9th Annual
Capitol Graduate Research Summit

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

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Department of Agronomy

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.

GENETIC DIVERSITY IN *FUSARIUM THAPSINUM* ISOLATES FROM KANSAS

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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.

HIGH PERFORMANCE LITHIUM ION BATTERY ANODE BASED ON CORE-SHELL HETEROSTRUCTURE OF SILICON

Steven Klankowski[1], *Ronald Rojeski*[2], *and Jun Li*[1]
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Improving the energy capacity, charging/discharging speed, and lifetime of lithium-ion batteries is critical for their broader applications in alternative energy applications and hybrid electrical vehicles used throughout Kansas. 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 thin copper foil substrate. 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.

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.

DESIGN OF A 'GREENER' SOLAR CELL USING MYCOBACTERIAL PROTEIN MspA

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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.

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

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Department of Diagnostic Medicine & Pathobiology, Kansas State University

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 x 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.

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

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, Paul A. Bartley and ***Wilson A. Smith***
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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.

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

Kyle S. Steele[1], *Melissa J. Weber*[2], *Elizabeth A.E. Boyle*[1], *Melvin C. Hunt*[1], *April S. Lobaton-Sulabo*[1], *Curtis Cundith*[2], *Yoelit H. Hiebert*[3], *Karen A. Abrolat*[3], *Joel M. Attey*[3], *Sherri D. Clark*[3], *Dallas Johnson*[1], *and Tawnya L. Roenbaugh*[1]
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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.

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.

LEADING KANSAS? DETERMINANTS OF HUMAN TRAFFICKING POLICY VARIATION IN THE UNITED STATES AND KANSAS

Laura Dean
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In 2002, Washington state became the first state in the United States to enact anti-trafficking legislation on the state level that made human trafficking illegal in an attempt to combat this growing problem. Today Washington remains one of most encompassing states for anti-trafficking legislation while Kansas, a state admitted to the United States as a free state and proud of its anti-slavery roots, continues to lag behind. By examining the determinants of policy adoption with respect to human trafficking, this project explains this variation throughout the United States and investigates why some states have comprehensive policies while others have no policy at all. This project builds on a theoretical framework of social regulatory policy to explain state variation in the adoption of human trafficking laws in the United States and seeks to determine what this variation can tell us about the implications for human trafficking in public policy research. A cross-sectional analysis was utilized to determine that state government ideology, professionalization of the legislature, issue salience, percent farmland, violent crime, and the percentage of women in the legislature have the most influence over the scope of human trafficking laws in the United States. The number of trafficking shelters in each state, or interest group strength, negatively influences the scope of trafficking laws. In addition to this quantitative analysis a qualitative case study of the legislation in Kansas was performed to examine the gaps in legislation present in the state and where improvements can be made.

TOWARDS AN ENHANCED UNDERSTANDING OF PREFERENTIAL SOIL WATER FLOW

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Water flows preferentially through certain pores in nearly all soils, but these paths are difficult to quantify by typical soil descriptions. Preferental flow paths (PFPs) affect soil water infiltration, drainage, solute transport, erosion, and natural hazard risks. Techniques such as X-ray computed tomography have been used to quantify PFPs but present barriers of cost, portability, and scale. This study investigates a structured-light technique called multistripe laser triangulation (MLT) scanning for characterizing PFPs. MLT sweeps parallel laser stripes across an object to collect information about its surface. On excavated soil pits, segments of the stripes may disappear in the space between aggregates as the pattern moves across the surface allowing actual PFPs to appear as gaps in the virtual mesh. Our objectives were to assess the ability of MLT to capture PFPs and identify metrics characterizing their geometry. Work was conducted in a Grundy silt loam on a gently-sloping prairie near Lawrence, KS. Mean annual temperature at the study site is 13.6oC with mean annual precipitation of 101 cm. The ability of MLT to digitize actual PFPs was analyzed using a dye infiltration experiment. Soil cores were collected, dyed and opened in the laboratory, and digitally photographed. Dyed areas matched patterns of missing data (i.e., digital pores) from MLT scans of the same core. Observations from the soil pit confirm the validity of scanned PFPs and geometric characterization metrics such as area, perimeter, and pore density. Results will be used in future work to enhance soil water infiltration models.

TOWARDS A CARBON DIOXIDE-FREE, SUSTAINABLE, ETHYLENE OXIDE TECHNOLOGY

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Ethylene oxide (EO) is, a large volume chemical building block used to make a variety of consumer products, such as plastic bottles, detergents, and paints. Current EO production methods emit ~3.4 million tonnes of carbon dioxide per year globally, making the process the second largest emitter of this greenhouse gas of all chemical processes. Carbon dioxide results as byproduct from the burning of a portion of the starting material (ethylene) and EO product. The goal of this research is to develop an alternative process that eliminates this wasteful burning. This goal has been achieved. The new technology offers economic and environmental advantages. For example, by conserving feedstock, an economic analysis shows that the process could save $2 billion per year globally. An environmental analysis shows that the process also reduces carbon dioxide emissions by 23%. This process has received national recognition by winning the 2010 Kenneth G. Hancock Memorial Award for its novelty and greenness. It has also garnered significant interest from Fortune 500 companies. Further, this project has attracted both federal and industrial R&D funding. The EO technology process can be adapted for broader applications, including making other chemical building blocks from biomass instead of petroleum. If successful, Kansas would be an ideal location for manufacturing these chemicals because it is 4th in the U.S. in biomass availability. Capturing as little as 1% of the current U.S. chemicals market would represent a $7.2 billion/year industry with significant employment opportunities in rural Kansas communities.

EFFECTS OF NEGATIVE PRESSURE TO INDUCE BONE GROWTH INTO POROUS TITANIUM IMPLANTS

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Extremity War Injuries (EWI) with peri-articular defects constitute a high volume and high morbidity challenge for the military trauma management system. Among military injury specialists it is agreed the development of an internal fixation device to be used earlier in the reconstructive process is needed. This research combines Negative Pressure Wound Therapy (NPWT), known to promote granulation tissue growth, and porous metal implants, having similar mechanical properties to bone, in order to develop an internal fixation device to be used in EWI reconstruction. A caprine model was used to examine the effectiveness of NPWT applied across a porous titanium implant to promote tissue ingrowth. Bilateral surgery was performed on 6 goats, attaching one large porous titanium implant to the lateral side of each femur using bi-cortical screws. One leg of each animal was sutured closed to serve as the control while the other side was treated with NPWT at either 125 mmHg or 200 mmHg. Tissue ingrowth for each negative pressure was examined at 6, 9, and 12 days. In 5 of 6 animals, gross examination showed improved tissue adhesion to the implant treated with NPWT when compared to the implant not treated with NPWT. This study shows promise that a device combining NPWT and porous titanium could be used in repairing large injuries with defects in both bone and soft tissue such as people suffering EWIs, bone cancer, or other traumatic injury.

BIOMECHANICAL ANALYSIS OF POSTURAL INSTABILITY IN PARKINSON'S DISEASE

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Postural instability is one of the major unmet needs in Parkinson's disease (PD) and a primary cause of falling, fractures, and nursing home placement for persons with PD. Interventions to lower fall risk are effective, but are costly and time consuming for both the patient and the clinician, so it is not practical to prescribe a fall intervention unless a significant fall risk is determined by the physician. Currently there are no good clinical tests that reliably predict a future fall besides a history of falls. Therefore, fall interventions are usually not prescribed until after multiple falls have occurred. To improve care for the person with PD, we need a reliable method to assess fall risk based on the level of postural instability so that the appropriate fall risk intervention can be used to reduce fall risk before falls occur. Reducing fall risk in PD would not only delay the pain, suffering, and medical costs associated with an injurious fall, but also the loss of independence, psychological consequences, and expenses associated with long term care.

APPROACHING INNER EAR HAIR CELL REGENERATION THROUGH NON-VIRAL GENE THERAPY

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Balance and hearing loss can be attributed to damaged inner ear hair cells (IEHCs) in the vestibular organ and cochlea of the inner ear. A method that could replace or regenerate damaged IEHCs has the potential to provide relief to individuals suffering from hearing or balance loss attributed to damaged IEHCs. Significant developments in gene delivery methods over the past decade have presented new opportunities to attempt IEHC tissue engineering. One such method is Nucleofection™, which can enhance the ability of cells to take up genetic material. Nucleofection™ is a reliable and robust gene delivery method, making Nucleofection™ a greatly desirable technique for reducing costs, labor, and safety risks to patients and investigators. Furthermore, Math1 is a potent master gene that plays a key role in guiding naïve cells toward IEHC lineages. The ability to deliver Math1 to naïve cells, such as human umbilical cord mesenchymal stromal cells (hUCMSCs), presents a unique opportunity for investigating the potential of hUCMSCs to express IEHC characteristics for IEHC regeneration. This work focuses on combining stem cell therapy with gene therapy for IEHC tissue engineering. hUCMSCs are an easily accessible stem cell source that exhibit no donor risks, are politically benign, highly proliferative, and can differentiate into a variety of tissue specific cells, making their use with gene therapy a ripe opportunity for IEHC tissue engineering.

PRESERVING THE PAST: TOPEKA'S JAYHAWK THEATRE

Juli Pitzer
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This historic research explores the story of Topeka's Jayhawk Theatre in Kansas, a 1926 movie palace, through its glory days before WWII until its closing in 1976. Housed in the Jayhawk Complex (hotel, arcade, and former Crosby Department Store) the Jayhawk Theatre was more than an entertainment house. The theatre became the place where its patrons heard the latest local, national, and international news; where local talent got their start in the entertainment industry; where the Crosby's showed their latest fashions through style shows on stage between acts; where children enjoyed Saturday morning serials and cartoons; and a place where different classes and races came under one roof, though entangled with issues of segregation. Through on-camera interviews, photographs, newspaper clippings, and videoed tours, the accumulated research produced a short documentary called “Preserving the Past: Topeka’s Jayhawk Theatre” and research presentation. Downtown Topeka was once a thriving entertainment and commercial place for people to congregate. Like most cities across America, with suburban sprawl and construction of commercial shopping centers, Topeka’s downtown area significantly declined. Today, Topeka hopes to revitalize and preserve its heritage in order to rekindle life once held on its main street, Kansas Avenue. Being the last remaining historic movie theatre and one of the few historic buildings in downtown Topeka, the future of the Jayhawk Theatre rests in the hope of revitalization and historic preservation.

STROKE SURVIVOR REHABILITATION: HOW MUCH EFFORT IS NEEDED FOR RECOVERY?

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The purpose of the research in our lab is to determine optimal methods of sensory motor training in stroke rehabilitation. One area of focus in our research is to determine what may be the best sensory motor training methods. For instance, conventional therapy in stroke rehabilitation would encourage patients to give their maximal effort in performing motor training tasks. However, one of our studies has shown that the maximal effort made by stroke survivors during motor training may not be the optimal path to recovery of normal function. We are currently working on the project to identify an optimal effort level and develop novel training approaches that will help stroke survivors to maximize their functional recovery. Another area of research focus in our lab is to develop novel sensory motor training devices that will optimize the outcome of training activities. We strive not only to help the patient but also the therapist providing the treatment. Currently we are developing a robotic device that assists with walking rehabilitation and reduces the workload of physical therapists. We are also developing a cost-effective and portable robot for stroke survivors to train their shoulder and arm function at home. Improved motor function recovery will increase the independence and quality of life of stroke survivors. In addition, our training robots may be further developed into commercial products with a huge market potential and therefore contribute to regional economy and job market.

PROMOTING SAFE STUDENT NURSING CARE: GAINING BSN STUDENT PERSPECTIVES ON TECHNOLOGY SUPPORTED PATIENT SIMULATION

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Research has shown that high fidelity patient simulation (HFPS) experiences can improve student confidence and skills and lead to increased patient safety. While attention to broad student roles in HFPS has been described, no study on the specific roles played by nursing students was found. This descriptive study examined the perceptions of nursing students about roles played in HFPS, with particular attention to the Observer role related to role enhancement, perceptions of the guided observer activity, perceived clinical judgment, and educational practices in HFPS. Data were collected from a convenience sample of senior bachelor degree nursing students at two Midwest universities, including rural and urban (N= 23 Observers interviewed and N= 34 Traditional roles). Students completed demographics, written surveys, and the Educational Practices in Simulation Scale. Students in the Observer roles were interviewed using the Hober Qualitative Interview Prompts. Qualitative data were analyzed using a naturalistic inquiry, iterative process to find patterns and themes in the data focusing upon the Observer roles. Three themes emerged from the data including Conceptualizing the Learning Experience, Capturing the Big Picture, and Connecting with the Team. Specific codes within each theme such as minimizing the stress of applied learning; increasing confidence; and consulting with the team were described. While Observers described a difference in 'seeing and doing' simulations, they described the value of this role in enhancing clinical judgment and learning safe, quality patient care strategies. This study supports that simulation technology allows students in multiple roles to learn patient care strategies in the safety of the clinical learning lab prior to clinical care experiences. Implications include continued use of technology supported patient simulations for enhancing nursing student learning and continued research on extending these learning roles.

OUABAIN IS A MODIFIABLE FACTOR THAT INCREASES CYST GROWTH IN AUTOSOMAL DOMINANT POLYCYSTIC KIDNEY DISEASE

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Autosomal Dominant Polycystic Kidney Disease (ADPKD) is the most common inherited disease of the kidney. The condition is characterized by the formation and growth of multiple renal cysts which cause structural and functional defects in the organ ultimately leading to renal failure in affected patients. Formation of ADPKD cysts depends on abnormal proliferation of the cells forming renal tubules, while cyst expansion also requires secretion of fluid into the lumen of the growing cysts. Although ADPKD results from mutations in the genes that encode polycystins, cyst growth is highly dependent on physiologic factors that are circulating in blood. Identifying those factors is essential in controlling disease progression. Research in our laboratory is directed at understanding the role of the hormone ouabain in ADPKD cyst development and growth. We have found that circulating levels of ouabain bind to the Na,K-ATPase present on the membrane of kidney cells to activate intracellular signaling pathways that enhance proliferation and augment fluid secretion by ADPKD cells. Thus, ouabain acts as a factor that facilitates progression of cyst growth in ADPKD. Our current efforts are investigating the molecular mechanisms responsible for ouabain's effect on ADPKD cells. We have found that activation of intracellular messengers of the MAP kinase pathway mediate the effect of ouabain on both proliferation and fluid secretion in ADPKD cells. Future work will continue to define mechanisms responsible for ouabain's action in ADPKD with the goal of pharmacologically blocking these mechanisms to slow the growth of kidney cysts in ADPKD patients.

MicroRNAs ARE NECESSARY FOR FEMALE FERTILITY

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Regulation of fertility in the female is a dynamic and highly regulated process that requires the coordinated actions of multiple tissues and organ systems to develop a fertilizable gamete, as well as provide a suitable environment for fertilization and subsequent fetal development. To attain this optimal environment, the female reproductive system must be highly responsive to subtle changes in hormones and other external cues. Previous work from our laboratory has found that expression of microRNAs (miRNAs), a class of short RNA molecules that play a role in numerous processes including embryonic development and cellular differentiation and proliferation, are hormonally induced in the ovary. The purpose of this study was to determine what role miRNAs may play specifically in female fertility. MicroRNAs are synthesized through a multi-step process that includes cleavage by the enzyme Dicer. To determine if miRNAs play a role in female fertility, a line of mice with Dicer knocked-down specifically in the reproductive tract was established. Female mice lacking Dicer failed to reproduce, suggesting that miRNAs are necessary for fertility. Further examination of the reproductive tracts found large, fluid filled sacs in the oviduct that prevented fertilized embryos from reaching the uterus. Mice lacking Dicer expression also exhibited a decreased ovulation rate. These findings provide evidence that miRNAs are essential for the development and function of the female reproductive tract and are necessary for fertility. Further study of these molecules may provide important means to either treat fertility problems and/or provide new modes of contraception.

TARGETING CANCER STEM CELLS; OVERCOMING MULTIDRUG RESISTANCE IN COLON CANCER

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It is believed that tumors contain a small population of cancer stem cells. These slowly dividing cells have been implicated in multidrug resistance (MDR) which provides resistance to a wide range of chemotherapeutic drugs. Often chemotherapy treatment will eliminate the vast majority of the cancer cells; however, the small population of cancer stem cells remains viable and gives rise to cancer relapse. Therefore, it is important to identify the molecules that play a role in regulating cancer stem cell biology. Here we demonstrate that the protooncogene RNA binding motif 3 (RBM3) is capable of increasing the cancer stem cell population in colorectal cancer by inducing Notch activity, a crucial signaling cascade for managing stem cell behavior. Furthermore, cells overexpressing RBM3 display significantly less cell death when treated with the chemotherapeutic agents doxorubicin and paclitaxel. These cells demonstrate an increased capacity to actively efflux doxorubicin, which correlated with an increase in the expression of the multidrug efflux pumps, multidrug resistance protein 2 (MRP2), and phosphoglycoprotein (Pgp). Importantly, RBM3 overexpressing cells treated with DAPT, a compound that inhibits Notch signaling, showed significant cell death implying that inhibiting Notch signaling in RBM3 overexpressing tumors would have favorable outcomes compared to treatment with classical chemotherapies. In summary, we have elucidated a new role for the protooncogene RBM3 in promoting the cancer stem cell population in colorectal cancer cells and increasing MDR. We have also determined that chemotherapeutic inhibition of the Notch signaling pathway can provide a potential approach in overcoming RBM3 mediated MDR.

SHOULDER INSTABILITY MAY DEPEND ON LABRAL AND CAPSULAR PROPERTIES

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Shoulder instability, characterized by excessive joint laxity that leads to subluxations and dislocations, is the most frequently occurring shoulder injury and is thought to result from repetitive stress or a traumatic event. It can be career ending for those in the workforce as well as for athletes.The joint constituents including capsule, labrum, muscles and ligaments provide shoulder stabilization. Capsular and/or labral injury are the most common pathological findings of instability occurrence and recurrence. These structures are also the least studied relative to instability. Repetitive stress elongates the shoulder capsule and introduces microtears into the labrum and capsule disrupting the collagen composition which is their essential structural component as well as resulting in damage to neural structures. The purpose of this study is to assess collagen composition and neural density of the labrum and capsule as they relate to shoulder laxity.Joint laxity of intact cadaveric shoulders will be measured using a material testing machine. The labrum and capsule will be dissected from each shoulder and their tissue properties determined. Ultimately, we will look for relationships between collagen types ratio, neural density, and joint laxity.Collagen type I (stiff) to type III (elastic) ratio will be determined after the collagens are extracted from tissues and quantified. In addition, neural density will be assessed using gold chloride staining followed by counting the number of pacini and ruffini corpuscles. We expect that shoulders with greater joint laxity will demonstrate lower type I to type III collagen ratios and lower neural densities.

IMPACT ON CO_2 EMISSION DUE TO ELECTRIC VEHICLE CHARGING AND DISTRIBUTED WIND GENERATION

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To reduce the greenhouse gas emission and fossil fuel dependency, electric vehicles (EV) are becoming viable options. EV charging is seen as an extra load on the electric power distribution system, and if not properly coordinated, it could increase the greenhouse gas emission from the electric power generators. This extra burden can be relieved by use of renewable distributed generation. By introducing distributed generation to support EV charging loading on traditional generation will be reduced and hence reducing the CO_2 emissions. Type of distribution generation will result in variable CO_2 emission levels due to their limited availability. This study focuses on the impact of wind generation on electric vehicle charging. There are three levels of electric vehicle (EV) charging. Level-1 is slow AC charging, level-2 is fast AC charging and level-3 is fast DC charging. This work analyzes the AC charging (both level-1 and level-2) and its effect on overall CO_2 emissions of traditional generation with the presence of distribution generation.

THE EFFECTS OF TEXTING AND DRIVING ON HAZARD PERCEPTION AND THE ADOPTION OF DRIVER RESPONSE STRATEGIES

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Hazard perception has received little attention compared to measures of vehicular control in studies exploring the effects of texting on driving performance, despite being a more direct measure of crash risk. Twenty participants (10 male; 10 female) were recruited to drive in a simulator, specifically designed to measure situational awareness, while text messaging in order to assess hazard detection performance. Two text message conditions were used to compare interference at early vs. late stages of information processing. Signal Detection Theory (SDT) analysis revealed the adoption of a more liberal response criterion (B") (i.e. increased false alarms and decreased misses) when text messaging interfered at an early stage but not at a late stage of processing ($F(2,38) = 3.76$, $p < .05$). Furthermore, reaction time and text errors increased when interference occurred at a later stage ($F(2,38) = 29.90$, $p < .001$ and $F(1,19) = 5.869$, $p < .05$, respectively). These findings suggest that the impact of text messaging on the detection of driving hazard depends in part, on the stage (late vs. early) of information processing, particularly in the adoption of response strategies.

A CONCEPTUAL STUDY OF AIRFOIL PERFORMANCE ENHANCEMENTS USING CFD

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A conceptual study of performance enhancing devices for an airfoil is performed using Computational Fluid Dynamics. Three simple, passive devices are examined to explore alternate methods for stall control and lift-to-drag improvement. The motivation behind this research is to study effective techniques to improve performance with fewer drawbacks than previously existing methods. An evaluation scheme is presented to compute airfoil lift, drag and pitching moment for a range of angles-of-attack up to stall. NACA 64_1-212 single-element and slatted airfoil CFD results are compared with experimental data to validate the computational model. Evaluations on the first conceptual design (Stall vane) show elimination of the separation at 15 degrees of angle-of-attack where the flow reversal normally starts at 86% - chord. A total drag increase of 22% is detected because of the sharp leading-edge of the device, but the main element drag has a reduction of 43%. The maximum lift coefficient does not show a significant change on the same model. The second device (Cylinder) has a negative effect, initiating flow separation and causing a significant decrease in lift-to-drag ratio at a given lift coefficient. The third device (Dimples) demonstrates the potential of lift-to-drag ratio improvement at the higher angle-of-attack.

USE OF ARTIFICIAL NEURAL NETWORKS TO DETECT DAMAGE IN COMPOSITE LAMINATES

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Maintenance has remained an important issue in the aerospace structures and materials field. As technologies have improved, composites have begun to replace increasingly more structural components. However, these still have a long expected life for service use and damage can occur within that time. Ultrasonic sensors can be placed on or within composite laminates to scan for damage. Analysis of signals from these sensors is difficult for composites due to effects of material boundaries. A novel method of using artificial neural networks to interpret signals has been investigated for this research. A simple four sensor system was created for this study. Four sensors were placed 4.25 units apart. In a pitch-catch method, strain waves produced by one sensor (used as an actuator) passed through the material and were received by the other three sensors. The received waves are then analyzed by artificial neural networks and a damage position was predicted. This system has been trained to identify damage location within the square area for actuator signals ranging from 50kHz to 100kHz. The system of four sensors was demonstrated to predict the damage location with a confidence interval of 95%. The research presented is a novel method of interpreting ultrasonic signal analysis with artificial neural networks which could be adapted to future structural health monitoring systems.

UNPACKING THE INVISIBLE PROBLEM OF CAMPUS HUNGER: THE HUNGER AWARENESS INITIATIVE AT WSU

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In the U.S. we often hear phrases like "starving college student" and "freshman 15" to the point that they have become clichés. How much truth lies behind these phrases? Existing data on hunger and food insecurity does not effectively address these issues. Ironically, despite the fact that research is conducted on university campuses, there is still significant need for such research. The present study reports phase 1 results of an on-going community-based, participatory initiative to enhance understanding of hunger issues on one campus, the Wichita State University (WSU) Hunger Awareness Initiative. Data were collected through surveys made available online through a social media campaign directed toward the WSU community, during a food-packaging event, and through focus group discussions. Data from 44 individual survey respondents to the prompt: "Tell us your hunger story" and the information shared by 50 participants in focus groups held during a campus-based "Dinner and Conversation About Hunger" were analyzed using inductive thematic analysis. Results indicated that while hunger stories varied widely among participants, several themes were found within participant groups. Stories offered by international and graduate students indicated that food insecurity was an issue for them. Indicating the complexity of this issue, three consistent themes found in the focus groups were that students feel reluctant to admit they are food insecure due to the stigma of asking for help, or the need to be self sufficient; students eat low-budget meals regardless of nutrition or taste due to lack of resources; and finally, there are opportunities to help hungry students now, and that preventative measures can be taken. The WSU Hunger Awareness initiative is the first step in a coordinated effort to understand hunger and food security awareness on college campuses.

THE BENEFITS OF MAGNETIC/PROTEIN TARGETED DRUG DELIVERY IN TREATING SKIN CANCER IN-VIVO

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Skin cancer represents the most common type of cancers, and is life threatening without treatment. People with light skin, genetic diseases and high exposure to ultraviolet radiation (UVR) are at a high risk of developing skin cancer. Skin cancer once developed may spread to the rest of the body including organs inside the body. Once the cancer advances and metastasizes, it is difficult to control and treat. We report on a Magnetic Carrier System that is capable of localizing the chemotherapy at the afflicted area. In-vivo experiments have shown that utilizing the Magnetic Carrier System developed at Wichita State University (WSU), the efficacy of the chemotherapy can be enhanced at least twofold.

IMPROVING READING: UNDERSTANDING THE ROLE OF WORKING MEMORY AND EASE OF INFERENCE GENERATION

Melinda Mueller
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Reading scores from the National Assessment of Educational Progress showed 24% of Kansas' fourth grade public school students were below basic reading levels. This shows there is a significant need for researchers to understand the different strategies readers use to successfully comprehend a text. An important skill for understanding texts is being able to fill in missing information from the text; this is called a *bridging inference*. When there is a coherence break in a text, readers will generate bridging inferences, but this can cause processing delays. This study examined whether the ease which with the bridging inferences could be generated is related to how difficult it is to generate the inference. Thus, participants in the current experiment read several passages in which the ease of generating an inference was gradually decreased by manipulating the explicitness of an action. Reading times for target sentences that followed the critical sentences increased as explicitness decreased. In addition, reader skills, such as working memory capacity, are related to inference generation skills. The effect of explicitness was more pronounced in readers with high working memory. This provides preliminary evidence that processing delays during bridging inference generation are affected by ease of generation. Understanding the types of processing, such as bridging inferences, that can improve comprehension among readers of all ages is critical for helping struggling readers in Kansas succeed.

NEW PROGRESS IN SELF-HEALING TECHNOLOGY OF COMPOSITE WIND TURBINE BLADES

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Wind turbine blades are subjected to external cyclic loadings, resulting in the development of micro and nanocracks, which in course of time becomes macro cracks, thus leading to fatigue and failure. The concept of self-healing composite materials might be introduced into the blade manufacturing to reduce the cost and to increase the life expectancy of the turbine blades. This can be performed by introducing urea-formaldehyde (UF) micro capsules into the epoxy matrix of the composite materials. The urea-formaldehyde microcapsules are filled with dicyclopentadiene (DCPD) which acts as the healing agent. When DCPD is introduced into the crack of the epoxy matrix, it reacts with a catalyst in the matrix and heals the cracks. The dispersion of nanoscale inclusions in the epoxy matrix has the potential of increasing the mechanical properties of the polymer composite in a great deal. When the nanoscale inclusions are used as reinforcements in the composite material, the rate of crack growth could be considerably reduced. This work deals with the self-healing of the wind turbine rotor blades. We used different nanoscale inclusions in the microspheres of DCPD to increase the healed fracture toughness and avoid crack regrowth. Wind farms in Kansas are producing 1228 MW of energy and the new wind farms being constructed would produce 921 MW of energy making it one of the biggest industries in the region. This research potentially increases the service life of the composite wind blades and reduces the overall costs. This concept can also be used for the repair of wind turbine rotor blades which helps creating many new jobs in this sector.

LORENZO D. LEWELLING AND KANSAS' 'CIVIL' WAR

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Lorenzo D. Lewelling and Kansas' "Civil" War research, will examine one of the most obscure periods in Kansas political history, the early 1890s. The paper will explore the rise of Populism, a grassroots third-party movement, that upset the long-standing Republican majority in Kansas and show how this movement brought Kansans to the brink of all out war on the Capitol grounds. This study will examine the topic through the eyes of the state's twelfth governor, Wichitan Lorenzo D. Lewelling, and show how his action, and inaction, in office changed reform politics in Kansas for the next twenty five years. Drawing on primary source documents, a look into Lewelling's legacy illustrates some important issues of the early Populist movement in Kansas like fusion with the Democratic Party, prohibition, women's suffrage, and other social reforms that helped to shape Kansas into the state we see today. Blamed largely for his role in the events on the Capitol grounds during the first three months of his term, Lewelling was not able to follow through on his campaign promises and became one of the first "casualties" of the Populist movement in Kansas. Research will show that although Lewelling was the face of the Party in Kansas, he was never the commanding voice that the movement needed to sustain itself and was therefore discarded to the political periphery until his death.

HOSPITAL RADIOLOGY DEPARTMENT OVERHEAD ENERGY ESTIMATION

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Efficient energy management is critical for every sector of the economy. This is true in the commercial sector which includes the healthcare industry. The focus of this study is to estimate overhead energy consumption of healthcare facilities where buildings are open and operating 24 hours a day/365 days a year. Overhead energy consumption, heating, air conditioning and lighting are the greatest contributors to the total energy consumption in commercial buildings. According to the Annual Energy Outlook 2011 Report, healthcare facilities are ranked third, after malls and offices, in total energy consumed. Governor Brownback's budget for Kansas, fiscal year 2012 reports current energy and conservation projects, and states the importance of studying HVAC (heating, ventilation, and air conditioning) systems in order to achieve better efficiency. In this document, Governor Brownback comments on the need for continuing efforts to reduce the cost of providing health services. The Annual Energy Outlook and Governor's budget highlight the importance the research conducted out of the Sustainable Engineered Systems Laboratory at Wichita State University. This study analyzes and compares three different methods for estimating overhead energy consumption in two rooms of a hospital facility (CT and x-ray rooms): a heuristic that uses annual energy consumption, a thermal analysis, and a simulation. The comparison of these three methods will provide information and guidance for method selection at a desired level of accuracy and ease of application.

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