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Emporia State University
Fort Hays State University
Kansas State University
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University of Kansas
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Research Abstracts

FILLING A PATIENT SAFETY KNOWLEDGE GAP: A MULTIPLE-CASE STUDY OF RADIATION THERAPY PROGRAMS AND THEIR RESPONE TO THE FIELD'S CRISIS

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Despite countless initiatives to reduce the rate of medical errors in the United States healthcare system over the past decade and a half, medical errors rank as the third leading cause of death. The critical issue of patient safety is present in all areas of the healthcare industry including radiation therapy. Radiation therapy is a medical specialty that uses ionizing radiation to treat cancer and some benign diseases. In the last decade, the complexity of radiation therapy has increased dramatically due to technological advancements. While such advancements offer benefits to patients, interrelated changes to hardware, software, and human interfaces produce new opportunities for medical errors and patient harm. Longstanding recommendations from the Institute of Medicine (now the National Academy of Medicine) include the adoption of a systems perspective of patient safety, application of human factors principles to reduce or prevent harm, and the establishment of a system of reporting and learning from errors or near misses. Along with these recommendations, health professions education has been recognized as a fundamental component to improving patient safety. However, education's ability to diffuse new ways of thinking about patient safety depends on the effective transfer of modern patient safety information in a manner capable of meaningfully shifting the perspectives of future healthcare professionals regarding patient safety. Using information theory and transformative learning theory, this research uncovers how radiation therapy educational programs have addressed identified patient safety knowledge gaps to prepare future radiation therapists for the more safety conscious work environment.

DOES CATTLE GRAZING AFFECT BIRDS NESTING IN CRP GRASSLANDS?

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Grassland bird populations have experienced declines coinciding with loss of prairie habitat. The Conservation Reserve Program (CRP) has benefitted birds through grassland restoration in landscapes dominated by cropland. Grazing by cattle (*Bos taurus*), which is currently restricted in CRP, might improve habitat structure for some bird species. However, the presence of cattle might reduce nest concealment from predators and attract Brown-headed Cowbirds (*Molothrus ater*), brood parasites that lay their eggs in other birds' nests. We investigated the fledging success of Mourning Dove (*Zenaida macroura*) and Dickcissel (*Spiza Americana*) nests, and cowbird parasitism of Dickcissel nests, in response to experimental grazing by cattle across 36 CRP fields in central Kansas. Fledging success was not substantially related to grazing for either species. Parasitism by cowbirds was not substantially affected by grazing, instead differed between types of CRP. The number of cowbird eggs per parasitized nest was higher in grazed versus ungrazed CRP fields in 2017 but not 2018. Based on data from the first two years of this three year study, cattle grazing in CRP does not appear to negatively affect grassland bird reproduction in terms of either nest success or brood parasitism by Brown-headed Cowbirds.

THE EFFECT OF ULTRAVIOLET LIGHT EXPOSURE ON SUBAERIAL WEATHERING OF *SUS DOMESTICUS* LONG BONES: A PRELIMINARY REPORT

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Subaerial weathering is the process of gradual decomposition of unburied bone. This taphonomic process is characterized by cracking and fragmentation, surface bleaching, and the loss of organic compounds. Variables known to change the weathering rate of bones include UV light, soil alkalinity, freeze/thaw cycles, animal/insect activity, desiccation levels, bone size, and exposed surface area, among others. This study strives to identify the individual contribution of UV light exposure to the qualitative characteristics of subaerial weathering in a controlled laboratory environment. *Sus domesticus* foreleg bones were procured from a meat processing facility and defleshed using dermestid beetles. The cleaned bones were then separated into five groups, representing the four seasons plus a control group (no UV exposure). Each test group was exposed to the number of hours of UV light appropriate for the season from two Aqueon 48 inch 32 watt full spectrum daylight bulbs. Bones were observed visually and photographed once every two weeks. After 4 months of exposure, indications of bleaching in the light-exposed portions of the bone were present. Signs of oils and moisture being pulled to the bottom half of the bones by gravity were also evident as well as the beginnings of potential flaking. These preliminary results seem to contradict the expected timeline for subaerial weathering indicated in the literature. In future months, these effects are expected to continue to develop, giving a clearer understanding of the role that UV light plays in subaerial bone weathering.

DETECTING THE INVASIVE LEGUME SERICEA LESPEDEZA (*LESPEDEZA CUNEATA*) USING SMALL UNMANNED AERIAL VEHICLES

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The application and usefulness of small, unmanned aerial vehicles (sUAV) has increased considerably in the past few years due to their increased efficacy and affordability. We used an sUAV to capture low altitude aerial photos of tallgrass pasture infested with sericea lespedeza (*Lespedeza cuneata*), an invasive legume listed as a noxious weed in Kansas. Sericea lespedeza is unpalatable as cattle forage, displaces native vegetation in tallgrass prairie, and is difficult for land managers to control. Herbicide applications are currently the most successful at eliminating this noxious weed, but broadcast applications negatively impact non-target native vegetation. Spot spraying has fewer negative impacts, but its success depends on high detection rates that are difficult to achieve by manually scanning the landscape. Currently, we are developing automated image search criteria to detect and map sericea lespedeza in tallgrass prairie in eastern Kansas on images collected with an sUAV during different times of the year to provide accurate maps of infestations and improve detection rates for spot spraying. Preliminary results of this study show success in being able to detect sericea lespedeza plants using sUAVs, and we predict that this method can be applied to other landscapes. In addition, providing land managers with detailed maps containing the location of sericea lespedeza on their property will likely increase the success of their control methods through higher detection rates and decrease the time required to locate plants.

ADJUSTED POVERTY RATES IN KANSAS COUNTIES: EMPHASIS ON COUNTIES WITH UNIVERSITIES

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Poverty rates are essential for describing how much of a county, state, or nation is considered to be poor. Economists and other decision makers use poverty rates regularly. Poverty rates in college towns can be inflated because of how the poverty rate is calculated. Poverty rates are usually calculated by including students who live off-campus and excluding students who live on-campus (dorms). We contend that students should be viewed differently than those in poverty because they can get financial help from their parents, scholarships and/or grants. In our research, we adjust the poverty rate to see how college students affect it in all the counties in Kansas. Our research study starts with calculating an unadjusted poverty rate, which includes all college, graduate, and professional students, and then we calculate an adjusted poverty rate where college, graduate, and professional students are excluded. Our results show that two out of the four counties (those with large universities) went from the worst six to middle of the pack. Lyon and Crawford County remain low but are out of the bottom ten, and Ellis County went from the 75th percentile to the 23rd percentile. The rankings of all five counties also improved by at least nine places.

THORACIC RIB HISTOLOGY OF A SKELETALLY MATURE ADULT FROM THE SPECIES DOLICHORHYNCHOPS OSBORI (SAUROPTERYGIA; PLESIOSAURIA)

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Dolichorhynchops osborni is a species of polycotylid plesiosaur from the Western Interior Seaway of the Late Cretaceous. FHSM VP-404 is a nearly complete specimen of D. osborni from the Niobrara Formation of Logan Co., KS. The purpose of this study is to test if skeletal maturity can be assessed for D. osborni using the microanatomy of thoracic ribs. A smaller individual, MCZ-1064, is also used to test for histologic differences between individuals of different size. Three ribs from FHSM VP-404 were selected to represent an anterior, medial, and posterior rib and one posterior rib was selected from MCZ-1064. All ribs were sectioned on the proximal shaft and the medial rib was sectioned an additional four times; at the head, the diaphysis, and the distal shaft. In all sections, the medullary cavity is small with trabeculae composed of pseudo-lamellar bone. The cortex is compact and most primary bone has been extensively remodeled by secondary osteons. The distal most section of the medial rib from FHSM VP-404 retains the most primary bone of any section and preserves an external fundamental system (EFS) which signals skeletal maturity. MCZ-1064 also has a highly remodeled cortex but has fewer and less mature secondary osteons suggesting it to be less mature than FHSM VP-404. Though complete growth records of the specimens are not known, the presence of an EFS in FHSM VP-404 confirms that rib histology can be used to show skeletal maturity in Dolichorhynchops and that MCZ-1064 is less mature than FHSM VP-404.

MENTAL HEALTH AND LAW ENFORCEMENT: AN EXPLORATION OF CURRENT TRAINING PRACTICES AND FUTURE DIRECTIONS

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One-in-five adults in the United States have been diagnosed with a mental illness (NIMH, 2016). As a result, a substantial amount of law enforcement work involves interacting with individuals diagnosed with a psychological disorder, with some studies citing as many as 10% of all law enforcement encounters involving a person with a mental illness (Hails & Borum, 2003). Literature suggests that law-enforcement professionals, namely police officers, provide up to one-third of mental health services in the United States (Vermette, Pinals, Paul, & Appelbaum, 2005). Despite the commonality of these interactions, the majority of jurisdictions offer only basic mental health training for officers, with some officers only receiving the information they were provided at their initial academy training. Due to this minimal knowledge, many officers may view interactions with individuals suffering from a mental illness to be an operational challenge (Hails & Borum, 2003). Lack of knowledge may also lead to increased use of deadly force and heightened arrest rates, as well as perpetuate stigmatic views when officers encounter an individual suffering a mental health crisis (Godfredson, Thomas, Ogloff, & Luebbers, 2011). The proposed study seeks to investigate views that law enforcement officers may hold toward individuals with a mental illness or corresponding symptoms, while gaining more insight into needs within law enforcement mental health training. Researchers of the current study will survey police departments and sheriff's offices across the state of Kansas about their attitudes towards mental health and the mental health training they received. Data will be collected by January 2019.

ANALYZING CONVERGENT EVOLUTION IN THE FEEDING STRUCTURE OF XIPHACTINUS AUDAX AND MEGALOPS ATLANTICUS USING LANDMARK-BASED GEOMETRIC MORPHOMETRICS

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Convergent evolution is a phenomenon in which distantly related organisms independently evolve similar functional or morphological features due to similar environmental pressures. A better understanding of convergence is important for understanding both the phylogeny and ecology of fossil animals. Current assessment of convergent evolution relies on well-resolved phylogenetic analysis, which can be difficult to develop in fossil taxa due to lack of molecular data. In this study, we used landmark-based geometric morphometrics (GM) as a novel technique for investigating convergent evolution between the extinct ichthyodectiform fish Xiphactinus audax, and the elopiform fish Megalops atlanticus. X. audax was a large teleost that inhabited the epicontinental Western Interior Seaway (WIS) of Kansas during the Late Cretaceous. M. atlanticus (Atlantic tarpon) is a large, popular game fish that inhabits the east and west coasts of the Atlantic Ocean, as well as the Gulf of Mexico.

These two fish species are phylogenetically distant, but independently converge on a similar feeding structure – most evident in the form of a strongly supraterminal mouth. Landmark-based GM procedures were applied to the cranial material of a series of X. audax and M. atlanticus specimens to statistically compare the shape of the jaws and other cranial elements related to feeding. Results indicate morphological differences in the feeding structure of these two fish, suggesting a lack of convergence on a functional phenotype. These results may suggest a re-assessment of what constitutes convergent evolution is a necessary next step in better understanding this phenomenon.

INFLUENCE OF SHADED CONDITIONS IN GERMINATION, VEGETATIVE DEVELOPMENT, AND REPRODUCTION OF ASTERACEAE SPECIES NATIVE TO KANSAS

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Wildflowers are an integral part of the Kansas prairie. They contribute the most to species diversity and are good indicators of the condition of a grassland. Many wildflowers that occur in Kansas are species in the Asteraceae family and they are adapted to meet the constantly changing light conditions that naturally occur in their environment. Most previous studies have been about crop species, therefore some wildflowers could serve as models to understand how native plants use light in limiting amounts. During germination, the ability of plants to detect variations of light is an essential mechanism for seed survival. As they grow, plants may display two contrasting mechanisms of response when exposed to shade, shade avoidance or shade tolerance. In this study, six native Asteraceae species were exposed to shade, partial shade, and full sunlight conditions. Germination tests indicated higher light intensities to benefit germinability of most species. White Snakeroot displayed the classical shade avoidance syndrome when exposed to partial shaded conditions, including taller plants with reduced number of branches and early flower induction. However, when exposed to severe shade conditions, its responses included shorter plants without branches and no flower bud emergence. Although all species in this project are related and occur in the tallgrass prairie, our results indicate that Asteraceae species have great variation of strategies to deal with shaded conditions throughout their development. Understanding this variation has tremendous implications for crop and range production in Kansas.

GIS SPATIAL ANALYSIS AND ITS SUSCEPTIBILITY TO WILDFIRES

Kara Sill
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Wildfires are becoming more frequent each year not only in the United States, but throughout the world. Barber County, Kansas has not only experienced a devastating wildfire in March 2016, but is also at high risk during the fire season months. This study involved creating a functional GIS Database with layers corresponding to communication, transportation, and infrastructure throughout the county. This will allow responders and officials to have one unified reference space, which will facilitate communication and navigation. Within the ArcGIS environment, route maps can be created to show potential routes and quickest drive time to the scene of the emergency. Another aspect of this project was to identify areas with the potential for large fire outbreaks. In order to monitor fire hazardous areas, Landsat imagery was utilized to identify potential outbreak areas using the Normalized Differential Vegetation Index. Using this imagery allows officials to track areas that are at risk of overgrowth and fuel build up. While the focus of this project is in Barber County, Kansas, the techniques utilized can be transferred and set up for other counties.

POTENTIAL OF SOY PROTEIN AS AN ENVIRONMENT-FRIENDLY SEED LUBRICANT FOR PNEUMATIC ROW CROP PLANTERS

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Seed lubricants play a crucial role in proper seed singulation by ensuring the seeds flow smoothly through the metering unit. However, the harmful chemicals inadvertently expelled along with the air during the seed metering process have raised concerns regarding the negative effects of these lubricants to the environment. An alternative has been developed from soy-protein which biodegrades into aminoacids, however no knowledge exists regarding its suitability as a potential seed lubricant to achieve desired seed singulation. Therefore, this study was designed to assess the seed flowability by quantifying seed singulation of corn and soybeans. Two planter row units was used to simulate planting at 5 mph with a target population of 36,000 and 140,000 seeds per hectare for corn and soybean, respectively. For each seed, three levels of seed size and four levels of seed lubricant were arranged in 3x4 factorial in CRD. A computer program was written to record row unit electric motor rpm and seed tube data. Results indicate that seed lubricant and seed size could potentially affect seed flowability in soybeans. Medium size soybeans applied with soy protein and fluency agent achieved the highest singulation. In corn, large seeds singulates best irrespective of type of seed lubricant. In summary, soy protein seed lubricant provided singulation equivalent to existing commercial products, thus exhibiting potential to provide equivalent seed flowability. Its usage cost is 63% cheaper than Fluency Agent. Although slightly more expensive than talc, the benefit of using soy protein as seed lubricant is sustainability and environmental stewardship.

HIGH THROUGHPUT SCREENING OF MICROBIAL INTERACTIONS WITH MICROWELL ARRAYS

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Microwell array is a powerful high-throughput tool to analyze the interaction networks among dynamic and diverse microbiome communities by randomly combining fluorescently labeled focal species with a controlled number of microbiome isolates. Using microwell arrays thousands of unique interaction networks can be screened to identify those that influence focal species function. In this study a focal species *Agrobacterium tumefaciens* was randomly combined with *Pseuodomonas aeruginosa* where each well became compositionally unique in terms of the combination of species present. We intend to search for microbes that inhibit the growth or quorum activation of *A. tumefaciens* which is responsible for crown gall disease. We are also investigating the mutualistic interactions between *Pantoea* sp. YR343 with root microbes extracted from *Populus deltoides*, a Kansas native plant for applications in biofuel feedstock. Motile bacteria cells were trapped in wells during co-culture using a crosslinked, photo-degradable polyethylene glycol hydrogel membrane and then removed from wells of interest using a patterned light source. Later, 16S rRNA sequencing and other molecular characterizations can be applied to identify and characterize interacting bacteria. Since, Kansas is an agricultural state, findings from our research can be implemented in order to improve plant health and productivity of Kansas native plants.

PLANT-SOIL HISTORY HAS LASTING EFFECTS ON SOIL ORGANIC MATTER DECOMPOSITION

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Through their root inputs, plants modulate the soil microbial communities around them. This process is called soil conditioning. Different plant species select for unique microbial communities when they condition soils. The carbon that plants allocate belowground gives soil microbes the energy they need to “mine” for nutrients contained within soil organic matter (SOM). This process results in a flux of CO2 from the soil to the atmosphere. We wanted to know if an invasive plant species could affect SOM decomposition even after they are removed from the system, and 2) if there are detectable legacy effects of an invasive plant on soil microbial community characteristics. In a greenhouse, two C3 grass species (a native or an invasive) conditioned the same field-collected soil for 20 weeks. After that, each plant species was either grown in “invaded” soils or “native” soils for 6 months. Once a month, belowground CO2 flux and bacterial community composition were assessed. Throughout the experiment, SOM-derived CO2 production rates were significantly higher in invaded soils, regardless of the identity of the plant growing in the soil at the time of measurement. The soil bacterial community composition was affected by both soil history and the current plant growing in the soil. However, the current plant did not significantly influence community composition until late in the experiment. Invasive plants can have long lasting effects on SOM decomposition. This is potentially because the changes that invasive plants make to soil microbial community properties can persist for months after their removal.

LIQUID BIOPSY: THE SIMPLEST TECHNIQUE FOR PANCREATITIS AND PANCREATIC CANCER DETECTION

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Pancreatic cancer has an 8% five-year survival rate for a person after the first diagnosis, which makes it one of the deadliest cancer types. This disease is known as the "silent killer", because early detection is nearly impossible due to the deep location of the pancreas in the body and the misleading symptoms that appear once cancer has spread to surrounding organs. The purpose of this project is to develop a simple detection technology (nanobiosensor) that could identify the presence of specific pancreatic cancer proteases in blood serum samples, which could lead to an early stage detection and subsequent treatment of pancreatic cancer patients. Previous studies identified proteases overexpressed in cancer patients due to important roles they play for cancer survival and invasion. For this study, the Gene Expression Omnibus (GEO) web tool was used to identify eight proteases differentially expressed: arginase, MMP1, 3, and 9, cathepsin B, and E, urokinase plasminogen activator, and neutrophil elastase. The nanobiosensor developed contains dopamine coated Fe/Fe_3O_4 nanoparticles, cyanine 5.5, and a peptide sequence linked to TCPP (a fluorescent dye). The cleavage of the peptide-TCPP occurs in the presence of a protease, which leads to fluorescence signal detection using a plate reader. Eight proteases were identified with significant fluorescence signals between tumor and healthy samples among four types of pancreatic cancer. Also, five demonstrated significant differences between pancreatitis and healthy samples. This study identified eight protease candidates for pancreatic cancer detection, and two as potential markers to differentiate pancreatitis from pancreatic cancer.

THE FUTURE OF WOODY PLANTS IN THE GREAT PLAINS

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Current climate projection of the Great Plains region predicts increased carbon dioxide concentrations [CO_2] and altered precipitation regimes that, in the southern Plains, reduce soil moisture. These climate predictions will likely favor deep-rooted woody plants over shallow-rooted warm season grasses and exacerbate woody encroachment. To test this hypothesis, we conducted a greenhouse study to determine how 4 woody seedling species (*Cornus drummondii*, *Rhus glabra*, *Gleditsia tricanthos* and *Juniperus osteosperma*) would grow under elevated [CO_2] and decreased soil moisture. We measured leaf gas exchange, leaf fluorescence and a suite of plant functional traits. After 5 months of monitoring we found that all species increased water use efficiency and increased their root growth under elevated [CO_2] and lower soil moisture. We found each woody species had a different physiological strategy to cope with the different environmental conditions. Broadly, elevated [CO_2] did ameliorate the stress of decreased soil moisture for the seedlings, suggesting that woody plant seedlings will be able to cope with the projected climate scenarios for the Great Plains region.

DECIPHERING THE GENETIC BASIS OF HYDROXYPHENYLPYRUVATE DIOXYGENASE (HPPD)-INHIBITOR TOLERANCE IN GRAIN SORGHUM

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Grain sorghum is one of the most versatile crops, which can produce high yield under limited water and other inputs. Weed control, especially annual grass weeds in grain sorghum is a major challenge across the US. Herbicides such as mesotrione or tembotrione are effective in post-emergence control of a wide-spectrum of weeds including some grass weeds in crops such as corn but are not registered for use in sorghum because of crop injury. We recently identified four HPPD-inhibitor-tolerant sorghum genotypes from a diversity panel, two each, tolerant to mesotrione (G-1, G-10) or tembotrione (G-200 and G-350). To study the genetic control of mesotrione tolerance, crosses using mesotrione-tolerant (#G1, #G10, #G200 and #G350) and -sensitive (#S1) genotypes of sorghum were performed, and the F_1 seed were generated. The F_1 progeny were evaluated in a mesotrione dose-response (0 to 8x of mesotrione; where x is 105 g ai ha^{-1}, 0 to 4x of tembotrione where x is 92 g ai ha^{-1}, which are the field used dose) assay. Dose-response assay indicated F_1 progeny show same level of tolerance as tolerant parent. These results suggest that the mesotrione and tembotrione tolerance is genotype is controlled by single or multiple dominant gene(s).

We will generate F_2 progeny that will be used to determine the genetic basis as well as map the genes controlling tolerance. We intend to use bulk segregation analysis combined with RNA-Seq (BSR-seq) to rapidly and efficiently map genes.

THE DEVELOPMENT OF TEXTILE PRODUCTS IN RESPECT OF MULTI-SKILL LEVEL ARTISANS. A PRACTICE CASE STUDY ON SOCIALLY RESPONSIBLE PRODUCTION IN KERALA, INDIA

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Practices throughout the apparel and textile (AT) supply chain disregard the social well-being of those working to manufacture AT goods. Social responsibility, according to Dickson & Eckman (2006) involves multiple stakeholders including "…the environment, its people, the AT products made and consumed, and the systematic impact of production, marketing, and consumption…" (p.188). This study aimed to develop textile home goods in a manner that (1) respected artisan's skills, (2) eliminated environmental hazards, and (3) created products with social value. Research through practice guided the implementation of our goals (Bye, 2010). This project was accomplished in collaboration with the Lions in Four (LIF) foundation, a Kansas based company that aims to advance the well-being of women in Kerala, India. Through the production of ethical products at their Women's Training Center (WTC), the organization offers skill training and fair wages to those in need, including women with disabilities. By practically evaluating the applied design methods and natural dye method our team was able to create a system of manufacturing that respected the artisan skill-level. Using skill level as a design parameter permits all members of the WTC to work on the project, and thus earn a fair wage. The variation in applied designs and natural dye methods lead to the creation of a textile product the respects the maker and environment. The final outcomes, a table runner, table ribbon, placemat, and napkins, were also designed in view of the final user and created to inspire play at the dining table. Thus, continuing the incorporation of social responsibility throughout the entire lifecycle of the product, and leading to socially viable set of home goods for the LIF Foundation.

RAPID METABOLISM OF 2,4-D INCREASES THE RESISTANCE IN COMMON WATERHEMP (*AMARANTHUS TUBERCULATUS*) UNDER HIGH TEMPERATURE

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Common waterhemp emergence in the mid-western states of the US has a broader range from low average diurnal temperatures early in the season to high temperatures in late season. 2,4-D has been widely used to manage common waterhemp in this region. Temperature is considered one of the crucial factors affecting the post-emergence herbicide efficacy. The objective of this research was to investigate the effect of temperature on 2,4-D efficacy to control 2,4-D-resistant (WHR) and susceptible common waterhemp (WHS) populations. 2,4-D dose-response studies of WHR and WHS were conducted at two temperature regimes including high (HT; 34/20 ^{o}C, d/n) and low (LT; 24/10 ^{o}C, d/n) temperature regimes. Additionally, the uptake, translocation, and metabolism of ^{14}C 2,4-D were also determined. Further, to confirm the role of cytochrome P-450 monooxygenases in 2,4-D metabolism, dose-response was performed with malathion pre-treatment. Results indicated increased resistance and decreased sensitivity of both WHR and WHS population to 2,4-D at HT compared to LT. GR_{50} of WHR and WHS at HT were 3696 and 176 g ae ha^{-1}, while at LT these values were 1001 and 107 g ae ha^{-1}, respectively. Different growth temperatures did not affect 2,4-D absorption or translocation. However, rapid ^{14}C 2,4-D metabolism was observed in both WHR and WHS at HT compared to LT. Furthermore, pre-treatment of malathion significantly lowered 2,4-D resistance in WHR at both HT and LT. Application of 2,4-D early in the season when temperatures are cooler, can improve control of 2,4-D resistant common waterhemp.

SURVIVAL OF AFRICAN SWINE FEVER VIRUS (ASFV) IN FEED INGREDIENTS UNDER TRANSBOUNDARY SHIPPING CONDITIONS

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African swine fever virus (ASFV) causes a highly contagious disease in swine that threatens the pork industry worldwide. Since 2007, ASFV has been detected in Europe, the Caucus region, and most recently China, increasing the risk of spread globally. The goal of this study was to evaluate the survival of ASFV in animal feed ingredients that are imported daily into the U.S. under simulated transboundary shipping conditions. Virus survival was evaluated using a Trans-Atlantic transboundary model involving 11 representative feed ingredients, transport times and environmental conditions, with samples tested by polymerase chain reaction (PCR), virus isolation (VI) and/or swine bioassay.

Controls included complete feed (positive and negative controls) and a stock virus positive control (virus only, no feed matrix). Briefly, 5g of each ingredient were inoculated with 10^5 $TCID_{50}$ of the contemporary strain, ASFV Georgia/07. The PCR data showed consistent inoculation and nucleic acid stability across all inoculated feed ingredients during the 30-day transboundary model. Viable ASFV was detected by VI at 30 days post-inoculation (DPI) in 8 tested ingredients as well as both positive controls, with mean titers between 10^2 and 10^3 $TCID_{50}$. Both VI and swine bioassay failed to demonstrate infectivity of ASFV in 3 ingredients, including dried distillers' grains, lysine and vitamin D. Our data shows that ASFV maintains viability in varying environmental conditions, even in the absence of a protective feed matrix. This study provides additional information supporting the hypothesis that feed ingredients may play a role in the transboundary movement of foreign animal diseases, such as ASFV.

SOY PROTEIN IS AN EFFICACIOUS ALTERNATIVE TO WHEY PROTEIN IN FORTIFIED BLENDED FOODS

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Previously we found that extruded sorghum-soy blend (SSB) and corn-soy blend (CSB) fortified blended foods (FBFs) containing whey protein concentrate (WPC) are equally nutritious food aid products. WPC is commonly added to FBFs as a high-quality protein source, however, it is the most expensive component of FBFs. The primary objective of this study was to determine if soy protein may serve as an alternative to WPC in FBFs. Nine extruded FBFs were formulated; one SSB and one CSB both containing 9.5% WPC and 15% sugar served as comparison FBFs. Four additional SSBs and three CSBs were developed containing no WPC with increased soy flour to meet protein requirements and sugar content from 0 to 15%. Male, weanling Sprague Dawley rats were individually housed and divided into ten diet groups (n = 10) which consumed either AIN-93G, standardized rat diet, or one of the FBFs for 28 days. Results were analyzed using one-way ANOVA with Tukey's test. There were no significant differences in food intake or final body weights. CSB-WPC group had significantly lower food intake compared to SSB-0% and AIN-93G groups. CSB-5% group had significantly lower body weight compared to the SSB-0% group. There were no significant differences in hemoglobin concentrations; liver iron concentrations were significantly higher in all FBF groups compared to the AIN-93G group and CSB-5% group was significantly higher than the SSB-15% group. Our results suggest that extruded SSB and CSB FBFs with soy protein are an efficacious and cost-effective alternative to WPC-containing FBFs.

INCREASING PROVIDERS' INTENT TO PERFORM E-CIGARETTE SCREENING IN THE ADOLESCENT POPULATION

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Electronic cigarettes (e-cigarettes) have been increasingly used by the public in recent years. The use of e-cigarettes has increased by a staggering 900% over the past five years among adolescents. Research has repeatedly linked e-cigarette use to future traditional cigarette use. Additionally, research is mounting regarding the negative health effects of e-cigarette use such as a chronic lung disease, increased respiratory infections, nicotine addiction, and even the possibility of cancer. The increasing rates of e-cigarette use in the youth population should be concerning to all healthcare providers. Healthcare providers are uniquely positioned to halt this sharp incline through appropriate patient screening and effective patient education. Previous studies have indicated that the most significant barrier to e-cigarette screening in the clinical setting is lack of provider knowledge regarding e-cigarette safety. In this study, an educational offering was provided to healthcare providers highlighting the literature to date regarding e-cigarette safety. E-cigarette screening practices, as well as current e-cigarette knowledge, was measured via a pretest/posttest design. A pretest was given prior to the educational offering to determine the healthcare provider's baseline e-cigarette knowledge and screening practices. After viewing the educational offering, the data was collected again to determine if e-cigarette knowledge, and screening practices, increased. In February 2019, a six-week post education survey will be sent to participants. The quantitative data will be disseminated and statistically analyzed to determine if the educational intervention influenced provider e-cigarette screening practices. Ideally, increased e-cigarette screening practices will decrease e-cigarette use among youth and improve adolescent health.

PEROVSKITES AS EMERGING MATERIALS FOR WATER SPLITTING AND SUPERCAPACITORS

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With the present need for clean and renewable alternative energy sources, electrocatalysts producing hydrogen in fuel cells could easily translate into a practical solution. Currently, the most efficient electrocatalysts are not very cost effective or stable during the performance. Utilizing readily available transition metals, three lanthanum-based perovskite nanostructures were studied as a multifunctional material solution. $LaCoO_3$, $LaFeO_3$, and $LaMnO_3$ nanoporous materials were synthesized and then characterized by X-ray diffraction and scanning electron microscopy. Each material was analyzed with electrochemical impedance spectroscopy, line scan voltammetry, and chronoamperometry for electrocatalytic activity towards both the hydrogen evolution reaction (HER) and the oxygen evolution reaction (OER). It was shown that electrocatalytic activity toward OER was highly dependent on the material composition. Accordingly, $LaFeO_3$ had the lowest overpotential voltage of 316 mV at 10 mA/cm^2 compared with 376 and 419 mV for $LaCoO_3$ and $LaMnO_3$, respectively. Likewise, the dependency on material composition was again, shown to influence catalysis toward HER. $LaMnO_3$ had the lowest overpotential voltage of 176 mV at 10 mA/cm^2, while $LaCoO_3$ had 221 mV and $LaFeO_3$ showed the highest overpotential of 230 mV. Measured at a common current density of 0.5 A/g, the specific capacitance was calculated from the charge-discharge data to study their effectiveness as a supercapacitor electrode material. $LaCoO_3$ showed a capacitance of 105 F/g whereas $LaFeO_3$ and $LaMnO_3$ showed 45 and 35 F/g, respectively. Further investigation for fabrication of devices for energy storage and water splitting electrolyzer application has been considered.

UNDERSTANDING THE CHARACTERISTICS OF BACTERIAL ISOLATES OBTAINED FROM COMMERCIAL POULTRY FEED USING WHOLE GENOME SEQUENCING APPROACH

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In order to reduce pathogen contamination in poultry products identification of overall microbial populations in poultry production processing steps have always been considered an important monitoring tool for assessing sanitizer effectiveness and the corresponding responses of bacteria load levels on poultry carcasses. Bacterial isolates recovered from corn-based chicken feed were purified on aerobic plate count agar and eleven were morphologically different colonies were selected for whole genome sequencing. The goal of the study was to: 1. Sequence, assemble and annotate the whole genome of these isolates, 2. Compare the protein profile among different strains of the same bacterial species. Whole genome sequencing was performed using Illumina MiSeq platform. Genome assembly was carried out on six sequences via SPADeS; quality was checked via Quast; and annotation was achieved via PROKKA. Although sequencing of genome for all eleven isolates were completed, till date, sequences of six isolates have been further processed for assembly and annotation. The isolates were identified as Kosakonia cowanii (2), Enterococcus gallinarum (1), Klebsiella variicola (2), and Pantoea vagans (1).

The total %GC content of these bacteria ranged between 53 and 57; whole genome length was calculated as 4.8-5.7 X 10^6 bases; number of rRNA molecules were found to be 8-14; and total protein coding sequences were up to 5500. The data obtained from this study would help in identifying characteristics of a hygeinic indicator organism in the poultry processing pipeline and thus reinforce applciaitonnof WGS in food safety.

FACEBOOK-CAMBRIDGE ANALYTICA, 2018: A CASE STUDY IN CRISES COMMUNICATION

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Facebook faced one of the most serious public relations crises in the early part of 2018 when news broke in reports published simultaneously in the United Kingdom as well as in the United States, that Cambridge Analytica, a U.S. political consulting firm accessed data of over 50 million Facebook users and used them without their consent for political purposes. Facebook CEO, Mark Zuckerberg, was called to the U.S. Senate to testify in front of the Congress. The social media giant also lost $37 million in market value. It resulted in an enormous political scandal that engulfed not only the two nations across the Atlantic but reverberated around the world. It also resulted in calls for tighter government regulations for technological companies. This case study critically analyzes the strategies of crisis communication that was adopted by Facebook before and after the news reports exploded. The social media giant undertook two different kinds of crisis communication strategies. In the first part, the company was completely unprepared to tackle the crisis and responded with offensive and preemptive tactics which misfired. Then, in the second part of the case, Facebook resorted to vocal commiseration and rectifying behavioral strategies and took responsibility for its action. This case study is of significance because it is one of the first studies to comprehensively analyze the data harvesting crisis that took place in the United States and in United Kingdom. Given the significance that the crisis generated in the news media in over 30 nations, institutions and organizations might take a cue out of the case as how to respond during a crisis using strategic communication tactics.

TNF-α AND SOPHOROLIPIDS: COMBINATIONS APPROACH FOR THE TREATMENT OF PROSTATE CANCER

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Prostate cancer is one of the most prevalent forms of cancer afflicting men in the United States. In recent years, advances in the field of nanotechnology have allowed for new and innovative ways to treat various types of cancer and various other diseases. Our research focuses on the treatment of the prostate cancer utilizing iron oxide nanoparticles (IONPs) loaded with TNF-α and lactonic sophorolipids (LSLs). TNF-α is a cytokine responsible for apoptosis initiation, while LSLs are naturally-glycolipids shown to alleviate inflammation and improve immune response in certain diseases. We hypothesized that this combination may possess a synergistic effect, displaying greater therapeutic effects than either compound alone. We synthesized polyacrylic acid (PAA)-coated IONPs to serve as a vehicle for these compounds for target-specific delivery. The surface carboxylate groups of the PAA coating can be chemically modified, allowing for binding of ligands to target cell-specific surface receptors or antigens. We conjugated our IONPs with glutamic acid with the aim of targeting the over-expressed PSMA receptors on the surface of the LNCaP cells. This combination therapy showed significant LNCaP cell death within 48 hours of incubation, while healthy cells were unaffected. The therapeutic effects were determined using cytotoxicity, ROS, apoptosis, and migration assays. The results of the combined therapy suggest that these compounds may be a viable alternative to chemotherapeutic drugs in prostate cancer treatment and will be highlighted in this presentation.

MAPPING FLOODS ANYWHERE IN KANSAS USING THE NATIONAL WATER MODEL

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When the National Water Model went operational in 2016, for the first time in the modern computational era the nation went from a lumped basin parameterization to a fully distributed, coupled hydrologic/hydraulic representation of the water cycle. Not only does this implementation represent an almost 21,000-fold increase in our predictive potential of river discharge, its modular nature ensures that future efforts to improve individual aspects of the model are immediately integrated into the lifecycle of a hydrologic event. However, the methods of accessing these efforts for those not intimately familiar with the model or data science conventions are limited, and the means of consuming these within the emergency management realm are currently nonexistent. To rectify these shortcomings, a graphical user interface built on Free and Open Source tools is demonstrated whose ideal users include hydrologists, first responders, and decision makers. These intuitive and accessible tools presented enable virtually anyone with a modern computer to access, interact with, and make decisions based on, National Water Model forecasts – effectively bridging the gap between federal scale efforts to guide and inform, and the local scale where actions are made.

CHLAMYDIA OF PIGS AND HUMANS: A COMPARATIVE GENOMIC ANALYSIS

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Chlamydiae are unique pathogenic bacteria associated with a range of diseases affecting most mammalian species. *Chlamydia suis*, a common pathogen of pigs, causes chlamydiosis which is associated with diseases including spontaneous abortion, causing loss of entire litters, gastrointestinal issues, conjunctivitis, an eye disorder that can lead to blindness, and respiratory diseases like pneumonia. Importantly, there are several reports indicating that *Chlamydia suis* has been detected in pig farmers and has the potential for zoonotic transmission to humans. Even more concerning, *C. suis* often encodes for tetracycline antibiotic resistance which is a primary treatment antibiotic, meaning that these diseases cannot be treated in pigs, nor would they be treatable in humans. Additionally, recombination in the lab between *C. suis* and human chlamydia has shown that this antibiotic resistance can be transferred between species. Because of this emerging threat, and to gain a better understanding of the basic biology, a comprehensive analysis of the *Chlamydia suis* genome was completed to understand the genes that might be contributing to its ability to cause disease, both in pigs and humans. This report constitutes the first fully assembled and independently annotated genome for *C. suis* with complete comparison with other Chlamydiae, including human pathogen *Chlamydia trachomatis*. The 986 genes that make up the *C. suis* chromosome are closely related to other Chlamydiae, though several unique aspects of this bacteria come to light. This and future studies will enable focused efforts on discovering key species-specificity and host-adaptation factors that are attributed to chlamydial infections, including humans.

GROWING 3D CARTILAGE TO TREAT OSTEOARTHRITIS

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Osteoarthritis (OA) is a major public health issue affecting approximately 31 million Americans. This disease affects joints and symptoms include pain, stiffness, and decreased mobility and is characterized by the degeneration of articular cartilage that lines these joints. This is particularly an issue in the jaw joint, temporomandibular joint (TMJ), because these symptoms can lead to decreased ability to eat and a reduced quality of life. Interestingly, post-menopausal women are approximately 6 times more likely to experience TMJ-OA indicating that lack of estrogen likely plays a role in this cartilage tissue degeneration. Replacing estrogen by delivering it to the entire body is problematic, because it increases the risk for breast cancer.Therefore, this project addresses the issue twofold: first by creating a 3D scaffold that can be placed in the joint and encourage the growth of new cartilage tissue, and second to deliver medication targeting the major estrogen receptor from this scaffold locally to the joint in order to prevent further degeneration during the regrowth period. In order to create this tissue scaffold, a process called electrospinning is used to create a mesh that has a similar structure to natural cartilage. In this process a liquid emulsion is pushed through a needle in the presence of an electric field to create dry fibers with the medication inside these fibers. Through altering the composition of the emulsion and electrospinning processing parameters, we hope to control the architecture of individual fibers and therefore the rate at which medication is released into the joint.

MONITORING WATER CONTENT IN SOIL USING RADAR

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Water content in soil is a key factor for agriculture, water resource management, and predicting natural disasters like droughts and floods. Farmers can utilize moisture data to make vital decisions regarding irrigation and possibly increase crop yield. This research effort describes the design of a radar system capable of measuring water content in the topsoil. The overall objective was to build a miniaturized system, which could be integrated on a small Unmanned Aerial Vehicle helicopter, without compromising electrical performance. This method provides a quick, convenient, and flexible way of monitoring farmlands, without physically interacting with the soil. The radar radiates microwaves over a 2 to 18 GHz (Gigahertz) ultra-wideband frequency range, with a power of 1mW. The system produces chirped pulses, each lasting 130μs long. These pulses are radiated by low-profile antenna arrays. These sub-systems are integrated onto the helicopter, which has a maximum payload capacity of 11 lb. At this capacity, the rotorcraft is capable of cruising for 60 minutes and hovering for 45 minutes. The helicopter, built by Pulse Aerospace (a locally owned company), is 6.3 feet long and 2 feet high. The flight altitude is restricted to 400 feet, in accordance with FAA regulations. A test-version of the radar electronics was used to perform ground tests on grassy soil, which indicated that it is capable of detecting at least 5% change in soil moisture content. It will be flown onboard the helicopter over Kansas farmlands to measure soil moisture.

IMPLEMENTING NEW CONCRETE TECHNOLOGIES FOR CONSTRUCTING CRACK-FREE BRIDGE DECKS

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Cracking in bridge decks is a serious concern because cracks provide corrosive agents a direct path to the reinforcing steel, reduce freeze-thaw resistance of concrete, and can ultimately lead to rapid deterioration. Over the past two decades, the Kansas Department of Transportation (KDOT) has worked with the University of Kansas (KU) to minimize cracking in bridge decks in the development of specifications for Low-Cracking High-Performance Concrete (LC-HPC) bridge decks. A long-term study on implementations of these specifications has shown significantly reduced cracking in bridge decks. Results from the Kansas LC-HPC study have identified concrete consolidation and early application of curing as primary factors affecting cracking during construction. For concrete production, limiting the cement content, specifying quality materials, and tight controls on concrete properties have shown to be the primary factors affecting cracking and durability. These specifications have since evolved to include provisions for additional crack reduction technologies for use by the Minnesota Department of Transportation in four recently placed bridge decks and by KDOT for future LC-HPC projects. Specifically, the crack reduction technologies include internal curing via pre-wetted fine lightweight aggregate and a partial replacement of cement with supplementary cementitious materials (SCMs). Lessons learned during construction of the Minnesota LC-HPC decks have identified additional factors affecting concrete production when including internal curing and SCMs. In other states that have used similar approaches, bridge deck crack surveys conducted by KU researchers have shown significantly reduced cracking through the first three to five years after construction.

COPLAND: A SEMANTICS FOR TRUST IN CYBER INFRASTRUCTURE

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A necessary component of security is trust. However, trust in the context of cyber-security is often misplaced. Consider the following scenario: You use an online banking application to complete a transaction with a remote banking server. As a user, you may (correctly) assume that a banking institution with a good reputation has implemented the necessary security features to protect the transaction, both in the application they distribute and on the server they maintain. But how can you be sure that you are using a genuine (unaltered) instance of the application, or talking to an honest server? If an attacker persuades you to interact with a malicious version of either, all security is lost. As can be seen from an increasing number of high-profile cyber attacks in recent years, this is far from a solved problem. The technology that enables deeper levels of trust in cyber infrastructure is called remote attestation. Existing IT solutions for this problem include virus checkers and network firewalls. However, these defenses remain ad-hoc and vulnerable to a more motivated attacker, especially when the attack undermines the system at a layer below those protections. Our work at the University of Kansas aims to leverage trusted hardware and a formally verified framework for remote attestation protocols to synthesize real systems that facilitate trust. This technology has application far beyond the mobile banking scenario mentioned above. Moving forward, Kansans will benefit from a robust cyber infrastructure that supports government websites, electronic voting, healthcare infrastructure, and schools.

MENTAL HEALTH OUTCOMES IN FOSTER YOUTH: PROMOTING COHESION AND CONFLICT RESOLUTION IN FOSTER FAMILIES

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Background: As of September 2018, there were 7,530 youth in foster care in Kansas. Youth exposed to maltreatment are three times more likely to have a mental health diagnosis and two times more likely to require inpatient care, than youth in the general population. The cost of child maltreatment is staggering; youth with a history of maltreatment incur an extra $2600 in Medicaid expenses per year, which equates to an extra $19,578,000 for Kansans. The quality of family interactions has been related to adjustment outcomes, such that low family cohesion and high family conflict is associated with poor mental health symptoms, but these factors have not yet been examined in a foster care family. Methods: The present study recruited 178 youth in foster care (M_{age}=15.18, SD=1.76) and their foster caregivers. Participants complete self-report measures about maltreatment history, current family environment, and youth internalizing and externalizing symptoms. Results: Family cohesion was negatively associated with internalizing problems, such that lower levels of cohesion were related to worse anxiety and depression symptoms. Furthemore, caregiver and youth report of family conflict accounted for the assocation between maltreatment exposure and mental health problems, suggesting that higher levels of conflict within the foster family can contribute to worse outcomes for youth. Conclusions: Findings highlight the the crucial role foster families can have on youth outcomes. Relatively simple interventions, such as fostering cohesive parent-child relationships within the foster family and training caregivers on conflict resolution can provide youth with support to reduce or prevent mental health problems.

UNDERSTANDING THE LINK BETWEEN STRESS AND MENTAL ILLNESS

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Severe stress is a major risk factor in the formation of multiple mental illnesses that impact millions of Americans, including depression, anxiety, and post-traumatic stress disorder. Social conflict, such as bullying or domestic violence, is a common source of stress leading to these conditions. In order to understand how these experiences affect the brain in such a way to cause these disorders, we must use animal models of social conflict to be able to dig deep into the biology of stress-induced changes in mental health. One of the most common animal models of social conflict is social defeat. In this model, an animal is the victim of an aggressive interaction with another animal of the same species. However, a major drawback of this model is that many female rodents are not aggressive, leading to difficulty in studying females using social defeat. We use the prairie vole, a small rodent species in which both males and females are naturally aggressive after living with a mate for a few days. After social defeat experience, both male and female prairie voles show behaviors that reflect those seen in humans with social anxiety or general anxiety disorders. We found that these changes in behavior following defeat were at least partially regulated by dopamine in the amygdala, a part of the brain responsible for fear and emotional processing. Moving forward, using the social defeat model in the prairie vole will allow us to continue to investigate the connection between stress and changes in mental state.

GENE EXPRESSION PROFILING USE IS ASSOCIATED WITH REDUCTION IN MODERATE TO SEVERE TRICUSPID REGURGITATION AFTER HEART TRANSPLANT

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Purpose: Tricuspid regurgitation (TR) following heart transplant often leads to reduced quality of life, need for valve replacement or even re-transplant. TR appearing 30-days or more after HT (late TR) often arises from injury to the tricuspid valve during endomyocardial biopsy (EMB) surveillance of rejection. Strategies to reduce TR are greatly needed. Methods: 464 HT performed at our institution were retrospectively studied. Excluded were 9 patients without available post-HT echocardiographic data. All post-HT echocardiograms, biopsy and gene expression profiling (GEP) tests were analyzed for 455 HT. TR was graded on a scale of 0 (none) to 4 (severe). Surveillance EMB were performed from 1 week to 36 months post-HT, decreasing in frequency, unless otherwise indicated. GEP testing between 4 and 6 months post HT was initiated in 2007 in lieu of scheduled EMB. Results: Patient demographics and incidence of EMB-proven rejection were similar between patients initiated on GEP or EMB-only surveillance at 6 months. Patients off the GEP protocol underwent more EMB in the first year (13.8±1.9 vs 11.1±2.1, $p<0.001$) and lifetime EMB (20.2±5.8 vs 13.2±4.1, $p <0.001$). EMB count was an incremental hazard for TR (HR 1.11 [95% CI, 1.032-1.194], $p<0.005$). GEP use was an independent predictor of fewer cumulative EMB (HR 0.0478 [0.437-0.523], $p<0.0001$) and lower incidence of developing TR (HR 0.272 [0.133-0.554], $p=0.0003$). 5-year survival was similar for patients on or off the GEP protocol. 10-year event free survival (death, reoperation, re-transplant) was 44.8% for patients with grade 3-4 TR vs. 60.5% for grade 1-2 TR ($p=0.0007$).The authors of this presentation have no conflicts of interest to report for this study.This research was made possible by the Frank L. and Evangeline A. Thompson Endowed Chair in Cardiovascular Surgery and Transplantation.

IMPACT OF A LOW-COST, MULTICOMPONENT INTERVENTION TO IMPROVE COLORECTAL CANCER SCREENING RATES IN A PRIMARY CARE CLINIC IN RURAL KANSAS

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Background/Significance. Residents in rural Kansas have significantly lower colorectal cancer (CRC) screening rates than urban populations and consequently experience higher rates of mortality from colorectal cancer. Research highlights the need to increase community demand, decrease access barriers, and increase provider delivery of screening services using low-cost, multicomponent interventions. Purpose. To determine the effectiveness of a low-cost, multicomponent intervention on improving CRC screening rates in patients seen in two primary care clinics in rural Kansas. Theoretical Framework. The Iowa Model of Evidence-Based Practice is used as a theoretical framework to organize efforts of the project including: identify triggers; clinical applications; organizational priorities; forming a team; piloting a practice change; evaluating the pilot; and dissemination of results. Methods. An intervention was implemented to determine if colorectal cancer screening rates increase within 3 months of a multicomponent intervention consisting of: 1) postcard and electronic educational mailers, and 2) Registered Nurse and Medical Assistant education. Pre-post intervention colorectal cancer screening rates will be compared to determine if an increase in CRC screening rate is seen. Results and Conclusions. Pre-post intervention analysis results and conclusions will be shared during the poster presentation. Preliminary results indicate an increase in CRC screening rates at the two primary care clinics in rural Kansas post-intervention.Impact/Benefit to Kansas. Improving CRC screening rates using low-cost, multicomponent interventions offer an inexpensive and effective way to improve CRC screening adherence in rural areas of Kansas and, thus, improve the health rural Kansans.

PINCH PROPRIOCEPTION AND HAND DEXTERITY: ARE THEY CORRELATED?

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Background: Subjects with hand function deficits spend longer time to perform fine motor tasks. Pinch proprioception plays a crucial role in the ability to perform such tasks like writing a sentence and picking up small and large objects. However, the relationship between functional deficits and proprioception of the hand is still unknown. Purpose: This study aims to assess the relationship between pinch proprioception and two hand function tests: Moberg pickup test (MPUT), and Jebsen-Tailor hand function test (JTHFT). Subjects: This study tested pinch proprioception in 12 healthy participants (7 males, 58±6 years), 11 participants with type 2 diabetes (T2D) without diabetic peripheral neuropathy (DPN) (5 males, 61±6 years), and 13 participants with T2D and DPN (6 males, 60±6 years). Methods and Materials: To test for pinch proprioception, this study used a device previously tested for feasibility and reliability. Following familiarization with a 15° target position of the index finger and thumb, subjects performed 3 trials in which they attempted to actively reproduce the target position without visual feedback. The standard deviation from the trials denoted precision, and the average of the absolute error matching the 15° target represented accuracy. MPUT assessed the ability to pick up small objects without visual feedback. JTHFT assessed the ability to perform common hand dexterity tasks. Time, in seconds, was used to represent both dexterity measures.

Results: Spearman's correlation coefficient showed that both precision and accuracy have significant positive correlations with MPUT: (r=0.73 and 0.63, respectively, p<0.001). Precision was significantly and positively correlated with JTHFT (r=0.45, p=0.006). Accuracy was not significantly associated with JTHFT (r=0.33, p=0.054). Conclusion: Our results showed moderate to strong correlations between pinch proprioception and hand dexterity measures (i.e., less accuracy and precision in pinch proprioception is associated with longer time to perform dexterity tasks). The current findings could be an important component for hand dexterity screening and following up with treatment plans focusing on hand rehabilitation. Pinch proprioception can be used for subjects with neuropathy as well as for other patients with orthopedic and neurological conditions that affect hand dexterity such as hand osteoarthritis, hand tendon repair, stroke, and multiple sclerosis. Funding Source: No funding was provided for this study and the authors report no conflict of interest.

ELEVATED O-GLCNAC EXACERBATES PRO-INFLAMMATORY CYTOKINE SECRETION FROM CD4+ T CELLS

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Chronic inflammation is a feature of obesity and enhances the risk of atherosclerosis, cancer, diabetes, and autoimmunity. Specifically, pro-inflammatory Th17 CD4+ effector T cells are increased in metabolic diseases. However, a clear molecular mechanism linking metabolic changes with pro-inflammatory T cells is lacking. We hypothesize that elevated levels of O-linked β-N-acetylglucosamine (O-GlcNAc), a post-translational modification of nuclear and cytoplasmic proteins, promotes pro-inflammatory CD4+ T cell function. Since production of O-GlcNAc involves input from carbohydrate, amino acid, fatty acid, and nucleic acid metabolism, the modification acts as a general sensor of a cell's nutritional status. To investigate the role of O-GlcNAc in a setting of metabolic disease, we analyzed O-GlcNAc levels in CD4+ T cells from mice fed a high fat and cholesterol "Western" diet. Naïve CD4+ T cells from obese mice have elevated O-GlcNAc levels compared to cells from mice fed standard chow. When polarized to a Th17 lineage, cells from obese mice secrete more IL-17A, the eponymous Th17 cytokine. Importantly, when naïve CD4+ T cells from lean and obese mice are polarized to a Th17 lineage in the presence of Thiamet-G (TMG, an inhibitor of the enzyme that removes O-GlcNAc (O-GlcNAcase, OGA)) the cells from lean mice secrete levels of IL-17 comparable to those from obese mice and IL-17 secretion was exacerbated in cells from obese mice. Transcript levels of IL-17 are similarly elevated in both lean and obese mice Th17 cells treated with TMG. RORγt (retinoic acid-related orphan receptor gamma) acts as the Th17 master transcription factor, orchestrating the Th17 differentiation program. TMG treatment increased RORγt binding at the IL-17 locus. Uniquely among the CD4+ effector T cell master transcription factors, RORγt is regulated by fatty acid ligands which promote or repress its activity. Acetyl CoA carboxylase 1 (ACC1), the rate limiting enzyme in fatty acid synthesis, is known to enhance generation of Th17 cells by producing ligands that increase the activity of RORγt. We discovered that ACC1 is O-GlcNAcylated. Furthermore, lipidomics analysis identified increased levels of sterols and saturated fatty acids—known ligands that increase RORγt transcriptional activity at the IL-17 promoter. Collectively, our data suggest that elevated O-GlcNAc levels increase pro-inflammatory IL-17 secretion from Th17 cells through alteration of the lipidome. Further study into the molecular mechanism of how O-GlcNAcylation promotes pro-inflammatory Th17 T cell function will provide insight into how nutritional excess worsens inflammation.

IMMUNE REGULATION OF CD8+ T CELLS BY NKG2D IN AUTOIMMUNE DIABETES

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A major challenge of the immune system is distinguishing between healthy cells, and those which have become virally infected, or cancerous. The receptor NKG2D is one of the primary mechanisms helping the immune system make this distinction. NKG2D is found primarily on natural killer cells and CD8+ T cells, and recognizes NKG2D ligands which are expressed on the surface of virally infected or damaged cells and act as distress signals. However, NKG2D has also been shown to be involved in autoimmune (Type I) diabetes, but how it's involved, and whether its effects are positive or negative is unclear. Canonically, NKG2D activation results in immune killing of the ligand-bearing cell. However, we and others have observed robust expression of the NKG2D ligands by healthy immune cells. We therefore sought to investigate how this expression affected the immune response. Using the non-obese diabetic (NOD) mouse model of autoimmune diabetes, we found that NKG2D signaling between T cells, during CD8+ T cell differentiation decreased cytokine production upon later antigen stimulation. This correlated with the loss of a protective effect in NKG2D knockout vs. wild NOD mice, and a decreased incidence of autoimmune diabetes in NOD mice with experimentally enhanced NKG2D signaling within pancreatic islets. Our recent work in humans and mice suggests that NKG2D signaling driving an increase in central memory phenotype CD8+ T cells may contribute to these effects. Our work is uncovering a previously undescribed immune regulating role for NKG2D in autoimmune diabetes with implications in other autoimmune conditions
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PRODUCED WATER TREATMENT FOR AGRICULTURAL USE IN KANSAS OIL, AND GAS PRODUCTION FIELDS

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Enhanced oil recovery (EOR) processes used by oil and gas companies in the State of Kansas and the Midwest region generate a large amount of water (up to 90%) as byproduct. Water or steam injection into oil reservoirs is necessary for maintaining the oil flow and other operations. Oil and gas reservoirs usually have water in the same formation of oil, or gas and it flows to the surface during production. Produced water is a term used to describe water that is produced as a byproduct of oil and gas operations. The amount of the produced water significantly increases as wells age. Currently, the produced water is disposed into designated wells to avoid environmental concerns and ground water contaminations of toxic minerals and bacteria. The main goal of the project is to find low-cost maintenance, energy efficient, cost-effective, and environmentally friendly methods for produced water treatment. The objective of this research is to study the elemental contents of the produced water in Kansas and develop a novel filtration method for the recovery of water and use it in the local agricultural fields. Produced water samples were obtained from Kansas Mid-Continent Region (Lario Oil & Gas Co), acidified with HNO3 and HCI, then Autoclaved according to ASTM D1971 standards for Optical Emission Spectroscopy and plasma-mass spectrometric testing. Filtration of produced water by multi-layers of ceramics, zeolite, micro size carbon, and aluminum hydrate, shows promising results in terms of bacteria elimination, total dissolved metal TDS, as well as salt removal.

CARDIAC FAILURE DETECTION USING A WEARABLE PATCH SENSOR IN A POINT-OF-CARE SETTING

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The importance of ventricular stroke volume (SV) for the detection of cardiac failure has been well established in the clinical field. The focus of this study was to develop a simple to use sensor that could be applied like an adhesive bandage that could potentially measure SV, and subsequently aid in the detection of cardiac failure. A patch sensor was designed from a trace of a copper configured into a square planar spiral. The patch sensor self-resonates when impinged upon by a specific range of radio frequency (RF) waves. Human participants (n = 5) were recruited to measure SV using the patch sensor and the data was compared against a clinical standard (impedance cardiography). Shifts in the resonance were registered as blood volume changes throughout the cardiac cycle. A statistical correlation analysis was performed to determine the patch sensor's performance in measuring SV, heart rate (HR), and cardiac output (CO). Changes in the effective permittivity in the aortic arch (AO) due to changes in blood volume were directly correlated to the measurements of SV. SV, HR, and CO were measured with the patch sensor with a 94.0 % accuracy as compared to the clinical standard impedance cardiography. This work presents a foundation for the development of a patch sensor that may be used as a non-invasive diagnostic to detect cardiac failure for people that live in low resource environments or have limited access to medical care.

MODELING AND EVALUATING THE EFFECT OF DATA AGGREGATION INTERVAL ON SMART POWER DISTRIBUTION SYSTEM

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The modernization of the power grid is expected to enable retail consumers to be active participants via data sharing information between the consumers and the operator. This initiative allows two-way communication by means of distributed intelligent devices, which allows better controlling and monitoring of the distribution system. Advanced metering infrastructure by means of a smart meter has become a reality in Kansas with consumers having access to their information via a provider dashboard. Control accuracy using this information will be affected by the granularity or level of detail of the smart meter data. Therefore, an optimal data sharing framework based on the control accuracy, infrastructure cost and consumer privacy is required to modernize the power system in Kansas. This work bridges the gap of quantifying the control accuracy based on the data granularity. A framework is proposed in this work to quantify the relationship between the required consumer data and the estimation accuracy of power system quantities. Voltage drop in a feeder and total power loss are used as two power system quantities in this work to illustrate the importance of the proposed framework. To better understand the effects, a model is evaluated in the presence of residential solar photo-voltaic modules. Standard test systems are used to evaluate the effect of data-granularity based on the proposed framework. A tool to estimate the maximum data-granularity to limit the estimation error is proposed. This framework can be used to determine the optimal consumer data-granularity by the utilities to enhance their performance.

INNOVATIVE GENETIC APPROACH MAY GIVE CROPS RESISTANCE TO CHARCOAL ROT DISEASE

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Macrophomina phaseolina, causative agent of the plant disease charcoal rot, impacts over 500 plant species, causing devastating crop failures worldwide. In Kansas, it is the biggest cause of soybean crop loss, and disease epidemics are increasingly frequent. Charcoal rot attacks primarily through fungus-infested soil, leading to yellowing and death of plant leaves. Traditional pathogen control means, such as natural resistance, crop rotation, and fungicides, have been ineffective or problematic. This study aims to evaluate the effectiveness of host-delivered RNA interference (HD-RNAi) to manage charcoal rot. HD-RNAi exploits the natural process of RNA interference to target essential genes for *M. phaseolina*. In this process, small interfering RNAs (siRNAs) are designed and engineered into plant genomes. Upon infection, siRNAs expressed in plant cells can enter invading fungus and prevent expression of genes necessary for successful infection. HD-RNAi has been successful against some nematodes, insects, and other fungi. In this preliminary work, we have manufactured siRNAs to interfere with genes used in the production of *M. phaseolina* cell wall compounds. We hypothesize that without these compounds, the fungus will be unable to grow and infect plants. To test siRNA effectiveness, we incubated the fungus with siRNAs and measured its growth. To date, we've detected no difference in growth between siRNA-treated and untreated fungus. We are working on optimizing testing conditions and developing an assay to evaluate the efficiency of siRNAs. Our work gives insights into RNA interference in *M. phaseolina* and provides a framework for future siRNA testing.

NON-INVASIVE DETECTION OF INTRACRANIAL FLUID VOLUME SHIFTS USING WEARABLE HEADBAND

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Pathological increases in cerebral blood or cerebrospinal fluid volume have been linked to neurological complications and even death in patients who have had hemorrhagic strokes, traumatic brain injury, or have undergone neurosurgical or neurological treatments. The development of non-invasive techniques to measure and monitor shifts in intracranial volume have included the use of ultrasound, magnetic resonance imaging (MRI), and computed tomography (CT). However, these methods require expensive, specialized equipment and personnel that may not be available in many rural communities across rural Kansas. This study's focus was to develop a point-of-care, wearable headband capable of non-invasively detecting shifts in intracranial fluid volume in limited resource settings. The sensor consists of a single baseline component configured into a rectangular planar spiral with a self-resonant frequency response when impinged upon by external radio frequency sweeps. Preliminary human tests, approved by the Institutional Review Board (IRB) of Wichita State University, were performed to determine the feasibility of detecting fluid volume shifts. Participants were placed in a 15° head down tilt for approximately 30 minutes to induce an increase in intracranial fluid volume. During this induced bio-fluid shift, the sensor was applied to the forehead and data was collected. Validation of the increase in intracranial fluid volume was performed through non-invasive ultrasound measurements of the optic nerve. This study establishes the foundation for future work to optimize the sensor capabilities to monitor shifts in fluid volume and assist with medical scenarios including stroke, cerebral hemorrhage, or traumatic brain injury in limited resource environments.

ECONOMIC DEVELOPMENT AND JOB CREATION BY APPLYING OPTIMIZATION METHODS FOR SCHEDULING PROBLEM IN JOB SHOPS

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The manufacturing sector earned one of the top spots in 2017 Kansas economy adding over 1,000 jobs. This developing direction is predicted to continue with 0.5% growth in 2019. Within the manufacturing sector, aviation is ranked fourth in Kansas with over 30,000 workers. 44% of Kansans work for small businesses (less than 50 employees) and this percentage is projected to increase since the annual growth of small businesses in Kansas is projected as 6%. Therefore, this research aims to study typical operations in one of these small businesses in the aviation sector. The study evaluates the scheduling problem with the objective of minimizing total earliness/tardiness cost. A new model is proposed that considers the effects of maximum allowable tardiness. In addition, the existing model in the literature is simplified to reduce computational time and enable corporate scheduling staff to use the model efficiently. The model is validated using data collected from a local job shop that manufactures aerospace parts in Wichita, Kansas. The results show the effectiveness of the proposed model since it reduces the total cost and computational time in most of the studied scenarios. As a result, decreased costs and more satisfied customers are expected to bring more business to Wichita and lead to a significant increase in economic development and job creation.

THE IMMIGRANTS WHO BUILT KANSAS: ONE SPIKE AT A TIME

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The prevalent link in the position of Latino neighborhoods in cities throughout Kansas is the railroad. Whether it is Newton, Wichita, Topeka, Emporia or even larger cities like Los Angeles and Chicago, the proximity of Latino neighborhoods to the train tracks is no coincidence. The recruitment of Mexican Immigrant labor during the late 19th and 20th century expanded the railway and allowed for the economic growth of Newton, and many similar cities in Kansas. These workers who endured harsh working and living conditions managed, through solidarity, to forge tight-knit communities, all the while weathering the waves of anti-immigrant political sentiment at the county, state, and national level. Newton, Kansas has been a crucial geographical location where the railway traffic not only bridges east to west, north to south but internationally from Canada to Mexico creating a bullseye in the center of the country. Via archival research, I intend to shed light on the richness of Newton's Mexican Immigrant History through existing documents and pictures that remain at the Kansas Historical Society, Harvey County Historical Society, and local church records. History has often been used as an instrument to advance the narrative of those in positions of power molding a one-dimensional historical memory. However, history can also be a tool to correct the silencing of the past. It is only through a complex analysis of this narrative that is it possible to fully understand the value of the contributions Mexican immigrants have made not only to Newton but to the State of Kansas and beyond.

ORGAN MOTION PREDICTION IN MR-GUIDED RADIOTHERAPY

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According to the American Cancer Society, it is estimated that around 15,000 cancer cases will be newly diagnosed in the state of Kansas in 2019, from which around 4500 will be lung and abdominal cancers. Radiotherapy is a major treatment modality for cancer with more than half of all cancer patients receiving radiotherapy as part of their treatment. The goal of radiotherapy is to deliver a therapeutic dose of radiation to the clinical target volume while sparing the surrounding healthy tissue to the largest extent possible. However, internal organ motion during radiation delivery may lead to under dosing of the target volume or overdosing of the normal tissue, potentially causing treatment failure or normal-tissue toxicity. Organ motion is of particular concern in the treatment of lung and abdominal cancers, where breathing induces large tumor displacement and organ deformation. A new generation of radiotherapy devices is equipped with on-board MRI scanners to acquire a real-time movie of the patient's anatomy during radiation delivery. The goal of this research is to develop, calibrate, and test motion predictive models that employ real-time MRI images to predict the short-term trajectory of anatomical motion during radiation delivery. These motion predictive models have direct applications in motion-intervention strategies to control and correct for any dose discrepancy that may occur as a result of organ motion during the radiation delivery process.

GUIDECALL: A SYSTEM FOR REMOTE VIDEO CALL ASSISTANCE FOR BLIND AND VISUALLY IMPAIRED PEOPLE

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Blind or Visually Impaired (BVI) individuals often face many challenges when performing many daily tasks or while exploring new places that are not very accessible. Getting assistance from strangers is not always desirable in such situations. With the advancement of technology, BVI individuals can utilize assistive technology like screen readers or accessibility features on smartphones to solve some of these challenges, but there are many tasks that still require some sort of human assistance. Some current approaches to provide remote assistance are either too expensive or do not use helpers with whom a BVI individual can fully trust when receiving assistance. This research project develops an Android application called GuideCall that enables BVI individuals to draw assistance through a video call from their own sighted friends or relatives. With a single click, a BVI user can request assistance whenever needed from trusted helpers. Among the trusted helpers, one person is paired with the BVI individual through a video call. In addition to general assistance, the remote helper can track a BVI user's location surroundings through both outdoor and indoor maps integrated into the application. Preliminary evaluation results show GuideCall to be an inexpensive and effective tool for enhancing the opportunities for BVI people to be independent anywhere by providing the assurance that assistance is one click away.

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