tumors and, after AMF treatment, significantly prolonged the lives of mice bearing disseminated intraperitoneal pancreatic tumors. Based on these observations we concluded that development of localized hyperthermia treatment using tumor tropic cells can be a potential therapy for cancer.

5

IMPROVED SOIL AGGREGATE CRUSHING-ENERGY METER

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Soil aggregate strength is an important physical property in evaluating wind erosion potential. In 1982, the USDA-ARS developed the Soil-Aggregate Crushing-Energy Meter (SACEM), consisting of two flat plates as the crushing device, load-cell, displacement transducer, and a stand-alone single-board computer with digital readout. The instrument has provided a compact means to measure dry soil aggregate strength; however it has major limitations, including manual operation at a constant speed, and manual recording of data. Improvements were made to the meter, including redesign of the cranking and data acquisition systems. The hand-cranking mechanism was replaced by a belt and pulley system driven by a universal brush-type electric motor. The stand-alone computer was completely eliminated and all signal processing and motor control is handled by a user-friendly PC-based program designed with LabVIEW. A major challenge in the updated design was accurately reading signals while eliminating unwanted electrical noise. Signal processing was accomplished with a low-pass Butterworth-type filter designed directly into the LabVIEW program. Preliminary testing shows good correlation with the original system, however more comparison tests are being conducted, and results will be presented. The updated system is simpler to use and provides more consistent results.

6

STUDY OF FRACTAL AGGREGATES USING SMALL ANGLE LIGHT SCATTERING

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Our goal is to investigate the fractal aggregation and kinetics of unstable colloids using small angle light scattering. Light scattering is a valuable tool to measure the size and aggregation kinetics of small particles. We use a 633 nm He-Ne laser to illuminate the sample, and the scattered light intensity, as a function of angle, is collected using a photodiode array. Our current experiment studies the aggregation kinetics of 20 nm polystyrene latex spheres when aggregation is induced using $MgCl_2$ salt, which screens the repulsive interaction between the spheres. These solid particles irreversibly aggregate to create structures with fractal dimension D_f = 1.75 ± 0.03, which is in good agreement with the well-known Diffusion Limited Cluster Aggregation (DLCA) fractal dimension, which ranges from 1.7 to 1.8. These fractal aggregates then grow until they fill the entire volume, forming a gel. The gel time is dependent on the salt concentration used to destabilize the polystyrene spheres. We also investigate the growth rate of the radius of gyration (Rg, the root mean square radius) of the fractal aggregates.

7

FLUX GROWTH OF CUBIC BORON PHOSPHIDE CRYSTALS

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The ability to intercept attempts to smuggle nuclear weapons into the United States is critically important for homeland security. New types of neutron detectors are especially needed, as current devices employ a rare helium isotope (^{3}He), which was a byproduct of the production of hydrogen bombs. As the production of nuclear weapons has largely ceased and the need for homeland security has grown, demand for ^{3}He has greatly exceeded supply. Boron phosphide, BP, a compound semiconductor, is a potential alternative for neutron detectors because of the large thermal neutron capture cross-section of the boron-10 isotope (3840 barns). In this study, cubic BP crystals were grown by crystallizing dissolved boron and phosphorus from a nickel solvent in a sealed (initially evacuated) quartz tube. The boron - nickel solution was located at one end of the tube and held at 1150°C. Phosphorus, initially at the opposite end of the tube at a temperature of 430°C, vaporized producing a pressure of 1–5 atmospheres. Transparent red BP crystals, mostly hexagonal shape and up to 2mm in the largest dimension were obtained with a cooling rate of 3°C per hour, and less than 0.5mm with a cooling rate of 10°C per hour. The lattice constant of the crystals was 4.534Å, as measured by x-ray diffraction. Intense, sharp Raman phonon peaks were located at 800cm^{-1} and 830cm^{-1}, in agreement to values reported in the literature. Energy dispersive x-ray spectroscopy (EDS) and scanning electron microscope (SEM) also confirmed the synthesized crystals were cubic BP crystals, with boron to phosphorus atomic ratio of 1:1. Therefore, this flux growth method is capable of growing large, high quality BP crystals.

8

THERAPEUTIC SCHOOLYARD: DESIGN FOR AUTISM SPECTRUM DISORDER

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Children are more often being diagnosed with various degrees of Autism Spectrum Disorder (ASD), commonly referred to as autism. Many children with autism have difficulties in communicating, must cope with their disorder, and may need special considerations in the classroom. Needs of children with autism vary from child to child, but they all can benefit from environments that are designed with awareness of challenges and characteristics associated with autism. Schoolyards are often predictable with asphalt, turf, and traditional play structures that do not take into consideration the needs of children with mental or physical disabilities. Schoolyards can be designed in such a way that they have therapeutic benefits on these children without segregating them from the larger school community. In order to understand how a schoolyard might be a therapeutic environment for children with autism, the challenges, needs, and common therapies for children with autism will be researched along with characteristics of therapeutic landscapes for children. By examining both therapeutic landscapes and the many facets of autism, design strategies from both of these focuses will be combined and laid out on a school site to incorporate both therapeutic and learning experiences into the schoolyard.

9

HEIRLOOM TECHNIQUES AS SUSTAINABLE TEXTILE DESIGN SOLUTIONS: LOCAL NATURAL DYE SOURCES AND HAND-WOVEN TEXTILES

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This practice-based research aims to examine sustainable textile and apparel design solutions through the use of heirloom textile design processes and techniques. The apparel and textile industry is one of the most polluting industries; from manufacturing through consumer disposal, the present abundance of synthetic dye chemicals and synthetic fibers is environmentally unsustainable; this research investigates more sustainable materials and textile production methods. Sustainable heirloom textile design methods and materials were researched within a practice-based methodology guided by a design research framework; preceding an exploration of local Kansas plant materials as natural-dye sources and hand-loom weaving. Two weights of wool yarns were purchased from an online source ("Pony 2-Ply", a 100% wool lace weight yarn, and "Kona Sport", a 100% Super-wash wool sport weight yarn) to be dyed with locally collected plant matter extracts (black walnut hulls (*Juglans nigra),* goldenrod (*Solidago sp.),* Midwestern tickseed (*Bidens aristosa),* pokeweed berries (*Phytolacca Americana*), sumac berries (*Rhus glabra),* and wild sunflower heads (*Helianthus annuus)*). Dyed yarns were then woven by hand into yards of textile measuring 26" wide (maximum loom width), utilizing various weave structures and yarn combinations. Both the heirloom textile design techniques and the finished artifact were evaluated regarding their appropriateness for use within the apparel design industry, as well as their qualifications as a modern sustainable textile design solution. Research outcomes include the creation of a designed artifact for exhibition, reflective journal and creative archive entries for exposition, and a written document appropriate for submission into juried scholarly journals.

10

FITNESS GAINS FROM A SUMMER YOUTH CONDITIONING CAMP

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This study examined the effects of shorter-duration, high intensity (HI) exercise training on fitness and body composition for youth. The Intervention Group (IG) had 9 participants (mean =10.6 yrs, 8 M, 1 F), and 6 were in the Comparison Group (CG; mean =11.3 yrs, 6 M). The IG participated in HI exercise (45 min, 2d/wk, 4wks) while the CG maintained normal activities. Both groups completed pretest and posttest fitness assessments, as well as a Dual-energy X-ray Absorptiometry scan 4 weeks apart. Difference scores were computed and t-tests were conducted. Statistically significant differences were found between groups for fitness and body composition ($p<.05$). A higher percentage of IG participants improved over the CG on the Margaria-Kalamen step test, while more CG participants improved on the 40m dash, agility, and the Fitnessgram Pacer test. More participants in the IG grew taller, while participants in the CG improved over the IG for total body mass, fat mass, lean body mass, and body fat percentage. Four weeks of HI exercise yielded greater increases in power and height. Both groups had participants that showed improvements but the CG showed greater improvement in more areas of fitness (speed, agility, cardiorespiratory endurance) and body composition as compared to the IG. Potential explanations include the short duration and frequency of the exercise intervention, measurement error and differences in reporting of fitness, body composition, and anthropometric measurement testing, psychological and motivational status of youth during testing sessions, and physical activity and fitness capabilities of youth between both groups.

11

COOLING FOODS IN SCHOOL FOODSERVICE OPERATIONS

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The purpose of this study was to analyze the methods used to cool leftover food products in school foodservice operations. Cooling treatments included placement in a walk-in cooler, a walk-in freezer, a walk-in cooler with the use of a chill stick, and a walk-in cooler with an ice bath. Two common food products, chili and tomato sauce, were used to test cooling times. Both products were kept at a two-inch depth (or in a stock pot when using the chill stick). The Food and Drug Administration (FDA) Model Food Code requires food to meet two cooling benchmarks, from 135°F-70°F within the first two hours (120 minutes), and 70°F-41°F in the next four hours (240 minutes). Food product temperatures were recorded at one-minute intervals during the cooling phase and the average of three replicates was taken to establish the statistical cooling curve for each treatment. Cooling data were analyzed using the Statistical Package for the Social Sciences (v. 17.0). Products monitored in the walk-in freezer met FDA food code requirements (135°F-70°F, M = 102.5 minutes ± 11.5 minutes; 70°F-41°F, M = 81.5 minutes ± 11.5 minutes). Ongoing data collection indicates that the remaining cooling treatments will not meet food code requirements. The chill stick treatment required the longest cooling time (135°F-70°F, M = 156 minutes ± 35 minutes; 70°F-41°F, M = 1,038 minutes ± 69 minutes). This study demonstrates the need for further research about cooling practices and establishing best practices in foodservice operations.

12

DESCRIPTIVE ANALYSIS OF MEAT RECALLS FROM 1982-2009 IN THE U.S.

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More regulations and implementation of safety procedures have been created to control the quality of food along the production value chain. Meat is one of the products very closely followed by FSIS in the U.S. Therefore, more efforts and resources have been allocated to monitor it. The purpose of the research is to describe trends in meat food recalls in the U.S. from 1982-2009, as well as to find correlations between meat food recalls and other variables (region where the recall was initiated, days since initiation, characteristic of the recall, type of hazard of the recall, etc) that can guide policy makers to improve the meat recall process. The descriptive analysis shows that the mean recovery rate is 46% of the total pounds recalled. The average of meat pounds collected per year during 1982-2009 is 60,000 lbs. The recall cases that have increased notably are the small recalls (<10000lbs). More than 50% of the recall cases took more than 15 days to be initiated. The state that has presented the highest number of cases is California, reporting 9% of the recalls. Using a linear regression model there is a statistically high correlation between the number of pounds recuperated from a recall, the region where the recall was initiated, the average number of days of the initiation of the recall, type of recall, and characteristic of the recall (Bacteria vs. non-Bacteria).

13

AID OR CONFLICT? A GAME THEORETIC APPROACH

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Development Aid (in the form of Official Development Aid (ODA) and Foreign Direct Investment(FDI)) to Least Developed Countries (LDC's) has long been debated in policy circles. Does it contribute to stability, drive conflict, or is it simply a waste of money? Using Game Theory, this project attempts to establish a logically consistent theory in order to compare the cost of aid to the cost of conflict. If aid is indeed a necessary component of stability, does that imply that a lack of aid will contribute to conflict? And if this assumption is true, then which is less costly: aid or conflict? What political costs are associated with the granting of aid or the funding of a conflict?

14

CREATING INCLUSIVE ADVISING/MENTORING FOR *BICULTURAL AFRICAN-AMERICAN PERSONALITIES IN A MAJORITY MAINSTREAM HIGHER EDUCATION ENVIRONMENT*

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Acculturation, assimilation and theories of identity development within a college student environment play a pivotal role within the day to day lives of both traditional and non-traditional students. Most importantly, these aspects are more salient within the lives of international individuals acculturating and assimilating to an American society which perceives them as foreigners and outsiders within their environments. The extent to which foreign students are affected by theories of identity development, acculturation and assimilation; ultimately affects their sense of belonging and mattering within their college environment, which in turn affects their success at their institutions. Advisors at various higher education institutions should be well-informed of varying international students from the aspect of their cultural background, to understanding the processes of acculturation and assimilation, and then finally understanding how theories of identity development and practical applications could facilitate a sense of belonging and inclusivity into both the campus environment and their new community. The case study framework presented of Samantha Smit is that of an international person with world experience outside of her own culture, language and country of origin. With these multitudes of experiences, her identity has evolved, and as such a multitude of theories of identity development within the college environment can be explored alongside that of assimilation and acculturation. Most importantly, a unique opportunity is presented to inform advisors, faculty and student affairs personnel of their response ability in *Creating Inclusive Advising/Mentoring for Bicultural African-American Personalities in a Majority Mainstream Higher Education Environment.*

15

THE LONGITUDINAL ASSOCIATION BETWEEN CHILD TEMPERAMENT, PARENTAL ENGAGEMENT, AND PARENTAL STRESS IN A POPULATION OF SINGLE MOTHERS

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During the transition parenthood, single mothers experience difficulties such as decreased economic resources, longer work hours, decreased time with child, and reduced social support. The increased maternal demands of single mothers impact the mother-child relationship. Using an autoregressive structural model, the primary aim of this study was determine the association of child's temperament at age 1 impacted parental stress and parental engagement across time and association between parental engagement and parental stress across time. The sample consisted of 2,370 single mothers from Fragile Families and Child Wellbeing study national data set. Single mothers were assessed at 3 time points, when the child was 1, 3, and 5. The measures used in this study included child temperament at Time 2 (child at age 1), parental engagement (child at age 1, 3, and 5), and parental stress (child at age 1, 3, and 5). The model had good fit with the data ($\chi^2(2) = .82$, $p > .05$; CFI = 1.00; RMSEA = .000), with significant ($p < .05$) paths from child temperament (Time 2) to parental engagement (Time 2) and parental stress (Time 2). There were also significant bidirectional paths from parental engagement (Time 2) to parental stress (Time 3), and parental engagement (Time 3) to parental stress (Time 4). Results show that children demonstrating difficult temperament at age 1 increases a single mothers' level of stress and decreases their level of engagement with the child, and that a single mother's lack of time with their children increases levels of stress.

16

THE IMPACT OF SMALL TOWN/RURAL COMMUNITY YOUTH DEVELOPMENT PROJECTS ON YOUTHS' PERCEPTION OF SOCIAL CAPITAL AND COMMUNITY HEALTH STATUS

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Flora and Gillespie (2009) found that targeted programs which increase the social, built, and human capital of communities can result in health and quality of life improvements. Five small Kansas towns implemented and evaluated youth led health promotion projects to improve physical activity through built environments. Adolescents conducted activities over 12 months follow by localized health promotion plans. Youth completed both pre and post assessments that evaluated social capital and belonging (Tolan, Gorman-Smith & Henry, 2001), and involvement (Jones & Perkins, 2006). At the conclusion of the study youth created a map that addressed the unique assets of their community.

Outcomes of the study included:

- Youth participants developed skills in health promotion.
- Youth and adults established effective partnerships where none had existed.
- Youth participant feelings of community belonging and loyalty to small towns increased.

The findings of this case study give direction to rural communities wishing to improve health status and strengthen social, built, and human capital.

17

THE MATHEMATICS OF HOMOPHOBIC BULLYING

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Although many sexual minority youth experience adolescence similarly to their peers (Savin-Williams, 2005), evidence suggests that lesbian, gay, bisexual, transgender, intersex, two-spirit and questioning youth are at a much higher risk of being bullied (Grant et al, 2010; Kosciw et al., 2010) and for experiencing criminal-justice and school sanctions (Himmelstein & Bruckner, 2011). Sexual minority youth may skip classes, skip one or more days of school, earn lower grade point averages, develop lower educational aspirations, experience depression or anxiety, become homeless, and think about or attempt suicide (GLSEN, 2010; Ray, 2006; Robinson & Espelage, 2011). In addition, the school experiences of sexual minority youth **of color** *may or may not* negatively affect their academic performance (Savin-Williams, 2005). However, sexual minority youth who *are* victimized plan to attend post-secondary schools at lower rates than their peers (GLSEN, 2010). Lower educational attainment reduces lifetime earnings, affecting both individuals and communities. This presentation relates lowered educational attainment to the annual earnings of two constructed communities: one is assumed to be racially homogeneous and the other is assumed to be racially heterogeneous. In addition, there are three assumptions made about the working population: non-LGB (no lesbians or gay men at all), low-LGB (1% lesbians, 3% gay men) and high-LGB (5% lesbians, 8% gay men). Both communities show significant differences in annual earnings, in differences from a non-LGB assumption, and in lifetime earnings per LGB person.

18

CHARACTERIZATION OF PHYSIOLOGICAL PARAMETERS IN SOYBEAN WITH GENETIC IMPROVEMENT IN SEED YIELD

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Recent results from a genetic gain study have illustrated the contribution of plant breeding to the improvement in seed yield of soybean (*Glycine max* (L.) Merr.). The objective of this research was to characterize the changes in several physiological parameters that have occurred in the released cultivars with the improvement of seed yield. Sixty maturity group III and 54 maturity group IV cultivars, released from the 1920's through 2010, were evaluated in dryland and irrigated environments at Manhattan, KS in 2010 and 2011. Genotypes were planted in four-row plots, 3.4 m long, spaced 76 cm apart, arranged in a randomized complete block design with four replications. Genotypes were evaluated for canopy temperature, leaf chlorophyll content, pollen germination, and leaf fluorescence. Canopy temperature measurements were captured at solar noon using an infrared camera multiple times after the plants reached reproductive stages of growth. Leaf chlorophyll content was measured using a SPAD meter several times from R1 continuing through R6. In vitro pollen germination was measured using incubation temperatures of 28 and 34° C, beginning at late R1 through the end of flowering. Leaf fluorescence was measured beginning at R1 through R6. Genotypes differed significantly for all traits measured. Seed yield increased with year of release. Canopy temperature was negatively correlated with seed yield in both the maturity group III and IV genotypes. Leaf chlorophyll content, in vitro pollen germination, and leaf fluorescence tended to be positively correlated with seed yield. Evaluation of these parameters may serve as a basis to select for seed yield, or to assess the abiotic stress tolerance of a genotype.

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SUPPRESSION OF SOIL FUNGI ON BIOPHYSICAL PROPERTIES INVOLVING CARBON DYNAMICS

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Soil carbon (C) sequestration has been identified as a means to mitigate global climate change and improve soil quality. Soil fungi, including arbuscular mycorrhizal fungi (AMF), influence soil biophysical characteristics important in sequestering C. Disturbance, such as tillage, disrupts fungi, destroys soil structure and reduces macroaggregates. The experiment was conducted at the Konza Prairie Biological Research Station. Main plots were native prairie grass (big bluestem (*Andropogon geradii*); PG), no-till (NT) and continuous-till (CT) grain sorghum (*Sorghum bicolor*). AMF was suppressed using phosphorus (P), fungicide (F), and fungicide and phosphorus (F+P). The fungicide was thiophanate-methyl. Controls were included. Percent AMF root colonization was significantly greater in PG than NT and CT, with mean values of 12.8, 8.4, and 8.0 % respectively. Relative to the controls, F reduced AMF in all ecosystems while F+P reduced only in the less disturbed PG and NT, but P reduced only in PG. Macroaggregates formation was PG > NT > CT . The TOC was higher in PG and NT than CT. The PLFA biomarker for general fungi was higher in PG and NT than CT. These results support our prediction that fungi are influenced by soil management which is critical to the formation of macroaggregates, important in soil C sequestration.

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MICROBIAL ECOLOGY OF STABLE FLIES: EFFECT OF BACTERIAL COMMUNITY OF AGING HORSE MANURE ON STABLE FLY OVIPOSITION AND LARVAL DEVELOPMENT

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Stable flies (SF) are blood-sucking insects with great negative impact on livestock. SF larvae develop primarily in animal manure. Our hypothesis was that the microbial community in animal manure changes over time and plays an important role in SF oviposition and development. Two-choice bioassays were conducted using 2-week old horse manure (standard) and aging horse manure (fresh to 5 weeks old) to evaluate the effect of manure age on SF oviposition and larval development. Results showed that fresh manure is not attractive for SF oviposition and that the attractiveness increases as manure ages but declines from 4 weeks of age. Eggs artificially deposited on 1, 2 and 3 weeks old manure resulted in significantly higher SF survival comparing to that of fresh, 4, and 5 week old manure. The bacterial community of horse manure was analyzed by 454-pyrosequencing. The microbial structure shifted from strict anaerobes (*Clostridium, Eubacterium, Bacteroides, Ruminococcus*) in fresh manure to facultative anaerobes/aerobes (*Bacillus, Stenotrophomonas, Brevundimonas, Sphingomonas,* and *Pseudomonas*) in 1-4 week old manure. In conclusion, the microbial community in 2-3 weeks old horse manure is the most attractive for SF oviposition and provides the suitable habitat for SF development. Manure of this age should be the main target for disrupting SF life cycle to manage SF around livestock. Better understanding of SF microbial ecology is critical for development of novel SF management strategies that could be based on alteration of the microbial community of SF habitat to generate a substrate non-conducive to fly oviposition and/or larval development.

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PYRETHRIN AEROSOL FOR PEST CONTROL IN FOOD FACILITIES

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Methyl bromide (MB), the major fumigant of the food industry, was phased out from the U.S. in 2005, in accordance to the *Montreal Protocol* on reducing the use of ozone depleting compounds. The commonly used pest management tactics of food industries such as sulfuryl fluoride (SF), phosphine, and heat treatment have been identified as ineffective, highly toxic, and cost-intensive, respectively. Aerosol application can be cost effective and safe method of pest control in the food industries; however, there are very few published reports on the use of aerosol insecticide. A study was conducted in empty warehouses to evaluate the toxicity of pyrethrin aerosol on *Tribolium castaneum* (Herbst), the red flour beetle and *Tribolium confusum* Jacquelin du Val, the confused flour beetle, two of the major pests of the food industries. Insects were kept in glass petri dishes with and without flour and exposed for 2 hours in an aerosol treated and a control warehouse. Pyrethrin aerosol was highly effective against both the species causing more than 95% mortality. However, mortality was only 35.9% in CFB and 61.6% in RFB in the dishes containing flour. This suggests that the sanitation prior to aerosol application such as removing spilled food could increase the efficacy of the applied aerosols. Our results show that the pyrethrin aerosol could be an effective control of food product pests, and may offer a practical pest management strategy for food industries leading to reduced use of SF, phosphine and heat treatments.

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ESTIMATING EVAPOTRANSPIRATION IN TURFGRASS: COMPARISON AMONG MEASUREMENT TECHNIQUES

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Evapotranspiration (ET) can be measured or estimated by using empirical models (FAO56 Penman-Monteith, Priestly-Taylor), direct measurement (eddy covariance, lysimeters), or indirectly (atmometer). The objective of this investigation was to measure and compare cumulative ET among eddy covariance, microlysimeters, atmometers, and empirical models [FAO56 Penman-Monteith (FAO56) and Priestly-Taylor (PT)]. The investigation was conducted at the Rocky Ford Turfgrass Research Center in Manhattan, KS. The study was initiated in July 2010. A weather station, three atmometers, and three microlysimeters were placed within the footprint of an eddy covariance system. The soil at the site was a Chase silt loam (fine, montmorillonitic, mesic, Aquic, Argiudolls). Microlysimeters were constructed from polyvinylchloride. The soil and vegetation in microlysimeters consisted of intact cores of tall fescue (*Festuca arundinacea* Schreb.) taken from the study site. Evapotranspiration from microlysimeters was 58% greater to 2% less than the other methods, indicating significant differences in ET among techniques. These discrepancies could have important implications for ET studies in turfgrass. The fundamental mechanisms that caused the differences in ET among techniques are poorly understood and will require further investigation.

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RESPONSE OF KENTUCKY BLUEGRASS CULTIVARS TO PROLONGED DROUGHT IN THE TRANSITION ZONE

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The use of water for the irrigation of turfgrass is under increasing scrutiny. Identification of drought-resistant turfgrasses may reduce water requirements and increase survivability if water restrictions are imposed during drought. The objective of this study was to evaluate the response of Kentucky bluegrass (Poa pratensis L.) (KBG) to prolonged drought in the stressful climate of the transition zone of Kansas. Irrigation was withheld from 30 bluegrasses for 60 days, and plots were protected from rainfall by an automated rainout shelter near Manhattan, KS. Visual color and quality and digital images were collected weekly for all 30 bluegrasses during the dry down. Digital images were analyzed using Sigmascan Pro., which calculated percent green turfgrass cover for each plot. In addition, physiological parameters including electrolyte leakage, gross photosynthesis, and water potential were measured for seven cultivars to determine their contributions to drought resistance. Extreme heat was experienced during both dry downs in 2010 and 2011 but all KBG cultivars recovered in both years. Several cultivars in this experiment would likely be suitable in areas that may experience extended periods of drought without irrigation. Few differences in the physiological mechanisms among the seven cultivars were observed as relating to drought resistance.

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VARIATION IN SUSCEPTIBILITY OF INSECTS ASSOCIATED WITH KANSAS FARM-STORED GRAIN TO INSECTICIDES RECOMMENDED FOR EMPTY BIN TREATMENTS

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Producers apply insecticides to empty bins to kill insects prior to storing newly-harvested grain. We evaluated time-dependent immediate knockdown (KD) and 7-day mortality responses of adults of 16 strains of the red flour beetle, 7 strains of the sawtoothed grain beetle and 2 strains of the lesser grain borer collected from Kansas farms exposed on concrete surfaces to β-cyfluthrin, at low (0.086 mg(AI)/m^2) and high (0.172 mg(AI)/ m^2) rates, and chlorpyrifos-methyl plus deltamethrin (0.573 mg(AI)/m^2). Similar species reared since 1999 served as standard laboratory strains. The minimum time for KD and mortality of laboratory strains was established through time-response studies. Time for 100% KD and mortality was selected for each insecticide-species combination for testing against field strains. Mortality of all species against the two insecticides was lower than KD, suggesting recovery when placed on food. Nonlinear or linear models fitted to KD and mortality data showed significant differences among species and insecticides. Only one red flour beetle strain showed reduced susceptibility to the two insecticides compared to the laboratory strain. Both field strains of lesser grain borers were less susceptible than the laboratory strain to chlorpyrifos-methyl plus deltamethrin but not to β-cyfluthrin. In sawtoothed grain beetle, one strain was significantly less susceptible to chlorpyrifos-methyl plus deltamethrin than the laboratory strain, and two field strains were significantly less susceptible to β-cyfluthrin. Reduced susceptibility in field strains could be due to development of resistance. These findings can be used to make recommendations to producers for improved stored-grain insect management.

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THERMOMECHANICAL PROPERTIES OF FLOUR DOUGHS AFFECTED BY PROTEIN COMPOSITION AND MIXING CONDITIONS

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Dough mixing is one of the most important ways to characterize the quality of wheat flour. The mixing process transforms the combination of flour and water into a viscoelastic mass, develops the dough and helps the air occlusion. The physical and chemical reactions occurring during dough development are related to complex mechanisms involving the wheat proteins. Proper dough development is also affected by mixing intensity (kneading speed) and work imparted to the dough. The objective of this research was to study impact of gluten fractions, namely glutenin and gliadin, mixing speed and temperature on thermomechanical properties of synthetic wheat flours using Mixolab (Chopin Instruments). Synthetic wheat flours containing 85% wheat starch, and 15 % of gliadin-glutenin mixture were prepared. Glutenin:gliadin mixture was added in 0:15, 5:10, 10:5 and 15:0 percent proportions. Tests were carried out at the constant water absorption (98% db) and varying mixing speed (80-120 rpm) and temperatures (30-50°C). The resulting mixing curves were analyzed for mixing time and stability. Increase in mixing speed resulted in increase higher dough consistency independent from the mixing temperature. Mixing temperature was observed to have higher impact on dough consistency and stability than mixing speed. Softening effect of temperature was more significant at low mixing speeds. Synthetic doughs with varying ratios glutenin:gliadin mixtures displayed different degree of sensitivity to varying mixing speeds and temperatures.

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DRUG EFFECTS ON BEHAVIOR AND CORTISOL LEVELS DURING CASTRATION IN CALVES

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Calf castration is a common husbandry procedure in the U.S. Despite its high incidence, and growing interest in animal welfare, bovine pain management in the U.S. remains limited. There are currently no drugs specifically approved for cattle pain relief. Acute cortisol response has been used as an indicator of the distress associated with castration in cattle, and behavioral responses (e.g. foot stomps) are accepted as indicators of pain resulting from castration. The primary objective of this study is to analyze the effects of xylazine, flunixin and lidocaine as local anesthetic or analgesic drugs during calf castration. The principle variables analyzed are behavioral responses and cortisol levels in surgically castrated calves receiving these drugs. This study is part of a larger project also investigating electroencephalogram (EEG) parameters and cardiac responses in calves undergoing castration. Thirty-two Holstein calves were randomly assigned to the following groups; 1) castrated, untreated controls (placebo); 2) xylazine immediately before castration; 3) flunixin meglumine, immediately before castration; 4) lidocaine, ten minutes before castration. Calves were castrated using the "cut and pull" method: a surgical incision to the scrotum, with testes and spermatic cords exteriorized by blunt dissection. Based on preliminary descriptive analysis of behavior data, group 2, xylazine calves, displayed numerically fewer foot stomps during castration, while displaying numerically highest number of collapses. Group 3, flunixin calves, displayed a numerically higher foot stomp average during castration than the other groups. All variables are under statistical analysis. A general linear mixed model was fitted to each response.

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LIGHT SCATTERING FROM AEROSOLS INCLUDING SOOT AND EFFECTS ON CLIMATE

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The goal of this research is to understand how soot backscatters light, as soot is one of the largest sources of uncertainty in analyses of climate change. We are unsure what to expect from this research due to the complex scattering patterns associated with aggregates and large structures and also because backscattering from soot has not received much research attention yet. This will help know the what effect soot has on the global radiation balance once it is released into the atmosphere. It has been shown by other researchers that soot absorbs more radiation than it scatters, but large uncertainty still exists with quantitative estimates and calculations. The methods used in this research will be shining laser light through a beam splitter then to the sample being studied so that the directly backscattered light will bounce off the beam splitter and get measured by the detector without the detector blocking the light that is sent directly backwards. Many samples of soot will be made and studied. Soot takes on a wide variety of fractal aggregate structures, so a few measurements will not be representative of what is occurring in the atmosphere. We will be comparing the backscattering patterns to the patterns of more known colloids and aerosols to find similarities and differences. We expect to find a very complicated pattern due to the complicated structure of soot, but many measurements should be able to show whether soot in fact does scatter more in the backwards direction and have enhanced backscattering.

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EFFECT OF REDUCED-SODIUM SALT IN BREAD BAKING

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Salt (sodium chloride) is an essential ingredient in bread. However, high sodium intake is associated with high blood pressure - a major risk factor for heart disease and stroke. The objective of this study was to determine whether satisfactory bread could be produced using salt with reduced sodium content. Two commercial salts containing 43% and 36% less sodium than regular salt were evaluated. Control doughs contained no salt and regular salt. Dough mixing time, strength, extensibility and viscosity were measured using the mixograph, Keiffer extensibility test and lubricated uniaxial compression test. Bread was baked using the standard AACCI pup loaf procedure. Salt significantly increased dough mixing time, however, there was not a significant difference in mixing time between salts with different sodium levels. Salt addition and sodium level did not affect resistance to extension or elongational viscosity of the dough. However, dough extensibility significantly increased as sodium content increased. The addition of salt significantly increased bread volume but sodium content of the salt did not have an effect on bread volume. Preliminary taste tests indicated that bread baked with the reduced-sodium salts had a different flavor than bread containing regular salt. Reducing the sodium content of the salt used to prepare bread does not affect the functionality of the dough. However, further work is needed to determine the effect on bread flavor.

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A QUALITATIVE STUDY OF SINGLE-TRAUMA AND DUAL-TRAUMA MILITARY COUPLES

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Single-trauma couples have been described as couples in which only one partner has experienced a history of trauma. Dual-trauma couples are described as couples in which both partners have experienced a trauma, or multiple traumas, which continue to impact their individual and relationship functioning. Complex trauma identifies the effects of multiple traumas experienced by a person over a period of time. Although complex trauma has garnered increased attention in the literature, the definition appears to be focused on "types" of traumatic experiences, rather than the "number" of traumatic experiences reported by participants. Limited research has provided information that "traumatic load" may be a root cause of both chronicity and severity of PTSD symptoms. In addition, trauma survivors and their partners may experience unique dynamics due to the ongoing effects of previous trauma exposure and current trauma symptoms that need to be better understood. The current study utilized a mixed-method design using quantitative measures and qualitative interviews with single-trauma (n= 5) and dual-trauma (n = 6) couples to further understand the systemic effects on couple functioning in a sample of military couples. The results indicate differences between single-trauma and dual-trauma couples as well as differences between male soldiers and female spouses. Overall, both positive and negative effects from previous trauma on the couple relationship were reported by participants, including increased awareness, increased communication, increased triggers, and increased support, with dual-trauma couples reporting more trauma-related triggers and reduced communication. Clinical and research implications for further study are described.

The following graduate student posters were presented at the 9th annual Capitol Graduate Research Summit (CGRS) in Topeka on February 16, 2012. The CGRS is a showcase of scholarly research with implications for state-related issues conducted by graduate students at Kansas State University, University of Kansas, University of Kansas Medical Center, and Wichita State University. Participating students present their research to state legislators, the Kansas Board of Regents, and the public. The top two presenters from each institution were awarded $500 scholarships from Kansas Bioscience.

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N_2O-N EMISSIONS AND THE RELATIONSHIP WITH DENITRIFYING ENZYME ACTIVITY IN CORN UNDER DIFFERENT MANAGEMENT STRATEGIES

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Management strategies for N fertilization and tillage are necessary for enhancing N use efficiency and reducing the negative impacts of N to the environment. The objectives of this research were to (1) quantify N_2O-N emission under no-tillage (NT) and tilled (T) agricultural systems, (2) determine the effect of different N source (Manure (M) and Urea (U)) on N_2O-N emissions, and (3) evaluate Denitrifying Enzyme Activity (DEA) under no-tillage systems. Nitrous oxide emissions and DEA were evaluated during the summer of 2011 on a Kennebec silt loam. The results were statistically analyzed using SAS 9.2 (SAS Institute, 2010). The N_2O emissions were significantly different with regard N source and tillage. M presented higher emissions which accounted for 8.2 kg N_2O-N ha^{-1} during the growing season whereas U had 3.4 kg N_2O-N ha^{-1}. The high emissions from M affected the overall emissions in NT systems. The cumulative value of NT and T systems were 7.8 and 3.8 kg N_2O-N ha^{-1}, respectively. DEA was higher in M than U treatment under both, T and NT systems. Under NT the DEA values were 1.05 and 0.18 µg N_2O-N g^{-1} hr^{-1} for M and U, respectively. Under T the DEA values were 0.67 and 0.18 µg N_2O-N g^{-1} hr^{-1} for M and U, respectively. The C:N ratio of the manure played a key role in the biochemical activities that enhance the N_2O production such as DEA. Results from previous years at the same location had lower emissions with M presumably due to changes in C:N ratio of the organic fertilizer.

Relevance of Research to State-Related Topic(s)

Nitrogen is critical for plant growth and is a major cost of inputs in production agriculture. Too much N is also an environmental concern, among others due to the N_2O emissions. Strategies to reduce N emissions should result in improved efficiency thus lowering input cost and producer profitability.

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GENETIC DIVERSITY IN *FUSARIUM THAPSINUM* ISOLATES FROM KANSAS

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Fusarium thapsinum, the causative agent of grain mold and stalk rot of sorghum (*Sorghum bicolor*) is characterized by the production of yellow pigments on lab media. However, pigmentation is variable in *F. thapsinum* strains, with some strains producing no pigment or violet pigments in the agar. Thus morphological variability in this species may reflect genetic and pathogenicity variation. The objective of this study was to evaluate genetic diversity in strains of *F. thapsinum* and to evaluate how this variability reflects on pathogenicity to sorghum seedlings. Amplified fragment polymorphisms (AFLP) analysis using *EcoR1*-TT and *Mse1*-AC was used to evaluate genetic diversity in 200 *F. thapsinum* strains isolated from different sites within Kansas. Preliminary results suggest a limited genetic variation in isolates of *F. thapsinum* from Kansas. Furthermore, isolates fell into different phylogenetic clades irrespective of their site of origin. This could be explained by the low sexual recombination that occurs in *F. thapsinum* field populations. Low female fertility in this species plays a role in the low rate of sexual recombination in field populations. In addition, we predict that there will be a difference in pathogenicity to sorghum seedlings by yellow-pigmented (YP) vs. non-pigmented (NP) strains of *F. thapsinum*. This may suggest that pigment production has a pathogenicity advantage in *F. thapsinum* strains. The results from this study suggest that any genetic variation or variability in pigmentation formation has the potential of allowing sub-populations within *F. thapsinum* to overcome currently deployed resistance towards grain mold and stalk rot of sorghum.

Relevance of Research to State-Related Topic(s)

Breast cancer is a very serious disease that threatens the health of women. It is the second leading cause of cancer death among women in the US also in Kansas State. From 2003 to 2007, the age-adjusted incidence and death rates for breast cancer in Kansas are 476.0 and 182.7 per 100,000 population respectively, which are higher than the average rates in the US. Out of 14,070 new cancer cases estimated in 2011 for Kansas, 1890 cases are breast cancer, among which 370 people are estimated to die. Thus, development of new drugs to treat breast cancer is needed to improve women health in Kansas. Our research provides a promising molecule for drug development. Compared with other anti-cancer drugs that only trigger one pathway of apoptosis, PQ1 can trigger both intrinsic and extrinsic pathways, which makes PQ1 a very effective anti-breast cancer candidate.

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WITHIN-PLANT DISTRIBUTION IMPACTS CABBAGE APHID (*BREVICORYNE BRASSICAE)* REPRODUCTIVE POTENTIAL ON WINTER CANOLA

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The cabbage aphid (*Brevicoryne brassicae*) is a perennial pest that specializes on plants of the Brassicaceae family. Feeding damage observed in winter canola (*Brassica napus*) can result in seedling death, curling, yellowing, stunting, or virus transmission; all of which can alter seed quality and reduce yield up to 33%. The cabbage aphid attacks canola before and during flowering, typically colonizing the new growth areas of the plant or the upper flowering canopy. This colonizing behavior can be induced by intrinsic characteristics of the host plant (bottom-up effects) such as nutritional value, secondary compounds, morphology, or plant architecture. However these considerations and their relationship to cabbage aphid population dynamics need further study. Therefore, our goal was to evaluate how within-plant distribution impacts cabbage aphid reproductive potential on different canola plant structures. Specifically, we restricted aphid localization using two types of exclusion cages. Cages enclosed either the flowering raceme, or a single leaf in the lower canopy. Each cage was inoculated with two, newly-reproductive adult cabbage aphids. This study was replicated in the field at Ashland Bottoms Research Farm near Manhattan, KS and in plants grown under controlled greenhouse conditions. Aphid populations remained in all exclusion cages for 3 weeks before they were removed; plant material was bagged and aphid densities were recorded in the laboratory. Preliminary results suggest that within-plant distribution of the cabbage aphid directly affects aphid population density with higher growth rates observed on reproductive canola structures. Direct implications for pest management and sampling plans will be discussed.

Relevance of Research to State-Related Topic(s)

Winter canola is a profitable first generation biodiesel crop (yields >40% oil) that yields up to 1600 lbs/acre (price ranging from 11-27 cents per pound) and is suitable to use in rotation with winter wheat. This crop contains the lowest levels of saturated fat and the highest levels of omega-3 fat among cooking. Because of its promising economic, health, and rotation potential, canola acreage has increased to over 40,500 hectares in the south-central US in the past decade. However, since the introduction of winter canola to the region, producers have battled with severe aphid infestations, that can account for as much as a 33% reduction in yield. Due to the lack of information on canola aphids, producers are reliant on chemical control to avoid yield loses. This study addresses the biology of the pest in KS canola, which is essential in the development of appropriate management strategies.

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COAXIAL SILICON COATING ON VERTICALLY ALIGNED CARBON NANOFIBERS FOR HIGH-PERFORMANCE LITHIUM-ION BATTERIES

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Improving the energy capacity, charging/discharging speed, and lifetime of lithium-ion batteries is critical for their broader applications in portable electronics and hybrid electrical vehicles. We report a study on the development of a three-dimensional core-shell nanowire architecture anode for high-performance lithium-ion batteries. This unique anode comprises of amorphous silicon coaxially coated on a forest-like nanostructure of vertically aligned carbon nanofibers (VACNFs) that is grown on a substrate of 0.0033 in thick copper foil. The highly conductive VACNFs are firmly attached to the substrate and provide a good electron-conducting pathway while mechanically supporting the silicon coating upon charge/discharging cycling. The freedom in radial expansion also accommodates silicon's large volume expansion upon lithiation (up to 300%) and thus improves the cycle stability. This nanostructured anode was characterized against a lithium metal electrode with cyclic voltammetry and galvanostatic charging/discharging measurements to determine energy storage capacity, capacity retention, coulombic efficiency, and cycle lifetime. Our results demonstrated that the silicon coating with the nominal thickness of 500 nm and 1500 nm presents a lithium storage capacity of ~3,000 to 3,500 mAh/g at C/2 power rate, close to the theoretical capacity of 4,200 mAh/g, and greater than 96% coulombic efficiency. This capacity is about an order of magnitude larger than that of commercial graphite anodes (~370 mAh/g). Besides the loss at initial cycling owing to the formation of solid electrolyte interface, the capacity remains relatively stable in following charging/discharging processes. The silicon thickness and carbon nanofiber length are currently being optimized to improve cell performance.

Relevance of Research to State-Related Topic(s)

The advancement of lithium ion storage capabilities is advantageous for Kansas to meet future energy demands of its communities and citizens. Renewable energy sources like wind and solar are intermittent sources, meaning energy cannot be produced constantly throughout the day; however, extra energy not utilized can be stored for service when conditions are less favorable. Lithium ion batteries are well positioned for this task with their ability to store large quantities of energy, and provide a long operational life. Nevertheless, the infrastructure required to store this energy are still vastly too large, demanding valuable materials and resulting high costs. The development of our electrodes to have larger capacities per unit mass, better performance and use abundant silicon materials marks our research as innovative and environmentally driven.

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EFFECT OF ALFERON N INJECTION (INTERFERON ALPHA) ON INFLUENZA A VIRUS REPLICATION *IN VITRO*

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Influenza A virus is an important respiratory pathogen which can affect public health, especially during pandemic episodes. Current strategies to combat influenza are vaccination and anti-viral drugs. Since influenza viruses change constantly via antigenic drift and antigenic shift, vaccines might be not protective and resistance to antiviral drugs can be easily achieved. Interferon alpha (INF- α) plays an important role as a first line of innate anti-viral immunity. To investigate the anti-viral potency of exogenous applied INF- α on the replication of various influenza A viruses, 3 subtypes of influenza A virus, i.e. H3N2, pandemic H1N1, H9N2 were chosen to study their replication kinetics in the presence of Alferon N injection (Human Interferon alpha) on human epithelium (A549) cells and swine testis (ST) cells. We found that the replication ability of all 3 viruses is inhibited when ST cells were pretreated with Alferon for 4 hours before infection. The ability of Alferon to inhibit influenza replication is dose-dependent. Similar results were obtained when A549 cells were used, and pretreatment of A549 cells with Alferon for more than 16 hours was necessary before infection. In summary, these results demonstrated that Alferon has the ability to inhibit replication of different strains of influenza A viruses *in vitro*. Our study build the basis for future in vivo study on using exogenous INF- α treatment as an alternative strategy to combat influenza A virus infection especially in patients infected with influenza strains which are resistant to common anti-viral drugs.

Relevance of Research to State-Related Topic(s)

Influenza is a globally important respiratory pathogen causing annual epidemics and the occasional pandemic. Over the centuries there have been several influenza pandemics resulting in loss of human lives. The famous "Spanish flu" killed 12,000 alone in Kansas and more than 20 million worldwide. The next influenza pandemics are inevitable and estimated to cause 4,600 to 10,700 hospitalizations and 1,100 and 2,500 deaths in Kansas alone according to WHO and CDC. So it is very crucial to find out effective ways to treat the patients who are infected and to protect the welfare of the people in Kansas and worldwide. With emergence of influenza virus strains resistant to existing antiviral drugs there is an urgent need to develop alternative ways to treat these infections. Results of our study provide promising direction for future *in vivo* studies to find out alternative strategies to cope with influenza infection.

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DESIGN OF A MYCOBACTERIAL PORIN BASED DYE SENSITIZED SOLAR CELL

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A prototype of a nano solar cell containing the Mycobacterial channel protein MspA, as the matrix for vectorial electron transport has been successfully achieved. MspA is an octameric trans-membrane channel protein (i.e. porin) produced by *Mycobacterium smegmatis* and is one of the most stable porins known so far. Wild type MspA has been successfully isolated, analyzed and purified in high yield to obtain crystals. A novel Ruthenium-phenanthroline-viologen-maleimide dye which is a fast vectorial electron transporter, has been synthesized, purified and successfully bound to the terminal end of wild type MspA, via the cysteine-maleimide bond. The dye-protein complex has then been adsorbed onto TiO_2 plates and subjected to incident sunlight. The protein appeared to be stable under the incident wavelength and a steady current is observed. A 1% incident photon conversion efficiency of sunlight into current by the MspA-dye complex has been achieved so far. This finding marks the first ever evidence of incorporating a biodegradable material such as a protein in a solar cell, leading up to a greener generation of solar cell technology.

Relevance of Research to State-Related Topic(s)

Alternate, sustainable energy sources are gaining increased attention from chemists, physicists and engineers, as mankind realizes the limited availability and adverse environmental impacts of burning fossil fuels. Solar cells have great potential to be used as a sustainable and green energy source for the future. For States such as Kansas which have abundant sunlight for a significant period of time of the year, solar energy is an efficient alternate energy source. Also a greener solar cell with a biodegradable matrix is a much desired advancement. Funding provided by State of Kansas through Kansas Technology Enterprise Corporation and Kansas Bioresearch Authority for this project is greatly appreciated.

**Winner of $500 Kansas Bioscience award*

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GAP JUNCTION ENHANCER INCREASES EFFICACY OF CISPLATIN TO ATTENUATE MAMMARY TUMOR GROWTH

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Cisplatin treatment has an overall 19% response rate in animal models with malignant tumors. A new class of substituted quinolines (PQ) possesses inhibitory activities against breast cancer cells through the enhancement of gap junctional intercellular communication. Restoring cell communication is linked to drug sensitivity and reduction of tumorigenicity. The objective of this study was to examine the effect of a combinational treatment of PQ and cisplatin in an animal model to show an increase in efficacy via the enhancement of gap junctions. Mice were implanted with estradiol-17ß (1.7 mg/pellet) before the injection of 1×10^7 T47D human breast cancer cells subcutaneously into the inguinal region of mammary fat pad. Animals were treated intraperitoneally with DMSO (control), Cisplatin, PQ, or a combining treatment of Cisplatin and PQ. Cisplatin alone decreased mammary tumor growth by 34% while combinational treatment of Cisplatin and PQ showed a 60% reduction after 7 treatments at every 2 days. There was a significant increase of gap junction proteins in PQ-treated tissues compared to control or cisplatin alone, indicating an increase in gap junction intercellular communication. There was also evidence of highly stained apoptotic proteins, specifically caspase 3, in tumors of combinational treatment compared to cisplatin alone, suggesting PQ increases tumor cell death. We have showed for the first time an increase in the efficacy of antineoplastic drugs via the enhancement of gap junctions with PQs, a specific class of gap junction enhancers. This provides evidence for a new combinational treatment for breast cancer using cisplatin at a reduced dose to prevent renal toxicity.

Relevance of Research to State-Related Topic(s)

A total of 1,596,670 new cancer cases and 571,950 deaths from cancer are projected to occur in the United States in 2011. In Kansas that is 14,070 cancer cases, where 1,890 cases and 370 deaths are due to breast cancer.

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FEASIBILITY OF USING LIGNIN- A PLANT DERIVED MATERIAL FOR INCREASED SUSTAINABILITY OF RURAL TRANSPORTATION LIFELINES

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The feasibility of using lignin, a co-product of wood pulping and bio-fuel production, for stabilization of unpaved roads is being investigated. The objective of this research is to increase the performance, economy and sustainability of unpaved roads, which often serve as single transportation lifelines in rural communities. A calcium lignosulfonate (CL) powder, also known as lignin, is usually obtained by chemical processing softwood. Lignotech, U.S.A. donated the lignin used in this research. Dry uniformly graded masonry sand is first thoroughly mixed with lignin powder at several different gravimetric lignin contents ranging from 0% to 14%. Next, different amounts of water are added to initiate the cementation process thereby binding otherwise loose sand particles. In addition to the sieve analysis and Atterberg limits, the laboratory experiments include compaction and direct shear tests. The first phase of the research provides experimental data for characterization of early age compaction and strength behaviors, whereby the samples are tested immediately upon mixing sand, lignin and water. These early age strengths, which exhibit cohesion gain, will serve as the reference values for assessment of strength development with time due to air drying, which comprises the second phase of laboratory testing. The sand-lignin samples are presently being dried under laboratory conditions to assess their water loss and establish the optimal times for the next series of direct shear tests, which will provide a basis for characterization of strength development with time.

Relevance of Research to State-Related Topic(s)

Finding alternative uses for lignin is beneficial to Kansas because it has the potential to improve performance and reduce the maintenance cost of unpaved roads, which are prevalent throughout the state. Lignin is nontoxic and poses no threat to the environment unlike other co-products such as fly ash which can leach heavy metals into the ground. A larger market demand for lignin is also likely to lower the costs of environmentally friendly bio-fuels.

**Winner of $500 Kansas Bioscience award*

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SHELF LIFE OF FIVE MEAT PRODUCTS DISPLAYED UNDER LIGHT EMITTING DIODE OR FLUORESCENT LIGHTING

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Light Emitting Diode (LED) lighting used in retail display cases offers economical savings in energy use and generates less heat compared with fluorescent (FLS) lighting. A total of 144 beef, pork, and poultry products displayed in two retail display cases set up with the same temperature profiles were evaluated for visual color, instrumental color, aerobic plate counts (APC), *Enterobacteriaceae* counts (EB), display case and internal product temperatures and thiobarbituric acid reactive substances (TBARS). Visual color scores of the five meat products indicated color deterioration increased as display time increased. Beef *longissimus dorsi* steaks, ground beef, and the superficial portion of beef *semimembranosus* steaks had less ($P<0.05$) visual discoloration under LED lighting than FLS. Pork loin chops under LED lighting had higher ($P<0.05$) L* values. The superficial and deep portions of beef *semimembranosus* steaks were slightly ($P<0.05$) more intense red under LED lighting. Lighting type had no effect ($P>0.05$) on APC or EB populations. For most products, microbial populations increased over time. All internal product temperatures, except beef *longissimus dorsi* steaks, were lower ($P<0.05$) in the LED case. Compared with the LED case, FLS case temperatures were higher ($P<0.05$) by 0.56 to 1.11 °C over the duration of the study. Pork loin chops, ground turkey, and beef *semimembranosus* steaks had higher ($P<0.05$) TBARS values under LED lighting. Retail display case LED lighting results in lower case and, for most products, internal product temperatures and extended color life; however, lipid oxidation was increased in some cuts under LED lighting.

Relevance of Research to State-Related Topic(s)

Meat retailers in Kansas display products in self service retail cases under different lighting types. Lighting sources can influence the rate of meat discoloration on display. When discoloration of the meat products reaches a certain point, customers will no longer pay the full price for the product. Discolored products must either be reduced in price or discarded completely resulting in losses for the retailer. Light emitting diode (LED) lighting holds the potential for extending fresh meat color through benefits in operating conditions. Fresh meat color and other shelf life properties were evaluated on pork loin chops, beef loin steaks, ground beef, ground turkey, and beef inside round steaks. Results of this study provide meat retailers knowledge and technology to maximize fresh meat color stability and reduce any financial losses. Conclusions suggest retailers display fresh beef products under LED lighting to extend product color life.

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LIVING TOOLS: TREE USE IN THE NINETEENTH CENTURY

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Despite vast research on the nineteenth-century settlement period and westward expansion, little is written on the Afforestation movement and the Timber Culture Act, both of which altered human perceptions of the open prairies. The subject surfaces briefly in discussions of the ill-fated "Rain Follows the Plow" theory; however, the actual climate altering ideas centered upon trees and thus the resulting ecological changes in Kansas are largely overlooked. The plow has been discussed in terms of reclamation and as technology by historians Emmons, Miner, Fite, and Webb, but trees have not been. This study discovers from newsprint, settlers' diaries, railroad publications and governmental reports that trees and their supposed powers of reclamation were a topic of discussion nationwide. Rain Follows the Plow was not the only erroneous climate theory that emerged in the nineteenth century. Afforestation efforts encouraged first by the railroads and then the Department of Agriculture far out lived their successor. Richard Smith Elliott, of the Kansas Pacific Railroad, was the first to experiment with these theories on the open prairie. Due to his efforts, trees increasingly became viewed as a tool that could improve Kansas' ecology. Human perceptions of the true prairie environment were forever altered by the Forestry Division's public support of tree planting as a way to ameliorate the climate. The goal of this paper is to highlight historical events that carry contemporary importance in environmental conversations. The history of Kansas can be thus broadened by looking at the past from the perspective of trees and their uses.

Relevance of Research to State-Related Topic(s)

The face of Kansas has changed since 1861; the relatively treeless expanses that dominated three-fourths of the state are gone. Boosted by the Morrill Land-Grant Act of 1862, Kansas State University began agricultural experimentation and developed technological tree farms throughout the state. New farming models emerged including the use of trees for ameliorative efforts. Kansas was the leading state concerning tree research and implementation of tree planting, but this topic is widely overlooked even though the influences on the ecology and economy can still be seen today. What was developed in the nineteenth–century was a working knowledge used by people with economic interests and it provided the frame work for soil conservation attempts in the New Deal era of shelterbelt planting. Looking at the cultural relationships humans developed with trees in the early days of Kansas, this paper reveals the changing ecology and economy of the state.

Author Index

(Presenting Authors Only)