14th Annual
Capitol Graduate Research Summit

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Featuring Graduate Student Research from:

Emporia State University
Fort Hays State University
Kansas State University
Pittsburg State University
University of Kansas
University of Kansas Medical Center
Wichita State University

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WAVELET-BASED ACOUSTIC CLASSIFICATION OF BIRD SPECIES

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In this work, we use wavelet packet decomposition to classify bird species based off their calls. Knowing the bird species present in a given habitat can tell us many important things about the area. For instance, knowing the bird species helps us track the extinction of birds. Also, since birds are sensitive to changes in the ecosystem, knowing how many bird species are present in an ecosystem tells us how healthy the system is. The current methods of determining bird species have their limitations. Those methods usually need highly trained ornithologists to identify size, shape, posture, field marks, habitat, and flight patterns. The process requires many hours, and the results may be subjective. In our study, we developed a semi-automatic classification algorithm by using wavelet transformations, a mathematical tool which has been successfully applied in many areas. For example, the FBI uses a wavelet-based scheme to compress their fingerprint images. We consider the calls of the Whip-poor-will, the Northern Bobwhite, the Barred Owl, the Eastern Kingbird, and the Common Raven. We first segment the bird calls into syllables. Then we apply wavelet decomposition to decompose those syllables and extract certain parameters from the transformed signals. All of the instances and the parameters are compiled into a training set and a test set. We then classify the instances. Among all the classifiers we tested, Random Tree and Random Forest were the most successful. Both classifiers achieved over 70% accuracy.

IMPROVED TRACKING OF KANSAS ECONOMIC ACTIVITY

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Forecasting state level gross domestic product (GDP) has been notoriously difficult as past Kansas revenue over-projections have highlighted. This research develops a better estimating method for state GDP growth rates, at higher frequency, and more timely than current data provided by the Bureau of Economic Analysis (BEA). While the data provided by the U.S. Department of Commerce is reliable, the release cycles for quarterly state GDP can be as lengthy as five months before being reported. This research provides estimates on state level GDP growth at monthly frequencies with release cycles as early as five weeks after the end of each month. The methodology relies on time series forecasting on data collected from the Bureau of Labor Statistics, BEA, and Zillow Research. An ARIMA regression model is applied on historical data as well as the last twenty-four periods to generate an estimate on growth for recent months. The research borrows insights from Okun's Law and considers trends in local housing markets and in labor and gross domestic product to improve the accuracy of the model. Trends are observed by applying a Hodrick-Prescott filter on unemployment rates and state economic output. The research estimates GDP growth for the state of Kansas as well as nearby states: Arkansas, Colorado, Iowa, Missouri, Nebraska, and Oklahoma. The model estimates are on average within 0.15 percentage points of growth reported by the BEA. Therefore, the model can be considered a reliable early measure of local GDP growth.

DNA BARCODING OF BLOW FLY SPECIES IN COFFEY COUNTY, KANSAS

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Blow flies are one of the first insects to arrive during decomposition, thereby allowing forensic entomologists the ability to estimate the postmortem interval (PMI). Since blow fly succession patterns can vary among closely related species, accurate identification is crucial for correct estimation of the PMI. While identification of blow fly species using external, morphology-based techniques can prove difficult, many researchers have adopted molecular techniques to aid identification efforts. One such approach involves a technique called DNA barcoding. This methodology utilizes DNA sequence information from the cytochrome oxidase I (COI) gene for identification. The objective of this study was to examine the blow fly population in a rural Kansas county utilizing the COI gene. Flies were baited and trapped over a six-month time period. DNA was isolated from two legs obtained from the specimen followed by amplification of the COI gene. DNA sequencing and subsequent analysis involving the basic local alignment search tool (BLAST) allowed identification to the species level. Our results indicate the presence of at least five separate species, including *Phormia regina, Cynomya mortuorum, Lucilia cuprina, L. sericata, and L. pulverulenta*.

IDENTIFICATION AND QUANTIFICATION OF IBUPROFEN IN BLOOD USNG HPLC-UV/VIS

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Non-steroidal anti-inflammatory drugs are some of the most frequently used medications in the United States. Ibuprofen is a common over-the-counter nonnarcotic analgesic, and it is also typically used as an antipyretic and as an anti-inflammatory. Ibuprofen is commonly overdosed on but typically found to be non-life threatening. If a victim had decreased hepatic or renal function, however, ibuprofen overdoses may impart significant toxicity, and at high dosages, it has been linked to cardiovascular events. Currently, the Sedgwick County Regional Forensic Science Center (RFSC) must send postmortem samples to a contract laboratory if ibuprofen toxicity is suspected. The purpose of this project was to develop and validate a method for the detection and quantitation of ibuprofen for RFSC using HPLC with a UV/Vis detector. Ibuprofen and an internal standard, o-toluic acid, were added to negative blood and extracted using acetate buffer (pH 4.5) and ethyl acetate/ hexane 50/50 at a range of concentrations 40 mg/L – 350 mg/L. Using the Breeze 2 software, a calibration curve was generated and injections at different concentrations were quantitated. The method was validated in accordance with SWGTOX guidelines. Actual concentrations (as measured by the Breeze 2 software) were within ±20% of the expected concentrations. This method is a cost-effective option for rapid ibuprofen analysis.

FOSSIL OF THE OLDEST HEALING BONE FRACTURE IN AMNIOTES

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In Greenwood County, near Toronto, Kansas, a fossil locality in the Snyderville (Shale) Member of the Oread (Limestone) Formation (late Pennsylvanian Period, c. 300 million years ago) contains many disarticulated and broken vertebrate fossilized bones weathering out of an ancient soil. A notable specimen is a bone from an early amniote that was fractured while the animal was alive and then partially healed prior to its death. Amniotes are vertebrate animals that lay shelled eggs out of water. Living examples are reptiles, birds, and mammals, but not fish or amphibians. The fracture shows both an offset of the bone fragments and a preserved callous (healing growth zone). The bone's preserved parts appear to be consistent with it being from an early amniote. In transverse cross-section, the bone has a teardrop shape with a rounded anterior that tapers back to a flattened posterior that slightly curves. This shape compares favorably with other fossilized limb bones found at the locality that can be more readily identified as early amniote. This classification is also indicated by the microscopic structure of the bone when compared with that of known living reptiles and amphibians. In transverse cross-section, the bone has a sponge-like appearance that is consistent with that of living reptiles, and unlike that of living amphibians. Given the geologic age of the Toronto fossil, it is the earliest reported healing bone fracture from an early amniote.

THE RELATIONSHIP BETWEEN PSYCHOPATHY AND PERCEPTIONS OF OTHERS

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Psychopathy is a complex construct surrounded by many unanswered questions. It is characterized by dominance, superficial charm, manipulation, impulsivity, and a lack of empathy and remorse (Hare & Neumann, 2009). Additionally, psychopathy is often associated with many antisocial and criminal behaviors. This is thought to be the result of the characteristic lack of empathy. Therefore, it seems prudent to attempt to increase empathy levels in this population in order to decrease these often-harmful behaviors. One empathy-inducing literature intervention has shown promise in general populations in the past (Johnson, Cushman, Borden, & McCune, 2013). The present study attempted to apply this intervention to increase empathy levels in those high in psychopathy. Ninety-three participants recruited from Amazon's Mechanical Turk read a short story intended to induce empathy and were given a psychopathy scale, an empathy scale, and a scale measuring perceptions of the characters. Half of the participants were taught to generate imagery while reading, a process that is believed to increase perspective-taking and empathy (Johnson et al., 2013), and half of the participants were instructed to read as if for leisure. The intervention was unsuccessful; individuals in the imagery generation condition did not show more empathy, regardless of their psychopathy levels. However, exploratory analyses revealed that high psychopathy levels were related to more negative perceptions of both characters in the story overall. These results may provide new insights into the interpersonal functioning of individuals high in psychopathy and could have implications for intervention for this notoriously treatment-resistant condition.

A MINERALOGICAL AND GEOCHEMICAL CHARACTERIZATION OF LATE CAMBRIAN – PENNSYLVANIAN CARBONATES IN THE CENTRAL KANSAS UPLIFT, KANSAS WITH IMPLICATIONS FOR DIAGENESIS

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The NW-SE trending Central Kansas Uplift is known to contain two major hydrocarbon reservoirs: the Arbuckle Group and the Lansing-Kansas City Formations. These are carbonate reservoirs containing interbedded shales and silts and were deposited in shallow to deep marine settings. By using mineralogical and geochemical analyses we can discern diagenetic processes. Drill cuttings were obtained from three locations were analyzed to characterize the mineral assemblage and geochemistry of the sampled intervals. For all three localities, our analyses reveal similar mineral assemblages, which include quartz, chlorite, illite, calcite, dolomite, feldspar, albite, and silicified material. Illite and quartz are the dominant minerals, and illite is interpreted to be associated with burial diagenesis of the shale intervals. Calcite is also abundant, while dolomite is present mostly in small amounts. However, there are zones of elevated dolomite content which represent periods of increased diagenesis of shallow carbonates due to post-burial interaction with seawater. Major elements identified in the intervals include calcium, magnesium, aluminum, silicon, phosphorous, potassium, and iron. Calcium is the most abundant element with an average of ~60 wt%. Silicon is the second most abundant element and is interpreted to be correlated with the clastic-rich portions of the sample areas. Magnesium averages ~3 wt% and is found in increased concentrations in areas of dolomitization. Iron comprises ~6 wt% of the samples with elevated concentrations related to oil-bearing zones. This increase is interpreted to be a result of microbial biodegradation of the hydrocarbons which formed the Fe-bearing minerals.

THE RELATIONSHIP AMONG SUTURE COMPLEXITY, SHELL FORM, AND FORMATION IN AMMONITES OF THE WESTERN INTERIOR SEAWAY

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Throughout ammonite evolution, shell suture patterns grew increasingly more complex, possibly relating to structural integrity. The purpose of these immovable joints has long been debated. In this study, the suture patterns of coiled, straight, and heteromorphic ammonites from the Pierre, Carlile, Greenhorn, Graneros, and Mowry Shales, ranging from the Cenomanian to the Campanian were quantified using box-counting fractal analysis to determine if there is a significant difference in suture complexity among shell forms as a proxy for structural integrity. More complex suture patterns should be found in coiled shells as suture complexity should aid the coiling and growth of shells. Suture complexity was compared to shell form and formation to determine if there were significant differences in suture complexity among shell forms or formations. Results indicate there is a significant difference in suture complexity among the defined shell forms ($H = 27.88$, $df = 2$, $p < 0.001$). A Tukey's Multiple Comparisons test confirmed there is a significant difference between coiled and heteromorph shell forms ($p < 0.03$) and a significant difference in suture complexity between heteromorphic and straight shell forms ($p < 0.03$). However, there is no significant difference between straight and coiled shell forms ($p > 0.03$). Results indicate there is no significant difference among the median suture complexities and formation ($H = 5.238$, $df = 4$, $p = 0.2637$), therefore there is no change over time. This may indicate complex suture patterns aided in tightly coiled shell forms, but was not needed in the looser hetermorph forms.

UAV-COLLECTED MULTISPECTRAL IMAGERY FOR IDENTIFYING RANGELAND VEGETATION IN A SOUTHERN MIXED-GRASS PRAIRIE

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The interest in using unmanned aerial vehicles (UAV) for remote sensing of natural resources and ecological assessments has grown rapidly in recent years and is continuing to develop. Small unmanned platforms are useful because they are able to fly over expansive and remote locales with minimal time commitment, and do not require direct human contact with the ecosystem. Given that ecologists and rangeland managers must intensively sample vast rangelands in order to make informed decisions, the ability to identify vegetative species on hundred-acre to tens-of-thousands-acre properties with minimal time investment will be invaluable. This study aims to address key concerns in near-Earth remote sensing of rangelands such as (1) do mini or micro UAVs with low-cost sensors collect imagery useful for mapping rangeland plant communities, (2) are the blue, green, and near infrared bands sufficient to differentiate among species, and (3) do supervised classification and object based image analysis yield significantly different maps of species? Data were collected using a 3DR Iris+ quadcopter and a converted Sony RX100 camera collecting imagery in the blue, green, and near infrared bands. Field data were collected using a modified Daubenmire method. While imagery of this caliber was insufficient for identification of smaller or less dominant vegetation, object-oriented image analysis using a support vector machine classifier yielded a Cohen's Kappa of 0.75 suggesting the model performed well compared to random chance with regard to larger or more dominant species. Further research should compare the differences between supervised classification algorithms. Additionally, the timeliness and accuracy of classification methods should be compared to standard, field collection methods more rigorously to determine the real-world costs and benefits of using UAVs to identify rangeland vegetation.

PHYLOGENETIC DISTRIBUTION OF AN ENDOGENOUS STRAIN OF DAHLIA MOSAIC VIRUS IN MEMBERS OF ASTERACEAE

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Dahlia Mosaic Virus (DMV) is a double-stranded DNA viral pathogen. A newly discovered strain of this virus called DMV-D10 was first observed in Dahlia variabilis. DMV-D10 does not induce visible symptoms of infection in the host plant, and is classified as an endogenous pararetrovirus. These viruses have the ability to integrate their viral sequences into the host plant genome, which can be transmitted vertically to offspring. Currently, no studies have examined the host range of DMV-D10. Because DMV-D10 has only been observed in Dahlia, the objective for this study was to determine if presence of DMV-D10 follows an evolutionary relationship among species closely related to Dahlia. It was hypothesized species in the same tribe (Coreopsideae) as Dahlia, such as Cosmos, were more likely to be infected with DMV-D10 compared to species within other tribes in the Asteraceae family. PCR results for a movement protein gene indicate DMV-D10 is more widely spread across Asteraceae than in Dahlia species. DMV-D10 was present in Callistephus chinensis (Astereae tribe), Centaurea cyanus (Cardueae tribe), and Dahlia variabilis (Coreopsideae tribe), but not in Tagetes erecta (Tageteae tribe) or Cosmos bipinnatus (Coreopsideae tribe). Therefore, phylogenetic relationship in host plants does not necessarily determine presence or absence of DMV-D10. This leads to questions of how this virus can move to other species in other tribes. Future work will further explore host range of DMV-D10 infection.

CHARACTERIZING THE INFLAMMATORY RESPONSE TO A HIGH-FAT MEAL IN HEALTHY ADULTS: A SYSTEMATIC REVIEW

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Previous studies have consistently indicated that heart disease, which is the second leading cause of death among Kansas adults, is underpinned by chronic low-grade inflammation. While poor diet is considered a long-term inflammatory stimulus, a single high-fat meal (HFM) has been suggested to acutely escalate inflammation, although there is ambiguity regarding the specific characteristics of this inflammatory response. We conducted a systematic review of published studies to objectively describe the post-meal timing and magnitude of changes in five commonly measured inflammatory markers: interleukin (IL)-6, C-reactive protein, tumor necrosis factor (TNF)-α, IL-1β, and IL-8. Ten relevant databases were searched, yielding 494 results, of which 47 articles met the pre-established inclusion criteria: 1) healthy men and women aged 18-60 years; 2) consuming a single HFM (≥30% fat, ≥500 kcal); and 3) assessing relevant inflammatory markers post-meal for ≥3 hours. The only marker found to consistently change (increase) in the post-meal period was IL-6 – starting at a baseline of ~1.4 pg/mL and peaking at ~2.9 pg/mL approximately 6 hours post-HFM (an average relative change of ~150%). C-reactive protein, TNF-α, IL-1β, and IL-8 did not significantly change in 79% (23/29), 68% (19/28), 67% (2/3), and 75% (3/4) of included studies, respectively. We conclude that future research should focus on the role of IL-6 in the post-meal period, as it is an inflammatory marker that consistently increases post-HFM. Our findings provide valuable and novel insights regarding the link between diet and inflammation, with clinical relevance for many Kansans burdened by heart disease.

CHARACTERIZATION OF PARENTS OF SORGHUM MAPPING POPULATIONS EXPOSED TO WATER-DEFICIT STRESS DURING THE VEGETATIVE STAGE

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Agricultural productivity is threatened by scarcity of water, particularly in the arid and semi-arid regions of the world where sorghum is an important component of the cropping systems. Global climate models have projected increased intensity and magnitude in water-deficit conditions. Consequently, characterizing and identifying plant traits that augment resistance to water-deficit conditions are indispensable. The research is of the intent that when genomic regions could be mapped as a result of the characterization, tolerance to water-deficit stress will be improved. Greenhouse experiments were conducted using 1 m lysimetric pots. Using eleven sorghum genotypes, water-deficit stress (55% to 60% Field capacity) was imposed for a 15-days period, starting from 35-days after emergence. Gravimetric pot weighing was followed daily during the stress period so as to impose uniform level of stress across genotypes and also to determine cumulative water transpired. Data collected at the end of the period included agronomic and physiological traits plus changes in leaf lipid content. Almost all traits measured varied significantly between stressed and well-watered plants. With respect to traits such as photosynthetic assimilation, stem height, leaf and tiller numbers, effects of the stress differed among the sorghum genotypes. Results from leaf lipid analysis showed significant effects of water-deficit stress on the regulation of leaf membrane lipid composition. In view of sorghum's adaptation to challenging environmental conditions, critical traits identified will be used to map genomic regions responsible for increased water-deficit stress resilience in sorghum. The findings will help standardize phenotyping efforts in enhancing sorghum productivity.

EXPERIMENTAL NATURAL SELECTION OF BIG BLUESTEM ECOTYPES ACROSS THE GREAT PLAINS: A NOVEL TEST FOR THE STRENGTH OF LOCAL ADAPTATION

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Andropogon gerardii (big bluestem) represents ~70% of prairie biomass and has a wide geographic distribution across a precipitation gradient (500-1200 mm/yr, western Kansas to Illinois). Thus, we expect bluestem to be adapted to home climate conditions. Ecotypes (central Kansas (CKS), eastern Kansas (EKS), and Illinois (SIL)) were reciprocally planted in Colby, Hays, and Manhattan, KS, and Carbondale, IL. Plantings consist of single ecotype plots (seeded with other prairie plants to simulate a natural prairie) and plots with all three ecotypes mixed together. Mixed plots allow for competition between ecotypes and one of the first rigorous tests of local adaptation, under natural ecological conditions. For the mixed ecotype plots, we first genotyped plants of known ecotype to be used subsequently to determine composition of unknown plants in mixed plots. We used known genotypes to train a random forest model that assigned unknown individuals in mixed plots to one of three ecotypes. Single ecotype plots show evidence of local adaptation of the dry CKS ecotype to western Kansas and the wet SIL ecotype to Illinois. For mixed plots, if there was no selection, all three ecotypes should be represented equally at all sites. However, the random forest model confirms CKS ecotype dominates Colby and Hays sites and SIL ecotype dominates Manhattan and Illinois sites. Combined, results from single ecotype and mixed plots similarly show evidence of local adaptation of distinct dry and wet ecotypes. These results will provide recommendations on climate-adapted source populations for restoration planting in future warmer and drier climates.

CHARACTERIZING SOIL EROSION POTENTIAL USING ELECTRICAL RESISTIVITY

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The erosion rate, or erodibility, of soil depends on many soil characteristics including: plasticity, water content, grain size, percent clay, compaction, and shear strength. Many of these characteristics also influence soil in situ bulk electrical resistivity (ER) measurements. The objective of this study was to characterize soil erosion potential by correlating the in situ ER of soil with erodibility measured in the Kansas State University Erosion Function Apparatus (KSU-EFA). ER surveys were conducted at 11 bridges selected by the Kansas Department of Transportation (KDOT). Five soil samples were also collected at each site with a drill rig from the surface to three meters. The soil samples were tested in the KSU-EFA and analyzed for plasticity, mean grain size, and water content. Analysis showed that an ER over100 Ω-m is correlated with a highly erodible soil. As such, ER surveys may be used to characterize the soils at future bridge sites or prioritize existing bridges for additional testing to measure the scour potential. Analytical models to predict critical shear stress were also developed. The final model predicts critical shear stress using ER, plasticity, and mean grain size with an R2 of 0.72 when compared with the measured critical shear stress.

EFFECTS OF INTENSIVE LATE-SEASON SHEEP GRAZING FOLLOWING EARLY-SEASON STEER GRAZING ON POPULATION DYNAMICS OF SERICEA LESPEDEZA IN THE KANSAS FLINT HILLS

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Sericea lespedeza (SL) is an invasive weed in the Tallgrass Prairie ecosystem. Infestations of SL reduce native grass production by up to 92% through a combination of aggressive growth, prolific seed production, and plant community dominance. Herbicides slow the spread of SL but application is difficult and expensive; moreover, herbicides may harm ecologically-important, non-target plant species. Increased grazing pressure on SL by beef cattle may slow its spread and facilitate some measure of biological control. Unfortunately, mature plants contain high levels of toxic compounds called condensed tannins, which are a strong deterrent to grazing by beef cattle. Sheep, in contrast, appear less susceptible to certain plant toxins than beef cattle and may be useful to selectively pressure noxious weeds like SL through grazing. In this study, sheep were used to intensively graze SL-infested pastures from 8/1 to 10/1 over the course of 2 years. Sheep grazing followed early-season beef steer grazing from 4/15 to 7/15. Late-season, intensive sheep grazing on native Tallgrass Prairie decreased the vigor and reproductive capabilities of SL. Sheep appeared to preferentially select SL and other undesirable broadleaf plants (e.g., Baldwin's Ironweed), whereas steers avoided these plants. Annual seed production by SL and whole plant weight at dormancy were less in pastures treated with late-season sheep grazing. Late-season, intensive grazing by sheep may be an effective means for controlling SL infestations in the Tallgrass Prairie ecosystem.

PROTECTING KANSAS WHEAT: ASSESSMENT OF A NOVEL HESSIAN FLY MONITORING STRATEGY

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The Hessian fly, Mayetiola destructor (Say) (Diptera: Cecidomyiidae), has been a significant pest of wheat in Kansas since the early 1900s, resulting in significant economic losses to this multi-billion-dollar commodity to Kansas. The current Hessian fly monitoring trap, utilizing Hessian fly female sex-pheromone, does not consistently reveal field infestations, which greatly hinders control strategies for this pest. Recent research has demonstrated Hessian fly attraction to green light emitting diodes (LEDs) (~525 nm) set to high intensities (16W/m2) does not interfere with their attraction to the sex-pheromone. However, before LEDs are incorporated into traps, a better understanding of Hessian fly response to LEDs under field conditions is required. Therefore, the purpose of this research was to examine Hessian fly response under controlled laboratory conditions toward LEDs and interacting factors (light dilution and wheat odor) found under field conditions. Choice bioassays assessing the effects of light dilution on fly response were conducted in a four-leaf, clover-shaped arena, in presence and absence of white, simulating day and night. The effect of wheat odor on female Hessian fly response to LEDs was conducted in Y-tube shaped arenas in choice bioassays. Female Hessian flies chose the green LEDs 98% more than wheat odor; however, white light illuminating the arena did reduce fly attraction to LEDs causing no significant response. These results help us to better understand how Hessian flies will respond to LEDs under field conditions, and ultimately demonstrate the potential for incorporation of LEDs into Hessian fly traps to improve monitoring.

DIET-INDUCED IMPULSIVITY: THE EFFECT OF HIGH-FAT AND HIGH-SUGAR DIETS ON THE MECHANISMS OF IMPULSIVE CHOICE

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Americans typically consume a diet high in processed fat and sugar, which has contributed to the obesity epidemic. There is an established relationship between obesity and impulsive choice, and recent research suggests that people who consume diets high in fat and sugar exhibit more impulsive behavior. In fact, a study in rats depicted that diets high in fat and sugar can induce impulsive behavior. The present study sought to understand how high-fat and high-sugar diets affect the mechanisms of impulsive choice to determine which deficits (timing or reward sensitivity) could be targeted to improve impulsive behavior through behavioral interventions. Rats were split into three groups (high-fat, high-sugar, and chow). Following 8-weeks of diet exposure, impulsive choice behavior was assessed. Rats were given a choice between a small reward available after a short delay and a larger reward after a longer delay. Deficits in timing and reward sensitivity were assessed through separate discrimination tasks that tested how diet affected the rats ability to discriminate between different delays to reward and different reward amounts. Finally, the effects of diet on body composition (percent body fat) was investigated. There was no relationship between body fat percentage and impulsive choice, as is seen in humans. However, diets high in fat and sugar resulted in increased percent body fat and induced more impulsive behavior possibly due to the deficits the rats exhibited in timing. Deficits in timing could be targeted through time-based behavioral interventions to improve impulsive behavior that results from poor diet consumption.

DETERMINING SURFACE ROUGHNESS IN EROSION TESTING USING PHOTOGRAMMETRIC METHOD

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Surface roughness is an imporant characteristic in numerical and physical geotechnical soil models. The methods for measuring surface roughness are currently operator dependent, time consuming, or require highly specialized equipment. Therefore, there is a need for a method that can quickly measure surface roughness accurately and cost effectively. The primary goal of this study was to develop a photogrammetric method to measure surface roughness of soil samples. A stereophotogrammetry computational program was developed to calculate the surafce roughness of soil samples. Using a digital camera, two photos for each soil sample were taken and processed in the program. The technique was validated by comparing the roughness measurements of a three-dimensional printed disk using photogrammetric method to a structured light scanner and hand measurements with calipers. The results of this study show that the stereophotogrammetry computational program was able to measure the surface roughness of the soil samples equatable with the other methods. This model improves the accuracy of the roughness measurement, reduces the operator dependence and reduces the time required to measure roughness of soil samples.

BRINGING COMPUTATIONAL THINKING TO K-12

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The ever-growing popularity of computer science has fostered the need for computational thinking (CT), especially in K-12 education. Creating and delivering content to enhance these skills, as well as evaluation, remain open problems. In recent years, countries have begun to develop and incorporate computing in the K-12 education system. From these curricula and reports, succinct definitions of CT provide broader impacts in terms of education. Currently, the US does not have country wide K-12 CS education standards; however, some organizations, like the CSTA, have been dedicated in creating CS standards that incorporate CT, although their standards are not widely officially adopted. The focus of this study is creating accessible material for teaching and assessing CT as part of local K-12 outreach efforts. By using low overhead teaching methods, interventions based on micro controllers, computer programming, and pop culture were created. Data collected through a newly designed self-efficacy instrument is used to determine effectiveness of these interventions at improving confidence in CT and problem solving skills. From the initial experiment, positive trends in relation to student self-efficacy was prominent in the all grade levels for students who had previously participated in STEM outreach programs. Overall, interventions showed a statistically significant ($p < .001$) positive gain in CT concepts from the pre-survey ($M = 52.39, STD = 27.7$) to the post-survey($M = 64.76, STD = 21.3$).

DEVELOPING MULTIPLEXED DETECTION OF BLOOD EXOSOMAL MARKERS FOR DIAGNOSIS OF OVARIAN CANCER

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Presently, substantial efforts have been made for improving diagnostic sensitivity and specificity of ovarian cancer, yet not fruitful. To this end, in order to develop a less invasive and more accurate diagnostic device, we introduced a microfluidic-based ExoSearch chip for diagnosis of ovarian cancer by simultaneously detecting three blood exosomal markers. Circulating exosomes in blood contain an enriched group of tumor antigens and represent the tumor origin. We utilize microfluidic based immunomagnetic manipulation to integrate exosome isolation and multi-marker detection in one device (ExoSearch Chip), in order to rapidly evaluate ovarian cancer status via blood. Standard Bradford assay of total protein levels in ultracentrifugation-purified exosomes from matched human subjects was performed for parallel comparison. Both ExoSearch and Bradford assay showed significantly increased the level of exosome proteins from ovarian cancer patients (n=15), compared to healthy controls (n=5) (Bradford assay p=0.001; ExoSearch chip p<0.001). To determine the diagnostic accuracy of ExoSearch chip assay, we analyzed the true positives (sensitivity) and false positives (one-specificity) by receiver operating characteristic (ROC) curves. The areas under the curves (a.u.c.) obtained for CA-125, EpCAM, and CD24 were 1.0, 1.0 and 0.91, respectively. The above results suggested that ExoSearch chip enables sensitive multiplexed exosomal marker detection for blood-based diagnosis of ovarian cancer with significant predictive power.

BACTERIAL DIVERSITY OF AN ABANDONED MINE LAND SOIL IN SOUTHEAST KANSAS

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Acid mine drainage (AMD) is found in areas of abandoned coal mines in southeast Kansas as a result of mine waste runoff resulting in low pH of groundwater, creating problems for both flora and fauna in the vicinity. Soil bacterial population acts as a reliable indicator of ecosystem health human-perturbed areas. The goal of the present study was to assess the bacterial diversity of AMD sites over a two-year period and to isolate acid-tolerant bacterial species for bioremediation purpose. In fall (2015) and summer (2016), soil samples were aseptically collected from five distant sites representing diverse topography. Soil texture was evaluated and samples were chemically digested for physico-chemical analysis using inductively-coupled plasma optical emission spectroscopy. Concentration of bacterial isolates was determined by counting CFUs after dilution plating on tryptic soy agar. Up to thirty morphologically different colonies from each sampling were characterized using physiological and biochemical tests and will be further identified at the species level using 16S rRNA gene sequencing. In addition, acidophilic and sulfate-reducing bacterial strains are being screened using selective media. Preliminary data showed that soil pH ranges from 2.5-6.8 and varied concentrations of arsenic, manganese, and iron. Total bacterial concentration was 102-108 CFU/g of soil. Biochemical tests revealed a diverse metabolic potential of the bacterial population. A baseline measurement of bacterial diversity as well as soil chemistry of AMD sites in this region is novel in its kind and the findings will have potential use in remediation of contaminated AMD sites.

GREEN POLYURETHANES FOR INDUSTRIAL APPLICATIONS USING ECO- RENEWABLE RESOURCES

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From flexible elastomers to rigid composites, polyurethanes serve to be one of the most versatile materials with wide range of applications such as in elastomers, foams, adhesives, casts, and composites with tailor-made properties. Raw materials synthesized from natural resources using highly efficient one step synthesis ensure quality, yield and large-scale productivity. Bio- polyols have ethical advantage over depleting petroleum oil, multiple processes involved in production of petroleum to polyols and non-biodegradability. Castor oil (from caster seeds), soybean oil (from soybean seeds) and limonene (obtained from orange-peel, a bio-waste) are rich sources of raw materials for such synthesis. In this work, we have synthesized polyols using these natural resources via single step thiol-reaction which give almost 100% yield at room temperature. Resultant products were analyzed to affirm the required characteristics of raw materials with the help of GPC, viscometry and FT-IR. The chemical tests suggest the reactive nature of the raw polyols for preparation of polyurethanes. This study provides useful insights and new directives to industry for making polyurethanes from natural resources.

EMOTION LABOR, PATIENT-CENTERED CARE & FIRST RESPONDERS DISASTER RESPONSE: LESSONS LEARNED FROM THE 2011 JOPLIN TORNADO

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The analysis examines the opportunities and obstacles experienced by first responders to providing patient-centered care within the first 48-hours following the EF-5 Joplin-Duquesne tornado that struck on May 22, 2011 in Joplin, Missouri. A total of 14 semi-structured qualitative interviews with first responders were transcribed and serve as our units of analysis. In total 291 typed pages of transcripts with 103,130 number of words comprise our data set. In order to address the research questions advanced in the study we a qualitative method to employ a grounded theory approach to thematically code the data set. Our analysis focuses on the key areas of emotion labor experienced by first responders, as well as the opportunities and obstacles to providing psychological, physical, and emotionally sensitive patient-centered care in the immediate aftermath of the storm. We offer an interpretation and analysis, as well as limitations and future directions for community crisis planning and disaster response training. Key Words: patient-centered care, health communication, disaster and community planning.

PSMA-RECEPTOR TARGETING TRANSLATIONAL MAGNETIC NANOPROBES: NOVEL NANOTHERANOSTICS FOR THE TREATMENT OF PROSTATE CARCINOMAS

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Prostate cancer (PCa) is the second-leading cause of cancer deaths in men as it is often over diagnosed and over treated. By the age 80, more than 50% of men will develop prostate cancer but all will not have aggressive form of disease. However, because their prognosis is unknown, many aggressive treatments will have side effects like urinary, bowel and erectile dysfunctions. To overcome all these problems, recent advancements in cancer nanotechnology have facilitated a better way to diagnose and provide therapy for prostate cancer. Herein, unique drug cocktail comprising of Triptolide and Celastrol encapsulating magnetic nanoparticles are formulated for the treatment of prostate cancers. In addition, optical imaging agents were carried for the imaging of the treatment monitoring. These magnetic nanomedicines will be targeted to the PCa cells (LNCaP and PC3) by conjugating anti-PSMA antibody on the surface. Detail experimental results including cytotoxicity, targeted drug delivery, drug release, ROS, apoptosis and necrosis and internalization studies will be discussed in this presentation.

FROM BIO-WASTE TO FLAME RETARDANT POLYURETHANES FOR INDUSTRIAL APPLICATIONS

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The goal of this work is to prepare flame retardant polyurethane foams using bio-waste. Bio-polyol was synthesized using limonene, an extract of waste orange peel and 1-thioglycerol via thiol-ene "click" chemistry. Fire retardant green polyurethane foams were prepared using bio-polyol and commercial polyols (X-210 & SG-520) with and without addition of dimethyl methyl phosphonate (DMMP). Rigid polyurethane foams (RPFs) prepared from blends of bio and commercial polyols showed closed cell content over 90%. In addition, these RPFs exhibited regular shape and uniform cell distribution. RPFs from bio-polyol showed excellent compressive strength of ~ 230kPa for RPFs. Thermal stability of the RPFs was analyzed and it was foundthat DMMP was released into gaseous phase between 100-250°C. These RPFs almost retained their specific compressive strength even when 2 parts by weight (pbw) of DMMP was added but was significantly improvement in fire retardancy behavior. Horizontal burning test of RPFs containing only 2pbw of DMMP showed reduction in burning time by ~ 83% compare to the neat sample. Weight loss during the burning test for the control sample was nearly 50% and this was reduced significantly by addition of 2 pbw of DMMP to merely 7%. Our study suggests that bio-polyol based on limonene can be used for the preparation of rigid polyurethane foams. Addition of small amount of DMMP significantly enhanced the fire retardant properties in green polyurethane foams, which can be utilized for various industrial applications.

GLOBAL TRENDS IN SNOW COVER FREQUENCY

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Trends in snow cover have yet to be qualitatively described in any meaningful way, particularly at the global level; despite the fact that snow melt can be a significant source of ground and surface water recharge. Additionally, estimates of the remaining lifespan of the high plains aquafer may fail to take into account the variable nature of climate and short-term trends in snow cover and precipitation, instead relying on background recharge rates which may no longer mirror surface water inputs. In this work, we present tshe magnitude and significance of snow cover frequency trends across the globe using more than 16 years of an improved and gap filled MODIS daily snow cover dataset from 10/01/2000 through 09/30/2016. This trend, available for exploration at trendy-snow.appspot.com, depicts a globally consistent and locally relevant snow cover assessment which allows Kansans and others to more accurately predict recharge rates; improve predictions of streamflow and water availability; validate local-, meso-, and macro-scale climatological forecasts; as a tool for winter planning and budgeting for municipalities; and to inform the general public about this critical aspect of the hydrologic cycle.

MALTREATMENT AND PHYSICAL HEALTH OUTCOMES IN FOSTER YOUTH: AN EXAMINATION OF PROTECTIVE FACTORS

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Child maltreatment and foster care placement are associated with physical health problems and high rates of health service use across the lifespan. Yet some individuals exposed to maltreatment and/or placed in foster care in childhood remain healthy. Protective factors, such as coping style, emotional/behavioral functioning, and foster family environment may explain differences in physical health outcomes. Therefore, the purpose of this research was to first describe the prevalence of chronic health conditions in a sample of 213 maltreated youth in foster care, enrolled in the Studying Pathways to Adjustment and Resilience (SPARK) project. Results revealed that 49% of youth were diagnosed with a chronic condition, and that sexual abuse, over and above other types of maltreatment, predicted chronic condition diagnosis. The second goal was to examine relations between protective factors and physical health outcomes to better understand what makes some youth resilient. Results indicated that youth who engaged in direct and prosocial coping had lower rates of chronic conditions and health service use than those who used other strategies. Youth with fewer emotional/behavioral problems had better health outcomes. Finally, neglect severity was associated with increased health service use and chronic conditions, but only for youth with high levels of foster family conflict. These findings have important implications for improving physical health of youth in foster care. Implementing interventions designed to reduce foster family conflict and help facilitate direct and prosocial coping skills, as well as treating mental health problems, will reduce physical health problems and service use in this population.

IDENTIFYING AREAS AT RISK FOR INJECTION-INDUCED SEISMICITY THROUGH SUBSURFACE ANALYSIS OF SOUTHERN KANSAS

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Kansas has experienced an unprecedented increase in seismicity linked to large-scale injection of wastewater. Subsurface faults and stresses, however, are not well known, making it difficult to properly site new disposal wells or make decisions regarding operations of existing wells. This study focuses on using publicly available well data to map subsurface faults, lineaments, and present-day stresses in southern Kansas, with the ultimate goal of identifying specific structures and regions that may be at higher risk for injection-induced seismicity. A database of >500,000 well tops from the Kansas Geological Survey was used to create new structure contour maps of 18 stratigraphic boundaries between the Precambrian basement rock and present-day surface. Convergent interpolation was the most robust interpolation technique used, evidenced by comparisons against other methods and data confidence maps. A range of 3D surface analysis techniques were then employed to tease out discontinuities and lineaments within each unit. The mapped lineaments were compared to known surface faults and lineaments. These analyses show two groups of structures across the region. NNE-trending structures are likely related to the Nemaha Ridge-Humboldt fault zone and earlier Mid-continent Rift System, while NW-trending structures are likely associated with the Central Kansas Uplift. Subsurface stresses were also examined using available well logs and through inversion of earthquake moment tensor solutions, where available. The findings are being used to assess the reactivation potential of the mapped faults, and will be evaluated in conjunction with brine disposal data, to identify areas at risk for injection-induced earthquakes.

DIGITAL UTILITIES: BRIDGING INTERNET DIVIDES WITH MUNICIPAL BROADBAND

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The venerable concept of universal service crucial to municipal utility operations may be the key to solving a digital-age challenge. Many rural Americans face persistent inequities in broadband Internet access, as low population density limits return on infrastructure investment. However, municipal broadband networks (MBNs) have already gained success at fostering economic growth, enhancing educational opportunities, and furthering social equity in places such as Chanute, KS and Chattanooga, TN. Municipalities are uniquely well-positioned to provide broadband due to their existing right-of-way assets and experience in providing utility services. 1930s-era Rural Electrification Administration programs helped double the number of farms receiving electricity in just five years. Today, municipal broadband networks (MBNs) could meet the education, health, and economic development needs of 21st-century communities. Rather than shutting out private providers, they create choice that stimulates marketplace competition. This research identifies what challenges face municipal broadband innovation, how these challenges vary based on unique local conditions, and how informed management practices can help overcome these challenges. Using an online survey with pre-coded and open-ended questions, I have collected data from thirty-eight managers in Kansas communities with and without MBNs. These data help illustrate the benefits of and barriers to municipal broadband, and disseminate best practices in utility management. Specifically, this research focuses on the perceived incentives and disincentives of MBN implementation, and how these impact implementation choices from both temporal and spatial scales. This project could help rural communities power a new generation of prosperity by implementing more efficient, equitable, and effective information systems.

PATTERNED ELECTRICAL MICROSTIMULATION IN THE BRAIN IMPROVES THE INFORMATION TRANSMISSION OF NEURONS

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Plasticity is the ability for individual neurons to modify their effective connections with other neurons. This is the basis for learning and adaption within the brain. Our lab works to understand how neural plasticity can be manipulated following injury in order to compensate for lost function. Specifically, we look at physiological and behavioral changes in spared motor areas following an injury to primary motor cortex (M1), and attempt to restore communication between regions that are otherwise disconnected through patterned electrical micro-stimulation of specific regions of the brain. The purpose of this study was to understand how changes in plasticity can be induced between regions of interest in an intact brain. Initially, extracellular recordings were taken from neurons in the premotor cortex (PM) of the anesthetized rat. Electrical stimulation was delivered in the somatosensory region of cortex (S1) after which a second set of recordings from the same site was taken. We then analyzed the distribution of times between occurrences of the detected action potentials (spikes) of individual neurons, quantifying the average reduction in uncertainty about the hidden state of a given neuron conveyed by its spikes. This quantity, which we termed the spike information rate, tended to decrease across conditions, possibly due to the sustained use of ketamine anesthesia during the recordings. However, compared to non-stimulated controls, stimulation of sensory areas significantly improved the reduction in spike information rate. This result suggests that electrical stimulation, even in the anesthetic state, can modulate the capacity of neurons to convey information efficiently.

NUMERICAL ANALYSIS OF A CRACKED HOT-DIP GALVANIZED STRUCTURAL STEEL BEAM

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In Kansas, galvanized steel structures and components are used widely in many parts of the economy, such as building construction, transportation, agriculture, manufacturing, energy production, and mining. However, cracking issues due to galvanizing process cost repair budgets, and pose safety concerns for the public, especially when the structures are placed in high-density traffic areas. If a galvanized structure already has some cracks when installed, it will be more susceptible to failure under the impact of natural hazards such as tornados, severe windstorms, and earthquakes. While there is little understanding of this phenomenon, previous research has indicated that it may be caused by interaction between welding residual stresses and hot-dip galvanizing thermal stresses. This paper describes a finite element investigation of a structural steel beam that was found to have cracked after hot-dip galvanizing. It was observed that both the welding and hot-dip galvanizing processes produced a critical area which coincided with the observed crack location. This study is part of several research projects conducted at the University of Kansas to mitigate hot-dip galvanizing cracking in many types of steel structures. The goal of our research is to provide improved design, materials, and construction specifications to help designers, galvanizers, and fabricators to build steel structures without any galvanizing cracking issues. As a results, new specifications would help the State of Kansas and other states to save considerable amounts of money by making reliable, durable, and sustainable galvanized steel structures.

INVESTIGATING THE IMPACT OF THE MUTATION CLUSTER REGION OF TUMOR-SUPPRESSOR ADENOMATOUS POLYPOSIS COLI (APC) ON COLON CARCINOGENESIS

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Colorectal cancer is the third most commonly diagnosed cancer in both men and women. In Kansas, over 1,100 people will be diagnosed with colorectal cancer in 2016 alone. A vast majority (>80%) of colorectal cancers result from acquired genetic mutations to the tumor-suppressing protein Adenomatous Polyposis Coli (APC). Mutation of APC is widely considered to be an initiating event of colon carcinogenesis. Expression of mutant APC protein by cells leads to the deregulation of many cellular pathways and processes. The rapidly dividing cells of the small intestine and colon are especially susceptible to this disruption of normal cellular homeostasis, and eventually develop polyps. If not caught early or left untreated, these polyps give rise to aggressive carcinomas. Mutations to APC nearly always occur in a specific, central domain aptly named the "mutation cluster region". Why mutations occur at this specific locus is not well understood, and is debated. APC is involved in numerous and diverse cellular processes, and new protein partners and mechanistic contributions are still being discovered. At the University of Kansas, the Neufeld lab works to define the precise molecular roles of APC and how APC governs cancer progression, with the ultimate goal of identifying new mechanisms by which to target and treat colon cancer.

BIOMIMICKING BIOLOGICAL INTERFACES BY ENGINEERED MULTI-FUNCTIONAL PEPTIDES TO PREVENT IMPLANT-ASSOCIATED INFECTIONS

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Medical implant failure resulting from bacterial colonization on the implant surface accounts for implant failures that require revision surgery in 7.5% of total hip arthroplasty, 14.8% of total knee arthroplasty, and 14.5% of dental implants. Current treatments involve antibiotics, and with increased bacterial resistance there is an urgent need for alternative therapeutic agents. Implant failure starts at the implant-body interface, preventing bacterial colonization at the implant surface, may reduce the infection and improve body-to implant interaction. Ti, Ti-Alloys and zirconia are the most common implants used in total joint and dental implants. Our approach to combat infection through surface functionalization is accomplished by designing a single multi-functional molecule. This molecule brings together an implant binding peptide that anchors the molecule to the surface and an antimicrobial peptide joined to the binding peptide through an engineered spacer region that allows for preservation of each function in a single molecule. This molecule thereby produces a biomimetic interface with antimicrobial activity and favorable tissue response. We optimize the antimicrobial activity and investigate the effect of engineering spacer design between each functional peptide domain of the molecule. Lengthening the spacer by additional amino acid building block resulted in as much as a 3-fold antibacterial improvement compared to a shorter length spacer against S. mutans and S. epidermidis, two bacteria associated with implant infections. Moreover, the resulting biomimetic interface created with the longer spacer is found to be more effective against S. mutans and S. epidermidis by 80% and 90%, respectively by reducing bacterial attachment.

IMPROVING RURAL CRITICAL ACCESS HOSPITAL OUTCOMES: AN EXEMPLARY CASE STUDY

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Rural hospital closures are rapidly accelerating, placing an estimated 1.7 million rural residents at greater risk for negative health outcomes. Kansas has the largest number of rural critical access hospitals (CAHs) (84) across the nation. Finding effective solutions to improve care quality is essential for the viability of CAHs and access to healthcare for rural dwellers in Kansas and across the U.S. Research indicates that Magnet®-designated hospitals have significantly better patient and organization outcomes compared to non-Magnet® hospitals. However, less than 7% of hospitals nationwide have achieved Magnet®, including only one independent CAH. The purpose of this study was to understand how one Midwestern 25-bed CAH led change to become the first to achieve Magnet®, and to use the findings to make recommendations for advancing CAH care elsewhere. Clinical nurses, nurse managers, interprofessional care providers, administrators, and board of directors (N=27) were interviewed; observations were done on all hospital units; and hospital reports were analyzed. We found through the triangulation of data sources that the journey to Magnet® led to significantly improved patient and organization outcomes (e.g., decreased patient falls, restraints, and infections; increased patient satisfaction; increased nurse and physician recruitment). A new organizational culture centered on shared governance, evidence-based practice, and higher education emerged. Results suggest that Magnet® may serve as a blueprint for advancing CAH outcomes. Efforts should focus on: securing administrative support; planning small, incremental change; building shared governance, research, and education; harnessing collective power; and staying committed to the purpose of improving staff and patient outcomes.

INHIBITION OF STAT3 SUPPRESSES ANGIOTENSIN II-INDUCED CARDIOMYOBLAST HYPERTROPHY THROUGH MODULATING THE AMPA/MTOR AUTOPHAGY PATHWAY

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Cardiac hypertrophy is a common cause of heart failure, and cardiac autophagy has been shown to regulate cardiac hypertrophy. Signal Transducer and Activator of Transcription 3 (STAT3) has been shown to mediate both cardiac hypertrophy and autophagy. The present study proposes a specific pathway by which STAT3 mediates autophagy in hypertrophic cardiomyoblasts (H9c2 cells). A group of H9c2 cells were treated with pharmacologic STAT3 inhibitor, while STAT3 was genetically eliminated from another group of H9c2 cells. Both of these experimental groups and control H9c2 cells were treated with Angiotensin II (Ang II). In each group, we examined cell size, expression of hypertrophy-related genes (atrial natriuretic peptide (ANP) and β-myosin heavy chain (β-MHC)), expression of a marker of autophagy (microtubule-associated protein 1A/1B-light chain 3-phosphatidylethanolamine conjugate (LC3-II)), the presence of autophagolysosomes, and levels of mediators of a known autophagy pathway (adenosine monophosphate-activated protein kinase (pAMPKα) and mammalian target of Rapamycin (p-mTOR)). Ang II-mediated increase in cell size in was significantly diminished in both control groups. Both experimental groups exhibited a decrease in mRNA expression of ANP and β-MHC genes. LC3-II protein expression was significantly increased in both experimental groups. Autophagolysosomes were visualized in both experimental groups. There was an increase in pAMPKα levels and a decrease in p-mTOR levels that resulted in autophagy. In conclusion, inhibition of STAT3 suppresses hypertrophy in H9c2 cells via modulation of the AMPKα/mTOR autophagy pathway. Elucidation of this and other mechanisms of cardiomyocyte hypertrophy is an important step in finding mechanisms to prevent cardiac hypertrophy.

IDENTIFICATION OF HEPATOCYTE NUCLEAR FACTOR 4 ALPHA (HNF4α) TARGET GENE SIGNATURE AND VALIDATION AS A PROGNOSTIC BIOMARKER OF HEPATOCELLULAR CARCINOMA

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Hepatocellular carcinoma (HCC) is the second leading cause of cancer-related death and the incidence of HCC is increasing in the US. HCC originates from hepatocytes, a cell responsible for many important liver functions such as carbohydrate and lipid metabolism, albumin and coagulation factor synthesis, bile acid synthesis, and xenobiotic metabolism. Hepatocytes are quiescent during normal conditions, but they possess enormous potential to proliferate and expand following liver injury. This proliferative capacity is beneficial during liver regeneration, but the mechanisms driving this cell division can contribute to HCC if left unchecked. Our lab studies a transcription factor known as Hepatocyte Nuclear Factor 4 alpha (HNF4α) which is expressed at high levels in normal hepatocytes and inhibits hepatocyte proliferation. Our studies show that deletion of HNF4α in mice results in spontaneous proliferation and hepatic dedifferentiation. Further studied revealed that HNF4α deletion promotes HCC development in rodents and HNF4α expression is decreased in human HCC samples. Currently, early detection tools and accurate prognostic biomarkers for HCC are lacking. We identified an HNF4α target gene signature that can measure HNF4α activity. Using in silico data and in vivo mouse and human samples we demonstrate this signature is capable of distinguishing between early and late stages of HCC. In summary, our studies show that HNF4α is a therapeutic target in both regenerative medicine and cancer therapy and can be used as a prognostic biomarker in HCC. Our studies not only highlight an important biological mechanism but will have significant impact on treatment of liver cancers.

SECRETORY AUTOPHAGY IN TUMOR ASSOCIATED FIBROBLASTS PROMOTES HEAD AND NECK SQUAMOUS CELL CARCINOMA PROGRESSION AND EMERGES AS A NOVEL THERAPEUTIC TARGET

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Despite therapeutic advances, the survival rate for head and neck squamous cell carcinoma (HNSCC) has remained unchanged for the last fifty years. The HNSCC microenvironment includes various types of non-cancerous cells. Tumor associated fibroblasts (TAFs) are one such cell type that constitute a large portion of HNSCC tumors. Our lab and others have demonstrated the profound tumor promoting role of TAFs. TAFs exhibit more vesicular cytoplasm than normal fibroblasts from cancer-free patients (NFs). Further studies revealed these vesicles are most likely autophagosomes. Autophagosomes are formed during autophagy, a process by which cells digest cytoplasmic constituents. We demonstrate an upregulated autophagic flux in TAFs. Although paradigmatically a degradation pathway, an appreciation for the role of autophagic machinery in cellular secretion has emerged. Therefore, we hypothesized HNSCC induces secretory autophagy in TAFs thereby facilitating tumor-promoting secreted factors. A reduction in TAF-facilitated HNSCC progression following TAF autophagy inhibition was observed. Additionally, NFs in co-culture with HNSCC upregulate autophagic flux. We demonstrate that HNSCC cells secrete basic fibroblast growth factor (bFGF), which promotes autophagy in fibroblasts. We used Beclin-1 siRNA to inhibit autophagy in TAFs and found levels of several cytokines were reduced. Further, by using a small molecule inhibitor, SAR405 with targets VPS34, a key player in the autophagic cascade, with the standard of care therapy cisplatin we observed a significant reduction in tumor volume in vivo ($p=0.007$). In summary, we uncover a fascinating biological role for secretory autophagy in the supporting stroma, which promotes tumor progression, and can be targeted for therapy.

TO HAVE A VOICE: TREATMENT PLANNING FOR PERSONS WITH APHASIA, THE KANSAS CONNECTION

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Aphasia is an acquired language disorder, most typically resulting from stroke, causing impairment in comprehension, expression of language, reading, and writing, while intelligence remains intact. According to the National Aphasia Association, aphasia affects approximately 2 million people in the United States, with risk for aphasia increasing with age. Currently, determining treatment goals for a person with aphasia (PWAs) is based primarily on results of standardized tests of language ability, which do not take into account the person's values and interests. The Life Interests and Values (L!V) cards were developed as a method of determining preferred and non-preferred activities for the use in treatment planning for PWAs; however, there is no information available regarding the test-retest reliability of L!V card sorting. Without this information, it is unknown whether the information provided by PWAs using these cards is a true representation of their wants/needs. Determining the usefulness of the L!V cards as a method of expressing preferred and non-preferred activities will help us to define whether these cards are of use clinically for the development of intervention goals, thereby improving autonomy and ability to communicate wants and needs for PWAs. With the aging population of Kansas, and with many Kansans living rurally, it is important to ensure that goals for treatment of aphasia are individualized since treatment is often limited. Information gathered will help to determine which populations of PWAs will benefit most from use of these cards. Results of this study, and relevance for the population of Kansas will be discussed.

FEMTOSECOND LASER NANOTEXTURING OF DRUG-ELUTING STENTS

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Stents have been used for over a decade to treat coronary arteries affected by stenosis, a state in which the arteries are narrowed by the deposition of plaque. However, studies have shown that a few years after placement of a stent, restenosis can occur at the site, hindering its purpose. Drug-eluting stents (DES) have a significant impact in treating in-stent restenosis. DES are embedded with drugs like Sirolimus that are released over time once the stent is placed within the artery, reducing the chance of plaque deposition around the stent. But DES increases the risk of thrombosis, formation of blood clots around the stent due to a change in the blood flow profile. To improve the DES characteristics, femtosecond pulsed lasers are used to create nano-textures on the metallic stents. Nano-textures increase the availability of the drug, increase adhesion of the drug and the stent, and minimize requirement of a polymer carrier. If the nano-textured materials can show effective fluid retention characteristics, this can be a cost-effective solution to reduce or completely eliminate in-stent restenosis and thrombosis without the need of post-finishing operations. The interaction of bio-elements with the metallic stents can also be tested to ensure the efficiency of the DES.

REDUCING PTSD FOR VETERANS AND EMERGENCY SERVICE PROVIDERS

Daniel Clifford and Greg Meissen
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Post-traumatic stress disorder (PTSD) is a mental health diagnosis that can result from exposure to both stress and trauma. PTSD negatively impacts a disproportionate number of veterans and first responders and is related to a variety of negative health outcomes such as depression, anxiety, chronic health issues, and suicidality. These health issues cost the government billions of dollars each year. This project responded to this problem by helping design, implement, and evaluate a community-based, peer-led initiative to teach mind-body self-care skills to veterans and first responders in the Wichita, Kansas's community. Veteran facilitators were trained and certified through the Center for Mind-Body Medicine to lead a 10-week intervention designed to reduce PTSD symptoms and increase overall functioning of participants. Interviews with participants indicated that veterans and emergency service providers greatly benefitted from this project. Participants described having increased self-regulation, mindfulness, and peer support and decreased PTSD and stress symptoms. These types of community interventions that utilize veterans as leaders can be a cost-effective alternative for providing leadership training and mental health support to other veterans and first responders in Kansas communities. Next steps for this project include additional research and expansion of services for first responders and veterans.

"IF IT BLEEDS, IT LEADS" VS. #HESSTONSTRONG: A FANTASY-THEME ANALYSIS OF LOCAL AND NATIONAL NEWS COVERAGE OF THE 2016 HESSTON, KANSAS SHOOTING

Kelsay E. Gardiepy and Deborah S. Ballard-Reisch
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The sleepy Mennonite town of Hesston, Kansas was suddenly disrupted on February 25th, 2016 when an employee of Excel Industries entered the company plant with an AK-47 and a Glock 22 semi-automatic pistol and opened fire. Three employees were killed and fourteen injured before the assailant was killed by local law enforcement. The tragedy made local and national news by the early evening and coverage continued for weeks. Amidst national scrutiny, which hastily and incorrectly associated the tragedy with Kansas' open-carry gun laws, Hesston citizens and community leaders chose to contest fallacy rhetoric propagated by national news by creating a #HesstonStrong campaign with a heightened focus toward forgiving the perpetrator, providing for the victims, and promoting the town's unity. This research uses Bormann's fantasy-theme rhetorical analysis to examine local and national media messages, extracting the dramatic elements that operate within the narratives. The implications of framing rural community tragedies through national, politically-based narratives contrasted with locally focused contextual analyses are discussed with an eye toward supporting rural communities in maintaining identify and culture in the face of national scrutiny. Strategies for community response to national narratives are outlined.

SOLAR ENERGY HARVESTING USING IONIC POLYMER-METAL ENHANCED WATER ELECTROLYSIS

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In 2015, Kansas invested six million dollars on 4.7 megawatts of solar energy installation, capable of powering 630 homes. However, the energy supplied by solar often does not coincide with consumer demand; a system is required that can store the extra energy in the form of other deliverable and storable energy sources for later use. Hydrogen has high energy density and burns with zero carbon oxide emission, which makes it an ideal energy source to be stored and consumed. The goal of this project is to develop a highly energy-efficient water electrolysis generator, which can convert the electricity harvested from solar panels to hydrogen fuel. Previous research has shown that applying electricity to Ionic Polymer-Metal Composite (IPMC), a proton exchange membrane (PEM) plated with platinum electrodes, can split water molecules with high energy-conversion efficiency. Our research explores a new IPMC fabrication method that can further improve the efficiency. Our experimental data show that roughening the surface through sanding or plasma etching of IPMC with an extra coating of gold can improve the efficiency. The data also validate a dynamic model that is developed to capture the dynamics of IPMC enhanced water electrolysis

DETERMINING AN EFFECTIVE TREATMENT PLAN FOR BREAST CANCER: A MULTI-CRITERIA DECISION MODEL AND ALGORITHM

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Breast cancer is the second leading cause of cancer deaths in U.S. women. For 2017, the American Cancer Society estimates that 255,180 women will be diagnosed with invasive breast cancer and 40,610 will die. Selection of an effective, patient-specific treatment plan has challenged physicians because the decision process involves many critical factors such as disease stage, disease risk factors, biomarker-related risks, and patient-related risks. In this study, a comprehensive set of criteria for selecting treatments was determined by literature review and oncologist interviews, and two analytical hierarchy process (AHP) models were used to weight criteria for both primary and secondary treatment therapies. Using the weighted criteria, we propose a treatment-ranking algorithm that evaluates every scenario and provides optimal patient-tailored treatment alternatives. We validate the multi-criteria ranking algorithm by comparing its treatment rankings with rankings from five oncologists, and show that, in most cases, the algorithm's output matches or is significantly correlated with the expert ranking. Thus the algorithm, on an easy-to-use Microsoft Excel platform, could be an accessible decision-support tool to aid oncologists and educate patients in choosing breast cancer treatment. Our multi-criteria ranking approach can also be adapted to solve complex decision-making problems in other service industries.

DIFFERENTIAL REGULATORY GENE EXPRESSION AT THE PROTEOMIC LEVEL IN SUBTYPES OF HUMAN OVARIAN CANCER CELL-LINES

Lipilekha Mukherjee, Isabel R. Hendry, and William J. Hendry
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Ovarian carcinoma is the most lethal neoplasm and the fifth leading cause of mortality in women. Among the different subtypes, widely heterogeneous high-grade serous ovarian cancer (HGSOC) poses a great challenge to modern chemotherapy, due to its high recurrence rate and resistance to standard treatments. Recent studies suggest that survival time-line and disease recurrence are linked to the variable expression of biomarkers in cancer cells. Therefore, using Western blot analyses, we assessed the expression of a host of regulatory gene protein products at the whole-cell level in extracts from both three HGSOC and five non-HGSOC cell lines. Some of our most distinctive findings from those analyses were that: 1) Nrf2, a key factor in the anti-oxidant response element system, is expressed as a series of protein bands of variable molecular weight in all but the Kuramochi (HGSOC) cell line; 2) Estrogen receptor alpha is expressed in all but the OVSAHO (HGSOC) cell line; and 3) the AUF-1, p120-catenin, and NFKB-p50 proteins are expressed in both HGSOC and non-HGSOC cell types. We will next follow up those findings conducted at the whole-cell level with assessments at the individual cell and subcellular level using immunohistochemical analyses.

NUTRITION GUIDELINES IN KANSAS ELEMENTARY SCHOOLS

Erin Sawyers, Megan Spradlin, Jordan Heins, and Michelle Wallace, MPAS, PA-C
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Childhood obesity is a nation-wide epidemic. Although the National School Lunch Program (NSLP) guidelines are designed to regulate students' caloric intake and nutritional needs, ambiguous snack guidelines may be counteracting NSLP efforts. Our study assessed components of school lunches and snack guidelines in public elementary schools across Kansas. A question set was developed to evaluate these items. Answers were obtained from public information on school websites. Schools were qualitatively evaluated and compared based on size and socioeconomic status as defined in the study. Our data found that Kansas public elementary schools are following the NSLP guidelines; however, snack guidelines vary greatly. Our data do not identify any patterns in number of lunch meal options or snack guideline similarities amongst schools. A set of national or state snack guidelines may help to establish basic nutrition knowledge and encourage healthy eating in schools to combat the complex epidemic of childhood obesity.

CUBESAT PLATFORM FOR RESEARCH, EDUCATION AND BUSINESS IN KANSAS

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A CubeSat is a miniaturized satellite weighing 1–10 kg, has a short lifecycle, uses commercial-off-the-shelf components, and is carried as a secondary payload. CubeSats provide low-cost access to space for scientific studies, technology demonstrations, and communication purposes. CubeSats also provide tremendous educational value because students can learn about spacecraft subsystems and integration of those components while still in school. Our research particularly focuses on propulsion and control technologies for CubeSats. We propose a hybrid propulsion system that can be used for high and low thrust maneuvers by CubeSats. In addition, an experimental setup has been designed for determining the specific impulse of a CubeSat propulsion system. Furthermore, an adaptive control algorithm, already demonstrated to work for larger satellites, is being studied for CubeSats. We provide an overview of these efforts and demonstrate their impact on Kansas. Specifically, CubeSats present new business opportunities that can leverage the existing aeronautical infrastructure in Kansas. MicroSats (10–100 kg) have used technologies for precision agriculture by obtaining near-real-time information about photosynthesis levels, evapo-transpiration, surface soil properties, nitrogen content, crop yield, extent of weed and vegetation cover; it is likely that some of these technologies will be integrated into CubeSats in the future.

IMPROVING TRANSIT IN WICHITA: MARRYING THE OLD AND THE NEW

Mercy Umeri

Hugo Wall School of Public and Urban Affairs, Wichita State University

The transportation system in Wichita has served a diverse customer base over the years with its traditional system of large buses on fixed routes and smaller buses for specialized transportation (such as for the physically challenged, or elderly). Shrinking state revenues, increases in population and a more diverse set of needs have necessitated a push to find creative solutions to transit service delivery. Advances in technology have brought about variety and technology-enabled services that have increased choice in urban transit. Ride-sharing firms like Uber and Lyft employ a business model that combines personal services with technology. This business model fits the competitive opportunities of today's marketplace and dovetails seamlessly with the larger dynamics shaping tomorrow's marketplace. In my research, I examine the informal transportation system with its rich mix of services, the use of technology-based transportation in the United States and the transportation sector in Wichita, Kansas. A combination of the case study method, participant observation and empirical data will be used. Results from my studies will inform decision makers as they seek solutions to improve transit in the Wichita area.

NOTES:

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