6th Annual
Capitol Graduate Research Summit

ABSTRACTS

Featuring Graduate Student Research From:

Kansas State University
The University of Kansas
The University of Kansas Medical Center
Wichita State University

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Kansas State University

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KANSAS STATE UNIVERSITY

CHANGES IN MORPHOLOGICAL PATTERN WITH ADVANCMENT OF SORGHUM HYBRIDS

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For the past six decades efforts in plant breeding have resulted in a number of improved sorghum hybrids to the world. In the USA, sorghum grain yield has improved more than a 139% since 1950's. Of the 139% increase, 46% is reported to be due to hybrid improvement. The objective of this paper was to identifying the changes in morphology and phenology with hybrid improvement in the past six decades. To meet the objective, five hybrids: P848/RS610, P828/P833, P8585, P8385, and P85G46 which were released in periods of 1954-1964, 1964-1974, 1974-1984, 1984-1994, and 1994-2005, respectively were studied for two years (2007 and 2008 summer) in a greenhouse. The five hybrids were studied in three watering treatments: well watered control, preflowering stress and postflowering stress. There was a 129% increase in dry weight of root comparing the oldest and newest hybrids. Leaf biomass has also increased substantially with advancement of hybrids. Recent hybrids were also relatively consistent in growth and had better panicle length in any watering schedule. Therefore, higher leaf and root per applied water and relative stability in growth, irrespective of watering, might have contributed to higher yield. Therefore, early selection of grain sorghum can base higher leaf and root biomass per applied water and relative stability in growth as criteria for future selection of hybrids.

SOCIAL FACTORS INFLUENCING ADOPTION OF CONSERVATION PRACTICES

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Water quality management in the Cheney Lake Watershed is the product of a joint effort between the city of Wichita, Kansas and the Cheney Lake Watershed Citizens' Management Committee. A dialogue between city and agricultural stakeholders resulted in this rural-urban partnership for watershed-level governance between these potentially contentious users. Through dialogue, these partners recognized the value of prevention over remediation, and the value of collaboration and cooperation. Farmers' voluntary implementations of water-quality management practices mitigate agricultural pollution and sedimentation to the city water supply. In addition, the city recognized the additional costs of these practices to farmers and agreed to pay partial reimbursement of structural costs and to contribute to financial incentives for improved management practices. Long-term successful water governance, however, will require management practices to continue even without incentives. Through in-depth, semi-structured interviews with agricultural producers and state water agencies, we identified social factors that influence the adoption and maintenance of conservation practices affecting water quality and those that influence cooperation between the agricultural and urban community partners, and we evaluated the necessary support structures that affect the success of the Cheney Lake Watershed management. Agricultural stakeholders are knowledgeable about their watershed and water quality issues and express a positive attitude toward conservation and the management practices proposed to meet conservation goals. Further, as producers they acknowledge their responsibility for protecting water quality. Although costs are an important consideration, they voluntarily adopt many best management practices that protect water quality. The interview data provides detail about farmer behavior at the field scale, and to the modeling and outreach efforts at the watershed scale. The research will also help to determine if the watershed management organization can use these social factors to encourage strategic placement of conservation practices.

THE INTERACTIONS OF BRAN WITH GLUTEN PROTEINS DURING DOUGH DEVELOPMENT USING X-RAY MICROTOMOGRAPHY

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The consumer interest in cereal food industry containing whole grains has taken over to another edge for research. The health benefits such as type 2 diabetes risk, body weight maintenance, blood pressure and circulatory health attributed to the various phyto-chemicals and nutrients associated with the non-endosperm portion (bran and germ) of the cereal kernel. The hypothesis of this study is that the nature and extent of bran interactions with the gluten protein matrix play a dominant role in both in-process dough and final product quality of whole grain baked goods. The objective is to study the development of bubble structure during proofing and the resulting crumb texture of the baked product of optimally developed dough with different bran contents and particle sizes using X-ray Microtomography, a non-destructive imaging technique. The preliminary study was conducted to capture micro structural properties of dough systems with 0%, 5% and 10% bran inclusions at 0 min, 30 min and 60 min proof time. The gas bubbles were clearly visible within the dough matrix extracted from 2-D images of horizontal sections of dough specimens. 3-D analysis of the bubbles indicated that the void fractions changes dramatically during 60 min proof time. Results showed that for all dough systems, as % bran and proof time increased, void volume fraction and mean bubble size increased as compare to 0% bran dough system. Higher mean bubble size values were observed in bran containing dough sample due to weakening effect of bran or gluten network causing gas bubble coalescence. Overall results support that the viscoelastic properties of the dough affects the evolution of bubbles, the number and size distribution of bubbles. The future study involves in understanding the chemical and physical interactions between bran and gluten proteins, develop and propose innovative techniques to study dough development using X-ray Microtomography.

RECONFIGURABLE SENSOR TEST BED

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Sensor networking technologies have a wide range of military, medical, agricultural, environmental, and homeland security applications. Advances in sensor technology are making it possible to deploy a large number of sensors to monitor physical or environmental conditions, such as temperature, sound, vibration, pressure, motion or pollutants, at different locations. Before a sensor application is made operational, it must be tested and debugged, especially when it is used in a safety-critical system. This is often difficult to accomplish as sensor applications often have to be deployed in large, remotely located areas. To address this problem, we have developed a reconfigurable test bed which is a collection of 18" x 36" plexi-glass boards. Each board has 8 TelosB wireless computing platforms (motes) which are connected via mesh networking to a gateway (Stargate Netbridge). The gateway can also communicate with the motes directly via a USB hub. The gateways of the various boards can exchange data with one another via TCP. Each board also has another board attached on top of it, on which E-puck robots can move. The PIR sensors on the TelosB can detect the presence of an E-puck.
The goal of this reconfigurable sensor test bed is to emulate different field scenarios in a lab so that the applications can be tested and debugged prior to actual deployment. Different scenarios involving fixed and mobile sensors to sense attributes such as temperature, light, motion, humidity and acceleration can be simulated in our lab. We have developed extensive software support for sensor applications on this test-bed which include remote monitoring and control of an application via a GUI, remote re-programming of sensors, and real-time data collection. Applications being developed and tested using our test-bed include real-time tracking of an object in a sensor field and an automated parking lot.

EVALUATING THE POTENTIAL FOR TRANSLOCATION OF LISTERIA MONOCYTOGENES FROM FLOOR DRAINS TO FOOD CONTACT SURFACES IN THE SURROUNDING ENVIRONMENT USING LISTERIA INNOCUA AS SURROGATE

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Floor drains in processing environments harbor *Listeria* spp. due to continuous presence of humidity and organic substrates. The cleaning and washing activities undertaken in the processing facilities may translocate the bacterial cells from the drain into the surrounding environment thus contaminating food products being produced. This study evaluates the potential for translocation of *Listeria monocytogenes* from drains to food contact surfaces in the surrounding environment using *Listeria innocua* as surrogate. A 7 x 7 x 8 feet flexi-glass chamber was built in which a cast iron drain mounted on an aluminum cabinet was placed. Stainless steel coupons (6.4 x 1.9 x 0.1 cm, 12 per height) were hung at 3 different heights 1, 3 and 5 feet inside the chamber. The drain was inoculated with meat slurry (10 g ground beef/liter water, and 6-7 Log_{10} CFU/ml of *L. innocua* four strain cocktail) and a commercial cleaner and a sanitizer was used. Cell translocation from the drain on to the coupons due to aerosols generated during cleaning and washing of drain was studied. Coupons were incubated in listeria enrichment broth for 48h. Turbid broths were streaked on to modified oxford medium (MOX) agar. Typical colonies that appeared on MOX plates were confirmed using VIP Listeria rapid test. For statistical analysis, Single Factor Model with binomial distribution was used and data were analyzed using GENMOD procedure in SAS. Significantly higher translocation ($p<0.05$) was seen at 1 foot (up to 25%), followed by 3 feet (up to 11%) and 5 feet (up to 2.7%) indicating the closer the surface from the drain, greater is the number of bacterial cells that transfer from the drain to the surrounding surfaces. Results show that *L. monocytogenes* may translocate from drain to food contact surfaces via aerosols generated due to cleaning and washing, thus contaminate food products.

CONFLICTING ENVIRONMENTAL CLAIMS: ANALYSIS OF THE DISCOURSE SURROUNDING BIOFUELS DEVELOPMENT

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Around the year 2000, low crude oil and natural gas prices, among other factors, lead to significant unemployment, out-migration, and tax revenue losses in Russell, a community of about 4,000 in central Kansas. The prospect of the construction of a modern ethanol bio-refinery promised to bring jobs and economic vitality to the community. Not surprisingly, this also generated significant interest in the local and regional media, which extensively covered the establishment of the plant and the regional biofuels industry over the past eight years. This paper examines the press coverage of the establishment of the ethanol plant in Russell and the development of the biofuels industry in the region. The approach is a content analysis of articles from two key regional newspapers – *The Hays Daily News* and *The Salina Journal*. Of particular interest is the framing of environmental claims for biofuels development.

FUNCTIONALIZED BIMAGNETIC CORE/SHELL FE/FE₃O₄ STEALTH NANOPARTICLES FOR THE DIAGNOSIS AND TREATMENT OF CANCER

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Cancer is one of the leading diseases in the world, responsible for millions of deaths each year. According to projected data from World Health Organization, 9 million people will die of cancer in 2015. This data displays the desperate need of more efficient methods of prevention, diagnosis and treatment of cancer. Drugs that treat cancer often have enormous side effects since they lack specific delivery to the site of the cancer. Our research focused on synthesizing drugs that can be delivered to the targeted cancer area, minimizing side effects. This goal in mind, we have modified Fe/Fe_3O_4-nanoparticles protected with an organic stealth layer comprised of dopamine-anchors, which bind to the Fe_3O_4-surface of the nanoparticles(Figure 1). The site-specific delivery is achieved by modifying the synthesis in several different ways: Cancer cells overexpress porphyrin receptors. By modifying the nanoparticles with several porphyrin units, they were rapidly taken up by cancer cells (mouse melanoma model). Hyperthermia experiments were conducted by magnetic heating of nanoparticles. Once the nanoparticle is delivered, we can selectively heat the desired area of the tumor. This will stimulate the death of the cancer cells. In the absence of A/C-magnetic fields and light, the bimetallic nanoparticles were non-toxic. An urokinase specific oligopeptide featuring the consensus cleavage sequence (SRGSA) was introduced as a link between the nanoparticle and porphyrin. Urokinase is an enzyme that is overexpressed by numerous tumors. The specific cleavage of the peptide sequence is used to identify the cancer site, since the luminescence of the porphyrin will remarkably increase once it is released from the nanoparticle. We have currently optimized the synthesis process and conducted *in-vivo* and *in-vitro* experiments. Hyperthermia experiments are currently being carried out in mice. These results demonstrate a very promising path towards the synthesis of site-specific cancer drugs.

NOVEL THERMO-MECHANICAL PRETREATMENT OF LIGNOCELLULOSIC BIOMASS FOR EFFICIENT ETHANOL PRODUCTION FROM AGRICULTURAL RESIDUES

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Corn ethanol alone cannot meet the increasing demand for biofuels because of sustainability issues. Lignocellulosic materials from agricultural residues are one of the most abundant and potential alternative sources for low-cost ethanol production. Extrusion is a continuous process with high pressure, temperature, and mechanical energy input, and which can break down the lignocellulosic structure, resulting in increased enzyme accessibility during hydrolysis and higher yields of fermentable sugars. The objectives of this project were to: (1) use a novel thermo-mechanical pre-treatment technology (extrusion) for lignocellulosic ethanol production from agricultural residues, and (2) help utilization of and add value to soybean hulls, which is a low value by-product of soybean processing.

The amount of enzymes, cellulase, β-glucosidase, and cell-wall degrading enzyme used for hydrolysis was optimized using response surface methodology. The effect of extrusion pre-treatment on sugar yield from soybean hulls was compared for different processing conditions, such as maximum barrel temperature (80, 110, and 140°C), in-barrel moisture content (20 and 25%), and starch addition (10 and 20%). Change in cellulose crystallinity was measured by using X-ray diffraction.

Optimum enzyme combination was found at 0.0843, 0.0822, and 0.1113 ml/g cellulose for cellulase, β-glucosidase, and cell-wall degrading enzyme, respectively, with R^2=0.96. Extrusion processing of soybean hulls was facilitated by addition of corn starch and increased sugar yield by up to 23.5% compared with non-extruded soybean hull-starch mixture. Maximum sugar yield was obtained with 20% starch, 20% in-barrel moisture and 80°C barrel temperature.

Thermo-mechanical pre-treatment based on extrusion processing has the potential of increasing reducing sugar yield considerably with the right combination of process variables. This study will increase interest and awareness among the biofuel industry, the wider scientific community and also farmers for the potential of lignocellulosic ethanol production from agricultural residues, and will help further agricultural by-product utilization and value-added development.

SPATIAL EXTENT, TIMING, AND CAUSES OF CHANNEL INCISION, BLACK VERMILLION WATERSHED, NORTHEASTERN KANSAS

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The Black Vermillion River (watershed area = 1310 square kilometers) contributes runoff and sediment into Tuttle Creek Lake, a large federal reservoir (volume = 327 million cubic meters) northeast of Manhattan, Kansas. Tuttle Creek Lake, completed in 1962, is filling with sediment faster than other federal reservoirs in the region. The lake's conservation pool is about 40 percent full of sediment and is predicted to fill by 2023. Debate rages over the relative contribution of sediment from upland sources (largely croplands and pasture) versus channel incision. Our study determined the sediment production in the Black Vermillion River from channel incision. The spatial extent, timing, and causes of channel incision had not been investigated previously. We conducted a watershed-wide survey of channel cross-sections repeated at sites that were surveyed 45 years ago by the Soil Conservation Service. Channel depth 1963-2008 increased by a mean of 1.6 meters (maximum = 5.2 meters). Most channels are actively incising, or incising and widening. Channelization has reduced channel length by a significant portion and is the leading cause of incision. Rates of incision were also related to land cover, riparian vegetation, channel bed material, and geology. Bedrock is overlain in most of the watershed by Kansan age glacial till and loess, where incision prevails and is related to upland land cover, riparian vegetation, and drainage area. Our study is part of a larger effort that will compare sediment contributions from upland and channel sources in the watershed.

GIS-ENABLE KINEMATIC WAVE APPROACH FOR RAPID SOIL EROSION ASSESSMENT AND IMPROVED BMP SITE SELECTION

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Based on the concept of accumulating overland flow energy, an erosion potential model (nLS model) was developed for the Flint Hills ecoregion of Kansas. By integrating data from digital elevation models (DEM) and landuse/landcover (LULC) classifications in a Geographic Information System (GIS), the model determines where surface water runoff transitions from overland sheet flow to concentrated flow and, as a result, where the potential for soil erosion and gully formation increases. The model is operationalized as a three-layer raster calculation in a GIS using classified LULC data and DEMs. The computed output grid represents a unitless estimate of the energy of surface runoff water as it flows downslope. The relationship between actual gully locations and accumulated energy are then compared to develop a predictive model. This model was calibrated and validated with field data from two watersheds in Kansas and proved successful (88% accuracy) in identifying the location of existing gullies. Because it requires few inputs, for which easily accessed data sets are available nationwide, data acquisition and preparation times are minimal compared to existing erosion models such as AGNPS and RUSLE. The erosion potential model is capable of determining areas of high erosion potential and, therefore, the optimal locations for siting erosion-preventing Best Management Practices (BMP).

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GREENER OXIDATION OF PROPYLENE AND ETHYLENE MINIMIZES ENVIRONMENTAL IMPACT AND INCREASES SAFETY

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Propylene oxide (PO) and ethylene oxide (EO) are important chemical intermediate for a broad spectrum of consumer products like preservatives, antifreeze, sports gear, and foam. Conventional technologies for the manufacture of these oxides are highly energy intensive, and are non-selective. Furthermore, current technology for the manufacture of ethylene oxide is the second largest generator of CO_2 among all chemical processes. Researchers at CEBC proposed the liquid phase oxidation process where low molecular weight olefins are oxidized using oxidant hydrogen peroxide (H_2O_2) catalyst methyl trioxorhenium (MTO), and base pyridine n-oxide dissolved in solvent methanol. The catalyst MTO transfers an oxygen atom from the hydrogen peroxide to the starting material to produce either propylene oxide or ethylene oxide.

GAS PHASE EMISSIONS FROM A HEAVY-DUTY ENGINE USING BIODIESEL BLENDS

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Environmental and health-related concerns, increasing fuel prices and scarcity of supply have stimulated the development of biodiesel for use in diesel engines. Biodiesel is a biodegradable, non-toxic and clean-burning fuel which can reduce THC and PM emissions. In this study, the emissions of a heavy-duty engine were analyzed by a SEMTECH-DS analyzer, which provided continuous, real-time laboratory-quality measurements. The engine was fueled with pure diesel and biodiesel blends ranging from 5-100% by volume. The following significant results were observed: (1) CO_2 and NO_2 emissions changed minimally across all fuels tested; (2) THC emissions decreased with increasing biodiesel percentage, whereas CO exhibited the opposite trend; (3) NO emissions remained nearly constant at lower biodiesel percentage, but decreased for pure biodiesel.

EXECUTIVE FUNCTION IN SIMULTANEOUS AND SEQUENTIAL BILINGUAL CHILDREN

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Bilinguals outperform monolinguals on problem solving tasks that require ignoring misleading information (cognitive inhibition). This study examines the bilingual advantage in executive function by comparing school-age children from three language groups: monolingual English, Spanish-English simultaneous bilinguals (Spanish/English acquisition < 3-year-olds), and Spanish-English sequential bilinguals (English acquisition > 3-years-old). Cognitive control was tested using the Attentional Networks Task (ANT) to determine whether age of second language acquisition mediates executive function by comparing inhibition between the bilingual groups. Both bilingual groups performed better in the conflict task than monolingual children after age and parent education were statistically controlled. No significant difference exists between the bilingual groups, but an emerging trend suggests that simultaneous bilinguals may outperform the sequential bilinguals in inhibition.

NANOCONJUGATE DELIVERY SYSTEM FOR TREATMENT OF ADVANCED BREAST CANCER

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Breast cancer is the second leading cause of cancer deaths in women today after lung cancer. Breast cancers initially spread to the lymph nodes underneath the arm before later spreading throughout the body. One significant problem with current therapy is the toxic effects chemotherapy agents create in otherwise healthy tissues causing significant side effects. Our goal is to crease nanocarriers that can be infected under the skin of the breast, and once injected will concentrate and localize chemotherapies to the breast lymphatics. Our studies in animals with breast cancer have found that our nanocarrier treatment is much more effective than conventional chemotherapy and produces fewer side effects. We are now developing similar treatments for lung, head, and neck cancers.

BRAIN CANCER: NEW HOPE FOR A DEADLY DISEASE

Natalie Ciaccio*
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Brain cancer is a deadly disease for which limited treatment options exist. New hope has been attributed to a protein molecule that appears to play an important role in the survival of this type of cancer. An animal model has shown that interference with the function of this protein causes the tumor cells to die and the tumor to shrink in size dramatically. Moreover, this protein is not present in normal brain tissue, which means that by targeting it, the cancer can be treated without harming the rest of the brain, minimizing side effects and complications for the patient. The focus of my research is to obtain structural information about this protein that will be needed to facilitate drug design.

FRAGILE X SYNDROME: WHAT CAN WE LEARN ABOUT AUTISM FROM FRAGILE X SYNDROME?

Audra Sterling*
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Fragile X syndrome (FXS) is the most common inherited cause of intellectual disability. It is caused by mutation on the X chromosome. Individuals with FXS often have a co-diagnosis of autism, or display symptoms concurrent with autism. This study examines the language phenotype in children with FXS, and the impact that autism has on FXS. Thirty-three children participated in the study (ages 8-16). Standardized testing and language samples were used to evaluate variables of interest. The males with FXS showed deficits in language comprehension and production, although they displayed a profile of strengths and weaknesses. Boys with FXS and autism had lower scores compared to boys with FXS only. Girls were not as impaired but did show variability.

PROMOTING WIND ENERGY: EVALUATING THE EFFECTS OF STATE RENEWABLE ENERGY INCENTIVES

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Policy scholars tend to focus on the adoption of policies, but often fail to take their examinations to the next logical level. We fail to ask, "Did this policy achieve its goal?" My research attempts to determine if state renewable energy policies, that are designed to promote the construction of renewable energy sources, actually achieve their intended goals. This is particularly important seeing as the national government often adopts successful state policies. My research attempts to determine if these policies actually have an impact on the total installed wind energy capacity. The data clearly suggests that some policies achieve their goals and have an impact on capacity, while others do not.

SEDIMENTATION IN KANSAS RESERVOIRS AND THE KANSAS ANALYTICAL METHOD FOR NATURAL CHANNEL DESIGN

John Shelley*, Bruce McEnroe, and C. Bryan Young
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Kansas has a sedimentation problem. The water reservoirs on which we depend for drinking water, flood protection, and recreation are filling in with sediment. In places, the rates of sedimentation far exceed anticipated rates, and the effects of sedimentation have already become severe. Studies have demonstrated that the sediment filling in these reservoirs is predominantly derived from stream channel bank erosion. The Kansas Analytical Method is a stream channel design method specifically created for use in Kansas. Streams designed by the Kansas Analytical Method pass the incoming bankfull flow and sediment load without eroding the stream bed. In addition, these streams mimic naturally formed streams in their meander patterns and bottom profiles. Streams designed with the Kansas Analytical Method incorporate traditional hydraulic and sediment transport engineering and natural stream geomorphology. This poster highlights the key features of the method, including design equations developed entirely from Kansas watershed hydrology and stream geomorphology.

THE UNIVERSITY OF KANSAS MEDICAL CENTER

THE COMBINED EFFECT OF A HIGH FAT DIET AND ESTROGEN LOSS ON INSULIN RESISTANCE

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Post-menopausal women have an increased incidence of Type 2 Diabetes (T2D) compared to pre-menopausal women, and hormone replacement therapy (HRT) can decrease this risk. Our objective was to investigate the roles of estrogen (E2) and a high fat diet in the development of T2D in female Sprague Dawley rats. Rats were fed a high fat (HF, 60%kcal fat) or chow (10%kcal fat) diet and were either ovariectomized (OVX) or sham-OVX for 6 weeks. A subset of the HF OVX group was given PPT, a specific estrogen receptor α (ERα) activator, for 3 days prior to sacrifice (10mg/kg). HF OVX rats had significantly higher body weight compared with chow OVX and HF sham rats ($p<0.05$). Accordingly, the HF OVX group had significantly higher energy intake compared to the chow sham group ($p<0.05$). Upon administration of PPT, the HF OVX PPT group lost significantly more weight ($p<0.01$) compared to the HF OVX group. Thus, long term activation of ERα may lead to decreased energy consumption and weight gain. A glucose tolerance test showed that the HF diet induced insulin resistance ($p<0.05$) with no additional affect of E2 status. In addition, skeletal muscle glucose utilization, as measured by glucose transport, suggested a trend towards decreased glucose transport in the HF OVX group compared to the other groups. While studies have shown that a high fat diet induces weight gain and insulin resistance, our data further suggest that a high fat diet in combination with E2 loss may exacerbate the progression to T2D.

BILE ACIDS INDUCTION OF PRO-INFLAMMATORY GENE EXPRESSION IN MOUSE HEPATOCYTES IS EGR-1 DEPENDENT

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One of the primary functions of the liver is to produce bile acids which aid in digestion of food. Cholestasis is a condition that results when excretion of bile acids from the liver is interrupted. This causes bile acid concentrations to increase within the liver, producing liver injury, inflammation and fibrosis. Prolonged injury and inflammation can lead to liver cancer and loss of liver function. Data from our laboratory has shown that the transcription factor, early growth response factor-1 (egr-1), promotes inflammation in the liver during cholestasis. Egr-1 knock out mice have less inflammation in the liver during bile duct ligation, an experimental model of cholestasis, and lower expression of pro-inflammatory genes. However, what remains unknown is whether egr-1 directly regulates expression of the pro-inflammatory genes, intracellular adhesion molecule-1 (icam-1) and macrophage inflammatory protein-2 (mip-2) and what cell types in the liver express these pro-inflammatory genes. To determine whether hepatocytes express icam-1 and/or mip-2 and if the induction of these genes is egr-1 dependent, primary mouse hepatocytes were isolated from wild-type and egr-1 knock out mice and exposed to various bile acids. Icam-1 and mip-2 were induced in wild-type hepatocytes by the bile acids, deoxycholic acid, chenodeoxycholic acid and taurocholic acid. This induction was attenuated in the egr-1 knock out hepatocytes. These data suggest that bile acids increase expression of pro-inflammatory mediators in hepatocytes by egr-1-dependent mechanisms. Further insight into this pathway could lead to new treatments that reduce liver injury in patients with this disease.

UNCOVERING THE CAUSES OF HEARING LOSS

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Permanent hearing loss involving the inner ear affects over 30 million adults and 2-3 out of every 1000 newborns in the United States. Common hearing tests identify the general nature and severity of hearing loss but do not pinpoint the underlying cause. Development of more precise tests that can uncover the causes of hearing loss may help tailor treatment with hearing aids and cochlear implants to individual patients. Recent advances in sensory cell and neural regeneration also prompt the need for diagnostic tests that can accurately identify the appropriate target within the inner ear and auditory nerve for delivery of therapeutic agents. The compound action potential (CAP), an electrical signal generated by the auditory nerve in response to sound, may reflect the health of the nerve in impaired ears. To test this hypothesis, CAPs were recorded from an animal model with induced auditory nerve lesions. The percentage of normal nerve area was calculated from microscopic observations of individual auditory nerves and compared to the characteristics of the corresponding CAPs. Results showed that the CAPs consistently became smaller and changed shape as the percentage of normal nerve area decreased. This relationship suggests that the CAP may be an effective tool for identifying the condition of the auditory nerve in individuals with hearing loss.

THE IMPACT OF WORK UNIT AND ORGANIZATION SUPPORT ON ADVERSE PATIENT OUTCOME

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Background: A *culture of safety* has been proposed by many healthcare professionals as the key to reducing negative patient outcomes. Knowledge regarding a culture of safety and nurse sensitive patient indicators is integral to the design of safe healthcare systems that support the work of nurses.

Study Design: A culture of safety was conceptualized as a multi-level phenomenon comprised of Work Unit Support (WS) and Organization Support (OS) operationalized using the National Database for Nursing Quality Indicators® (NDNQI®) RN Survey with Job Satisfaction Scales. Adverse Patient Outcome was operationalized using four Agency for Healthcare Research and Quality (AHRQ) Patient Safety Indicators: Decubitus Ulcer, Selected Infections due to Medical Care, Failure to Rescue (FTR), and Deep Vein Thrombosis. The study purpose was to discern the relationships between hospital level OS and WS on Adverse Patient Outcome. The convenience sample was comprised of 97 hospitals, across 20 states, participating in the NDNQI® RN Survey during 2005. Hospital Adverse Patient Outcome rates were derived from the AHRQ data and then the datasets matched by a unique hospital identifier.

Results: A structural equation model was developed with adequate fit indices (χ^2= 40.811, df= 27, p= 0.234; CFI= 0.930; RMSEA= 0.065; SRMR= 0.074). Unexpectedly, increased OS was associated (p= .030) with increased Adverse Patient Outcome. A promising, though non-significant finding, was increased WS was associated with decreased Adverse Patient Outcome.

Conclusions: The strength of the relationship between increased WS and decreased Adverse Patient Outcome is consistent with the culture of safety construct and warrants further study. The direct relationship between WS and Adverse Patient Outcome coupled with the indirect relationship of OS through WS on Adverse Patient Outcome reinforced the impact of the local culture or work group on patient safety.

STUDYING THE MOLECULAR CAUSES OF MIGRAINE: A PATHWAY TO NEW THERAPEUTIC TARGETS

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18% of American women of reproductive age suffer from migraine making it the most prevalent neurological disorder. Common symptoms of migraine include hyperalgesia (increased sensitivity to pain), phonophobia, photophobia, and nausea. We investigate underlying causes of migraine disorders. Calcitonin gene-related peptide (CGRP) is an endogenous neuropeptide with powerful vasodilator and neurotransmitter properties. CGRP levels in serum are increased during migraine attacks. A new drug in Phase III clinical trials blocks CGRP from binding to its receptor and blocks pain transmission and inflammation associated with migraine.

In studying migraine we use a model of recurrent headache in laboratory rats. This model involves the infusion of inflammatory soup on the dura of the brain 3 times per week for up to a month. The inflammatory soup contains the same biologic chemicals present during a migraine attack. We have created a system to quantify the behavioral changes by measuring orofacial hyperalgesia. By counting the number of withdrawals in response to stimulation by a von Frey monofilament to the periorbital and masseter regions of the face, we have demonstrated increased primary and secondary hyperalgesia in rats in response to inflammatory soup. We quantified mRNA from dura, brainstem, and the trigeminal nerve ganglia, and identified significant increases in the expression of CGRP in the trigeminal ganglia. We also measured significant increases in dural expression of the CGRP receptor component RAMP1 and the pro-inflammatory chemokine IL1β in response to inflammatory soup.

Our data demonstrate that inflammatory soup stimulation of the dura produces facial hyperalgesia and leads to increased expression of CGRP, RAMP1, and IL1β in key components of the trigeminal sensory pathway. This study implicates a role for CGRP, RAMP1, and IL1β in the pathology of migraine and identifies new therapeutic targets for pharmacotherapy.

WICHITA STATE UNIVERSITY

PEER REVIEWS OF TEACHING: ARE THEY USEFUL?
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Peer reviews of teachers consist of formal evaluations of faculty members performed by colleagues and peers in their college or university. They are frequently used for promotion, tenure, and salary adjustments. According to existing literature, they may also be used for formative purposes as in the development and improvement of teaching methods, techniques, and styles. Despite the purposes mentioned above, little is known about the authenticity, practicality, and usefulness of peer reviews of university teachers. The purpose of this study was to learn more about methods and uses of information gained from peer reviews of teaching, specifically in Communication Sciences and Disorders programs. Through a national survey, 115 participants from 85 programs returned information. Results showed that peer reviews are being used in many programs with mostly positive results, even though the use, format, and conduct of the reviews vary greatly among programs. The results of peer reviews were meaningful to almost 80% of the respondents, who also included comments and suggestions about the authenticity and helpfulness of reviews conducted by their peers.

DAMAGE DETECTION IN METAL STRUCTURES USING ACOUSTIC EMISSION
Zachary Kral*, Walter Horn, and James Steck
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The structural components of many machines remain in service far beyond their designed lifetimes. This is especially true in the field of aerospace structures, where aircraft, wind turbines, satellites, and other components are expected to be in service for decades. Therefore, a good maintenance system is desired, allowing these structures further service use, while maintaining efficiency and reliability from failures. The focus of this research paper is on developing an improved maintenance system, called structural health monitoring, using acoustic emission sensors and artificial neural networks to detect and analyze any damage well before any component failure occurs. To replicate a damaged component for this study, an experiment was performed, involving thin, flat panels of aluminum with a designed, initial crack. These panels were subjected to static loads that were increased until crack propagation occurred. Acoustic emission sensors, which detect energy released by growing cracks in the form of strain waves, were used to detect this propagation and transform the characteristics of the propagation into electrical signals. These complex signals were then analyzed through an artificial neural network system, which allowed for fast post-processing. A structural health monitoring system was found to be plausible, using real-time analysis of the aluminum panel, detecting and reporting any growing crack from a size larger than 0.05 inches, well before any failure occurred. This study proved that acoustic emission could make structural health monitoring a reality.

DETECTION AND QUANTIFICATION OF KETAMINE HCL IN ALCOHOL/WATER MATRICES USING ESI-MS^N AND LC-ESI-MS
Justin Lygrisse*, Martin Lapp, Kelsey Witherspoon, and Michael Van Stipdonk
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Drug facilitated date rape continues to be a problem around the world. Ketamine HCl (KT) has gained popularity since it is nearly odorless, tasteless, and colorless when dissolved in water/alcohol and a typical street dose (300-400mg) only costs \$20-\$25. A street dose of KT will send the victim into a dissociative state within 10-15 minutes and can cause temporary amnesia. Drug detection is paramount in the prosecution of drug facilitated date rape cases. Currently, detection of KT relies on urine or blood analysis. In this study we have developed a method for detecting and quantifying KT in a variety of different alcohols and mixed drinks.

Mass spectrometry (MS) was used to identify the presence of KT in the alcohol matrices. Liquid chromatography (LC) was used to separate the KT from the rest of the alcohol matrix. Quantification of KT was carried out both by MS and LC/UV absorbance using a series of external standards and plotting the concentration versus the signal intensity. Interestingly, it is possible to distinguish not only between different types of alcohol but also different brands of similar alcohol. KT was clearly visible in the spectrum of KT spiked drinks and did not show any interference from the alcohol matrix. Detection limits were found to be in the 100 picoM range and samples were stable for up to 7 days. This method has proven to be robust and a viable way to quantify KT in alcoholic beverages for up to 1 week with very low limits of detection.

IMPACT OF THE FIRST STEP TO ACTIVE AGING ON OLDER ADULT'S FUNCTIONAL FITNESS, BALANCE, AND DAILY ACTIVITY

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Purpose of the study was to determine how the First Step to Active Aging (FSAH) program impacts functional fitness (FF), balance, and daily physical activity (DPA) in older adults. The FSAH group consisted of 18 women. FSAH group met at a senior center for 12 wk, 2d•wk for a 50 min. training program (flexibility, strength, balance, aerobic). The control group consisted of 15 women. Program effectiveness was assessed using measures of FF (chair stand, arm curl, sit & reach, up & go, scratch test, and 12-min walk), balance (movement velocity (MVL), endpoint excursion (EPE), maximum EPE (MXE), and directional control (DCL) for forward (F), right (R), left (L) and back (B) movements), pedometer measured DPA, and weight. Findings show that no baseline difference existed between groups. Repeated measures ANOVAs revealed group x time interactions ($p<.05$) on all measures except flexibility. After 12 weeks, FF improvements were noted in the FSAH group: Chair Stand 35%, Arm Curl 26%; Up-&-Go 8%; 12-min Walk 14%. With respect to LOS, MXE improved in all directions (F 18%, R 14%, B 23%, L 10%) and DCL improved in the F direction 9%. DPA also increased from 3,108 to 5,077 steps (38%) and Ss lost 2.3lbs (2%). The control group did not change in any variable.
DISCUSSION: Participating in a FSAH program improves FF, which may result in improved function and more years living independently.

INCREASING EFFICIENCY OF DATA CACHING USING BLOOM FILTERS IN AD HOC WIRELESS NETWORKS

Julinda Taylor* and Bin Tang
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This project studies improvements to Ad Hoc Wireless networks. An Ad Hoc Wireless network is composed of many mobile nodes that move in and out of the network. The devices are designed to be mobile, so they are generally small and have limited power, range and data caching abilities. Data caching provides extended or faster access to data in the network by maintaining replicas of data in strategic parts of the network. Current research in the area of Data Caching does not manage space efficiently. Testing and monitoring of this work is accomplished using a Network Simulation package, NS2, http://www.isi.edu/nsnam/ns to simulate the network activity. This project adds a Bloom Filter, a fast, space efficient and probabilistic method for looking up data, to the current caching scheme. Our results will be comparisons between the network performance with regards to time accessing data, reliability in the network, and the overall quality of service in the network.

IDENTIFYING USERS' CHARACTERISTICS CRITICAL TO PRODUCT SELECTION USING ROUGH SET THEORY

Aly Ahmady*
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A consumer's purchase decision making process is very complex. It is obvious that the set of product functional features has a major role in the purchase decision. However, for a same product, users may have different assessments. So it seems that other factors than product functional characteristics play a role in decision making. Frequently, customers are segmented based on characteristics such as age, gender, geographic location, etc. Nevertheless, in many cases it has been seen that the customers in the same segment have different points-of-view for the same product. For example, some customers in a group may consider a product suitable while others don't. Inconsistencies between customers can cause uncertainty for designers in producing the most satisfying product attributes. This paper presents a method to resolve this kind of uncertainty using Rough Set Theory. The input of this method is users' evaluation data for a product with respect to a specific customer subjective feeling. The output is sets of the most influential users' characteristics on their product selection preferences. By using reduced sets of users' characteristics, designers are able to reclassify users and resolve inconsistencies.

A SCHOOL DISTRICTS' PERCEPTIONS: NECESSARY SKILLS IN THE 21ST CENTURY

Lisa Lutz*, Larry Callis, Dale Herl and Mark Watkins
Department of Educational Leadership, Wichita State University

Secondary students are graduating into a world that is increasingly interconnected, interdependent and culturally diverse. This dynamic environment requires a level of intercultural and information literacy that is presently recognized by some school district leaders and teachers in a mid-western suburban school district as a necessity for its graduates. This study focused on district stakeholder perceptions of the current intercultural and information literacy of graduates, stakeholder perceptions of what is needed for future graduates, and stakeholder perceptions of the requirements for instituting curricular changes to prepare its students for the 21st century. A qualitative methodology comprised of focus groups, interviews, and an online survey of key stakeholders and document review were conducted. Critical social, social exchange and constructivist learning theories underpinned a constructionist epistemology informed this methodology. The results served as an aid in providing awareness and direction to the school district in curricular and instructional decision making.

SYNTHESIZING DRUG-CARRYING NANOCOMPOSITE SPHERE FOR TARGETED DRUG DELIVERY

Janani Sri Gopu*, Bailey Cooper, and Ramazan Asmatulu
Department of Mechanical Engineering, Wichita State University

Magnetic targeting is a promising method of drug localization. Controlled delivery occurs when a drug is associated with a biodegradable polymer and magnetic nanoparticles so the drug molecules are continuously released from the composite structure to the area of interest In this study, drug-carrying magnetic nanocomposite spheres were synthesized using magnetite nanoparticles and poly (D,L-lactide-co-glycolide) (PLGA) for the purpose of magnetic targeted drug delivery. Magnetic nanoparticles (~13 nm on average) of magnetite were prepared by a chemical co-precipitation of ferric and ferrous chloride salts in the presence of a strong basic solution (ammonium hydroxide). An oil-in-oil emulsion/solvent evaporation technique was conducted at 7000 rpm and 1.5-2 hrs agitation for the synthesis of nanocomposite spheres. Specifically, PLGA and drug were first dissolved in acetonitrile (oily phase I) and combined with magnetic nanoparticles, then added drop-wise into viscous paraffin oil combined with Span 80 (oily phase II). Nanocomposite spheres with different contents of magnetite (0%, 10%, 20%, and 25%) were evaluated in terms of particle size, morphology and magnetic properties by using dynamic laser light scattering (DLLS), scanning electron microscopy (SEM), transmission electron microscopy (TEM) and a superconducting quantum interference device (SQUID). The results indicate that nanocomposite spheres (200 nm to 1.1 μm in diameter) are superparamagnetic above the blocking temperature near 40 K and their magnetization saturates above 5,000 Oc at room temperature.

TESTING A GLOBAL SCREENING METHOD TO PROBE THE ROLE OF EPIGENETICS IN AN EXPERIMENTAL MODEL OF ESTROGEN-DEPENDENT UTERINE CANCER

Megan Simpson* and William Hendry
Department of Biological Sciences, Wichita State University

Diethylstilbestrol (DES), a synthetic estrogen, was widely administered to pregnant women between 1947 and 1971 based on the misconception that it could prevent miscarriages. Consequently, at least four million women and their fetuses were exposed to the drug and the offspring often developed various reproductive tract abnormalities, including cancer. We focused this study on DES-induced abnormalities in the uterus. More specifically, we screened for altered DNA methylation patterns. DNA methylation is a major component of the currently high-profile topic of epigenetics. Epigenetic modifications are now viewed as just as important to the development of cancer as are DNA mutations. We use Syrian golden hamsters to study the consequences of early developmental DES exposure. This study used Methylation Sensitive Restriction Fingerprinting (MSRF) to screen for altered DNA methylation patterns in uteri from control vs. neonatally DES-treated hamsters. Preliminary results show differential DNA methylation patterns in uteri of control vs. DES-treated hamsters. Further studies will be done to determine the identity and functional significance of the differentially methylated DNA elements.

THE STUDY OF THE EFFECT OF LONG TERM WATER COVER ON THE MILL TAILINGS OF THE SILVER LAKE MILL # 1, NEAR SILVERTON, COLORADO

Renee Vardy*
Geology Department, Wichita State University

Mining and milling of metals were the primary industries in the study area during the late 1800's into the early 1900's. Wastes from the mining and milling processes are abundant in the area and present a significant environmental threat. Abandoned in 1900, the Silver Lake Mill # 1 is located on Silver Lake, southeast of Silverton, CO. Tailings (mill wastes) are located above and below the lake level providing an excellent location to study long term water cover of mill tailings. The project included water samples from the lake, its outlet and inlets plus tailings samples above and below water. These samples were used to determine if the lake is contaminated and if so, the pollution source. Field parameters of pH, conductivity, temperature, and dissolved oxygen were observed. Samples were analyzed for Al, Fe, Cu, Ni, Zn, Cd, and Pb. All parameters except Ni were found in the lake, but the inlets, which had low concentrations, cannot entirely account for this.   Examination of results show the lake holds contaminated water with increasing metal concentrations with depth. It also reveals the source of contamination is primarily transfer from submerged tailings. Lastly, it shows that the contamination is generally contained within the lake.

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