17th Annual
Capitol Graduate Research Summit

February 26, 2020

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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Michael Rott INTRUSION DETECTION FOR 3D-PRINTERS:
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APPROACH

BUILDING A HOUSE OF JOY: THE CRAFT OF CROSS-GENRE POETRY AND THE PUBLISHER'S ROLE IN CONTEMPORARY KANSAS

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Comparing and contrasting my poetry collection, *House of Joy,* to other current works published by traditional and independent Kansas presses, such as Lori Brack's *Museum Made of Breath*, Kevin Rabas' *Lisa's Flying Electric Piano*, and Rupi Kaur's *milk and honey,* shows the way in which finding the extraordinary in the ordinary is a trend in contemporary Kansas poetry. I also utilize these books and others like them to analyze how place and characters are crafted. The critical portion of this project explores what the voices of Kansas are; the responsibility of the author as narrator in cross-genre poetry; the relationship between the author, the poetry, the presses, and the readers; and how my research and poetry adds to the discourse concerning cross-genre poetry and the future of Kansas publishing.

SILICONE-BASED, COST EFFECTIVE, ALTERNATIVES TO TRADITIONAL CASTING MATERIAL FOR LARGE-SCALE IMPRESSIONS

Ashley Haas[1], Mousa Al-Zubi[1], Ryan Rezzelle[2], and Melissa M. Bailey[1]
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Traditional casting materials such as AccuTRANS™ and Microsil™ have been used successfully for many years to create casts of small impressions, such as those caused by tools. Larger impression evidence has been traditionally cast with products such as dental stone; however, its use is limited due to the weight and fragility of the resulting cast. The goal of this research is to create a new material for casting that will be a cost-effective, storable, and durable option for use in making large-scale impressions. Test compounds were created from various combinations of caulking compounds and augmenting compounds such as liquid latex and calcium nitrate tetrahydrate (CNT). To date, the best impressions have been obtained using a combination of 100% silicone caulk and acrylic latex caulk. It has been possible to obtain a detailed and reliable cast of the impression after a drying time of approximately 3 hours for the size of impressions used in the study. Research is ongoing to further reduce the drying time while still producing a quality impression that retains integrity over time. Future research includes testing the optimized formula on a variety of substrates, temperature conditions, moisture conditions, drying time as a function of impression size, and assessing the scalability of the optimized compound.

PERIODIZATION OF THE NORTHEAST KANSAS LIBRARY SYSTEM (NEKLS)

Beth Hendrickson and Michael Widdersheim

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The movement towards a regional library system in Kansas grew throughout the 1950s and by 1967 the Northeast Kansas Library System (NEKLS) formed. This regional library system throughout its political history has had eleven different periods emerge from it, from 1950 to 2016, each focusing on a different issue. These issues resulted in either change or continuity for the system. These periods are important for understanding how regional library systems have been viewed by the state, whether implicitly or explicitly stated, and how this particular regional system has reacted to this. This research incorporates ideas from Widdersheim (2018), including periodization and decision cycles. The purpose of this project is to test a theory of public library development proposed by Widdersheim (2018). NEKLS was selected as the case because it seems to falsify the theory.

EFFECTS OF SEASONAL BURN TREATMENTS ON NATIVE PERENNIAL PLANTS AND POLLINATOR RECRUITMENT: IMPLICATIONS FOR PRAIRIE CONSERVATION

Bethany Roberton and Darren Rebar

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To restore tallgrass prairies, prescribed burns are often used to replicate the historic fires that played a key role in maintaining the expanses of herbaceous vegetation. Although much is known about the effects of spring-applied burns on grasslands, burns during other seasons are increasingly recommended as an alternative management practice. Unfortunately, the effects of these alternative burns on plant-pollinator interactions are poorly understood. My research addresses this gap in knowledge by examining the response of the plant community and its ability to recruit effective pollinators following three seasonal burn treatments (spring, summer, and fall). Using a replicated experimental design at the Ross Natural History Reservation (Americus, KS), I focus on three specific aims: determine the impact of seasonal burns on the native flowering community, establish whether native perennial plants differ in their ability to recruit pollinators, and determine the downstream consequences of burns in terms of reproductive success. Plants from the milkweed family (*Asclepias spp.*) were used to address these aims through plant and pollinator surveys, sucrose concentration of collected nectar, plant biomass, and seed viability assays. Results from the first field season of data collection indicate that summer burns increase plant diversity, and burn season has little effect on pollinator recruitment investment.

TESTING THE ABILITY OF ATTENUATED TOTAL REFLECTANCE FOURIER TRANSFORM INFRARED SPECTROSCOPY TO DIFFERENTIATE FORENSIC SOIL SAMPLES

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This experiment explored the feasibility of using attenuated total reflectance- Fourier transform infrared radiation (ATR-FTIR) as a preliminary method to identify and differentiate forensic soil samples in Lyon County, Kansas. Current methods used by soil scientists such as inductively coupled plasma- mass spectroscopy (ICP-MS), atomic fluorescence spectroscopy, x-ray fluorescence spectroscopy, and scanning electron microscopy- energy dispersive x-ray (SEM-EDX) are destructive, costly, and are not available in all forensic laboratories. ATR-FTIR is nondestructive and is commonly found in forensic laboratories for trace evidence analysis. 100 surface soil samples and 100 samples obtained 6 inches below the surface were collected in five diverse locations of the Ross Natural History Reservation (Ross) located in Lyon County, Kansas. A blind study was conducted with 25 additional soil samples from either the surface or subsurface from unknown locations of the Ross. All soil samples were dried, homogenized, and scanned using ATR-FTIR. Preliminary qualitative data displays a substantial spectral difference between the two layers of soil. An additional peak was present in rocky soil samples from the same site of the Ross. Furthermore, a considerable number of the unknown soil samples were correctly identified to their collection site and layer. The ability of ATR-FTIR to discriminate among the soil samples will be further assessed using principal component analysis. Results from this study thus far have confirmed the benefit of using ATR-FTIR as a preliminary screening tool in forensic soil analysis before diverting crucial resources towards additional analysis by a forensic soil expert.

RNA INTERFERENCE OF GENES WITHIN THE UNFOLDED PROTEIN RESPONSE OF THE PEA APHID (*ACYRTHOSIPHON PISUM*)

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Pea aphids (*Acyrthosiphon pisum*) are pests that cause billions of dollars' worth of crop damage each year. Control of these pests using RNA interference (RNAi) methods would be an incredible step forward in increasing the yield and financial gain from crop harvesting. RNAi allows us to target and inactivate specific transcripts of an organism's proteome using cellular machinery ubiquitous in all living organisms. The Unfolded Protein Response (UPR) stands out as a promising suite of targets for gene knockdown. The UPR is an adaptive and interconnected set of signaling pathways within all cells that activates in response to physiological changes caused by misfolding or aggregation of proteins. Upon activation, the UPR pathways use complementary mechanisms to propel the cell towards either survival or death, also known as cellular apoptosis. We will be examining the results of using RNAi on six genes (PDIA6, VCP, DNAJC3, PFD2, TRAF2, and ATF-6) associated with the UPR. We hypothesize that we will see a decrease in pea aphid survivability and fecundity upon knockdown of these genes.

WRONGFUL CONVICTIONS STEMMING FROM FALSE CONFESSIONS

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False confessions are a contributing cause of wrongful convictions. Research demonstrates the power that police interrogative tactics have in determining the likelihood of an individual falsely admitting to a crime. Further studies have indicated that it is not a simple task to distinguish between true and false confessions, but policy proposals can help individuals identify ways in which interrogations are held. This research evaluates the significance and consequences of false confessions and offers policy proposals to reduce the risk of wrongful convictions in the future.

AN AUTOETHNOGRAPHIC EXPLORATION OF LANGUAGE ACCULTURATION

BingBing Tao

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Although a number of studies have revealed that the language problem is a prominent difficulty for international students in their transition to a new setting, the research about international students' English language acculturation is insufficient. I utilized an autoethnographic approach (Ellis, Adams, & Bochner, 2011) to review and analyze the development of my four English competencies, including listening, speaking, reading and writing, during one and a half graduate education semesters. I then summarized several difficulties arising from the language barrier and discussed how to make full use of internal and external resources to adapt and improve English proficiency for international students. My experiences provide more reference materials for prospective students and educators in their understanding of international students' language acculturation.

INCREASING ADVANCED DIRECTIVE CONVERSATIONS AND COMPLETIONS IN PRIMARY CARE
Jenny Niblock
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Most patients want to maintain complete control of their choices in their healthcare decisions throughout their entire life. Yet, few Americans complete advanced directives or proper documentation to retain control of how and who makes their healthcare decisions through end-of-life care. According to Bern-Klug and Byram's (2017) study, less than 25% of Americans complete advanced directives. Despite legislation that mandates healthcare providers to ask patients if they have an advanced directive, most healthcare providers do not have advanced directive discussions with their patients (Spoelhof & Elliott, 2012). The purpose of this project was to develop standardized interventions to increase the number of conversations and the number of patients over the age 18 who complete an advanced directive with their health care provider in a rural, primary care clinic in Western Kansas. Over three months using a sample of preliminary data, results showed a 50% increase in conversations about advanced directive and completions of advanced directive documents using the interventions of increased advanced directive education and awareness for both healthcare providers and patients, development of easy-to-use resources, and use of the electronic medical record as a reminder tool. This project is currently under advisement for replication across clinics in Kansas and the nation. The ultimate goal of this project is for patients to have a voice in their end-of-life healthcare decisions leading to increased patient, provider and family satisfaction, higher quality of life for patients, and decreasing healthcare costs for all.

THE PROPENSITY TO MAKE ATTRIBUTION TO PREJUDICE ON THE ACCEPTABILITY OF RACIAL MICROAGGRESSIONS
Jordan Sparrow
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Recently, there has been an increase in empirical research focused on racial microaggressions (Wong, Dethick, David, & Okazaki, 2014). This research has focused on the detrimental impact for minority group members; yet, little is known regarding factors that influence when White individuals might find racial microaggressions to be acceptable. The current study examined how White privilege (WP) awareness (Pinterits Poteat, Spainerman, 2009) and the propensity to make attributions to prejudice (PMAPS; Miller & Saucier, 2018) might help to explain when White individuals find racial microaggressions to be the least acceptable. Participants were recruited from Amazon's Mechanical Turk (n = 202). Almost equal number of men (N =104) and women (N = 85) who identified as White/Caucasian completed the study, average age of 36.76 (SD = 16.51). WP awareness was negatively predictive of the acceptability of racial microaggressions [t(189) = -9.26, p < .001; β = -.56]. The PMAPS was a significant moderator [β = -.17; t (189) = -2.804, p < .001]. This effect appeared to be the strongest when both WP awareness and PMAPS were high (t = -5.83) compared to low (t = -3.18). Overall, high levels of WP awareness and PMAPS were associated with less acceptability of racial microaggressions. This is consistent with prior research which suggests that when individuals were placed in situations in which they anticipate a prejudiced scenario, they were more likely to report concerns about race relations (Sawyer, Major, Casad, Townsend, & Mendes, 2012). Implications and future research will be discussed.

EFFECTS OF PROSTATE CANCER AND EXERCISE TRAINING ON LEFT VENTRICULAR FUNCTION AND CARDIAC AND SKELETAL MUSCLE MASS

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Prostate cancer is the most common type of non-skin cancer found in men with above average incidence in Kansas. Recent evidence suggests prostate cancer independent of treatment has atrophic effects on whole heart and left ventricular (LV) mass associated with a reduced endurance exercise capacity. We tested the hypothesis that exercise training will mitigate prostate cancer-induced cardiac and skeletal muscle atrophy and improve LV function versus sedentary tumor-bearing counterparts. Copenhagen rats (n=39; ~5 mo. old) were randomized into four groups; exercise-trained tumor-bearing (EXTB) or control (EXCON) and sedentary tumor-bearing (SEDTB) or control (SEDCON). Dunning R-3327 prostate cancer cells were injected orthotopically in 19 of the 39 animals. Treadmill exercise training was performed for 60 min/day for ~30 days. Animals underwent echocardiography to examine ventricle dimensions pre-cancer injection or exercise (PRE) and 15 (Post 1) and 32-35 (Post 2) days post-cancer cell injection with tissues collected after Post 2. LV cytokine concentrations were measured post-mortem. Cardiac and LV mass of SEDTB animals were lower than all groups (p<0.05). Tumor mass was negatively correlated with LV mass in EXTB (-0.75, p<0.02) and SEDTB animals (-0.72, p<0.02). EXCON group had higher stroke volume Post 2 assessment compared to both sedentary groups (p<0.05), but not EXTB animals. No difference between cytokines was found between cancer groups. This study demonstrates the atrophic effects of prostate cancer on cardiac and skeletal muscle mass independent of anti-cancer treatment(s) can be mitigated with moderate intensity exercise. These findings have notable implications for potentially improving therapeutic outcomes and quality of life for prostate cancer patients.

BENEFICIAL RECOVERY OF AMMONIA FROM SWINE WASTEWATER FOR REUSE AS TARGETED SLOW RELEASE FERTILIZER

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Swine wastes contain high concentrations of nutrients and organic matter. Anaerobic membrane bioreactor treatment (AnMBR) of swine wastewater offers the benefit of simultaneous resource recovery as energy and water for indirect potable reuse, along with the potential for controlled capture of Nitrogen (as Ammonium) and Phosphorus (as Ortho-Phosphate). This study uses clinoptilolite clay, an abundant natural zeolite that is capable of selectively removing ammonium ions from the AnMBR treated permeate using the ion-exchange mechanism. Subsequently, the ammonia saturated clinoptilolite can be used as a slow release fertilizer for conventional or organic agriculture. Bench-scale experiments for ammonia removal from AnMBR treated synthetic swine effluent were undertaken. Further, soil incubation experiments aimed at using ammonia saturated clinoptilolite as a fertilizer is being carried out to understand the mechanisms of ammonia transformation and release in the soil. The maximum ammonia removal of 18.2 mg NH_4-N/g clinoptilolite was observed at initial concentration of 600 mg NH_4-N/L. The column study revealed that the breakthrough concentration of 20 mg NH_4-N/L (5% initial concentration) was reached after 16.7 Bed Volumes (BV) and 23.9 BV for the treated swine permeate and ammonium chloride solutions, respectively. Both external film and intra-particle diffusion were identified as the fundamental mechanisms for ammonia adsorption using clinoptilolite with intra-particle diffusion being the rate limiting step. Overall, implementing this study will enhance soil quality, prevent nutrient (N and P) contamination in surface water and groundwater aquifers while enabling sustainable recovery of ammonia from animal wastes for use as fertilizer.

FLUORESCENCE ASSAYS FOR DETECTION, DISCRIMINATION AND QUANTIFICATION OF SIDEROPHORES

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Iron is vital for bacteria, as it plays a central role in energy production, intermediate metabolism, DNA synthesis etc. Bacteria secrete siderophores that specifically chelate iron and actively transport this ferric siderophore complex. Siderophore production and ferric siderophore acquisition are frequently associated with microbial infections. To survive in hosts, pathogenic bacteria obtain iron with TonB dependent ferric siderophore transport systems. For example, the outer membrane protein FepA actively transports the iron complex ferric enterobactin (FeEnt), and the inner membrane protein TonB provides the energy for this uptake reaction. I created fluorescent sensors that monitor high affinity binding reactions, and used them to detect, discriminate and quantify ferric siderophores, as either isolated iron complexes or in complex mixture of metabolites and other biochemicals. By introducing site-directed Cys residues in bacterial iron transporters and modifying them with maleimide fluorophores, we generated living cells that bind but do not transport target compound. By cloning, genetically engineering and fluoresceinating ferric siderophore transporters, we created specific sensors for the native, degraded and glucosylated forms of the catecholate ferric enterobactin, for the hydroximates ferric aerobactin, ferrichrome and ferrioxamine B, for the porphyrins hemin and vitamin B_{12}. When employed in spectroscopic analysis, these constructs sensitively detected ferric siderophores, and measured their concentrations in solutions. Sensitive Assays of Biochemical specificity, affinity, and capacity are valuable for both basic research and drug discovery. The sensors, which we created monitored production of siderophores by the pathogens, each of which manifested a particular profile of iron chelator production.

CONSERVING KANSAS COMMUNITIES THROUGH VOLUNTARY GROUP EFFORTS TO MANAGE OGALLALA GROUNDWATER

Stephen Lauer and Matthew Sanderson
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Rural farm communities in western Kansas rely on groundwater from the declining Ogallala aquifer. We present findings from a four-year, USDA-funded research project on the values and motivations for groundwater conservation among Kansas producers (farmers). We conducted a survey of 1226 producers across the Ogallala aquifer region (279 in Kansas), 41 interviews with Kansas producers, and a case study of the Wichita County Water Conservation Area. An overwhelming majority of Kansas producers believe that Ogallala groundwater should be conserved. Their primary motivations for groundwater conservation are securing their way of life for future generations, supporting their local communities, and preparing for droughts. While most Kansas producers believe that they are already doing all they can individually to conserve water, producers involved in voluntary group efforts like Local Enhanced Management Areas and Water Conservation Areas are finding additional ways to conserve. Voluntary group efforts have tremendous opportunity to grow. While only 4% of Kansas producers are currently involved in organizing voluntary group conservation efforts, 81% are open to the possibility that such efforts can solve problems and 79% believe they might personally have something to contribute. Successful voluntary group conservation efforts involve: diverse stakeholder representation, an early focus on team-building, hiring an outside facilitator, frequent, respectful community outreach, and partnering with state and local government. Voluntary group efforts are effective at conserving groundwater and merit state support to help local organizers succeed and to create a social and political environment that encourages producers to participate.

FUNCTIONAL STARCH PROPERTIES OF EXTRUSION PRE-COOKED CHICKPEA FLOURS

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Chickpeas and pulses are rapidly becoming a popular ingredient in today's food industry. Chickpeas provide many benefits including being nutritious and sustainable. Some drawbacks to chickpeas include a poor functionality in baked products. Extrusion processing was proposed to pre-cook the starch and remove volatile and anti-nutritional compounds. Different varieties processing conditions were tested to create a pre-cooked flour that was then analyzed. Milling flow sheets were previously developed to produce a meal (300-750microns) from whole and split chickpeas. Two varieties of chickpeas, D and K, were milled at Hal Ross flour mill to produce a de-hulled chickpea meal that was then extruded using a pilot scale twin screw extruder, dried, and then milled back into a flour (<150 microns). Flours were evaluated on degree of starch cook, damage, and functionality in baked crackers. A commercial pre-cooked chickpea flour was used for comparison. Varietal differences led to different specific mechanical energy trend and cooking that lead to appearance and shape differences in intermediate extruded products. Varying extrusion processes lead to differences in color, water absorption, paste viscosity, and cracker texture than raw or commercial samples. Extruded chickpea flours (ECPF) have a higher cold paste viscosity than both raw and commercial chickpea flours. Crackers baked with ECPF sheet better than raw flours showing enhanced functionality. ECPF has better cold paste functionality than raw or commercial flours. Extrusion provides a sustainable low water method to enhance the properties and characteristics of chickpeas.

SELF-COMPASSION IN THE AFTERMATH OF SEXUAL VIOLENCE

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School of Family Studies and Human Services, Kansas State University

Sexual violence (completed or attempted rape, sexual coercion, and unwanted sexual contact) is common with higher rates for women, some racial and ethnic minorities, and gender and sexual minorities. The medical model of trauma has been used to understand the aftermath of traumatic events in general, however, feminist critiques of this model have argued that the experience of sexual trauma is different due to many contextual factors such as insidious trauma from marginalization and the lack of accountability for sexually violent offenders. Self-compassion is a two-factor construct that describes either the kindness we offer ourselves (self-warmth) or the self-judgment we experience (self-criticism) during difficult times. This may be an important construct for treatment after sexual violence, but research is limited. The sample consisted of 368 women (88.6% white, 94.6% straight) recruited from a large undergraduate class over two semesters who completed an online survey at three time points through the semester. A path analysis was conducted to explore the possible mediating role of self-warmth and self-criticism in the relationship between sexual violence and mental health outcomes. Sexual violence was significantly associated with more self-criticism, anxiety, depression, and PTSD symptoms. Self-criticism mediated the relationship between sexual violence and mental health outcomes. While there was evidence that self-criticism contributes to worse mental health outcomes, there was limited evidence that self-warmth contributes to better mental health outcomes. Future research should look into how survivors of sexual violence are conceptualizing the core concepts of self-compassion in order to improve both measurement and treatment.

EFFICACY OF NOVEL, REDUCED-RISK INSECTICIDES AS AN ALTERNATIVE MANAGEMENT TACTIC FOR POST-HARVEST INSECTS IN FOOD FACILITIES

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One fifth of all wheat grown in the United States is grown in Kansas. Kansas stores more wheat than any other state. Kansas's farmers produced 645 million bushels of corn in 2018, ranking 5th in the country for corn acreage planted. However, every year, 10-30% of cereal crops such as corn and wheat, are lost to insects after harvest. The most important stored products insect pests of corn and wheat are the maize weevil (*Sitophilus zeamais*) and the invasive larger grain borer (*Prostephanus truncatus*). Weight loss in corn grains due to these insects is about 10–20% and 34–40%, respectively. Given the importance of these global staple crops, and their particular relevance to Kansas's agriculture, it is therefore imperative to develop and utilize new management tools to protect these commodities from post-harvest insect pests. In this study, we investigated the efficacy of a new insecticide, the insect growth regulator combined with the pyrethroid deltamethrin and the synergist piperonyl butoxide (Central Life Science), at inducing mortality and causing sublethal changes in movement for adult *P. truncatus* and *S. zeamais* exposed on a treated concrete surface for varying periods. We were able to induce significant mortality and reduced movement for individuals exposed to the new compound compared to controls. Overall, these results suggest that this new insecticide combination is a very promising tool for controlling these insects in warehouses where bagged corn is stored, and could be incorporated in integrated pest management programs to protect stored maize.

HARNESSING THE WILD SIDE TO IMPROVE WHEAT CURL MITE RESISTANCE

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Genetic diversity is the foundation for crop breeding. When genetic diversity is scarce, we can turn to crop wild relatives as donors of novel sources of diversity. *Aegilops tauschii* is the donor of the D genome of the cultivated bread wheat. It has been used as a valuable source of novel genes for many economically important traits such as pest and disease resistance. Wheat curl mite (WCM) is a threating pest for wheat, mainly because of vectoring wheat streak mosaic virus. The objective of this study was to characterize a diverse panel of *Ae. tauschii* accessions against WCM and identify genomic regions associated with resistance that can be used with marker assisted selection to breed wheat against WCM. We tested 234 accessions of *Ae. tauschii* (109 from Lineage 1 and 125 from Lineage 2). WCM infestation was performed under controlled conditions and the plants were tested 14 days after infestation. Phenotypic response to WCM was recorded using a 0 to 4 scale, where 0 was resistant (R) and 1-4 different levels of susceptibility (S). Genotyping-by-sequencing data was used to map genomic regions associated with WCM resistance using genome wide association study. The diverse panel resulted in 190 S and 44 R accessions. Strong population structure was identified within the accessions, consistent with the lineages. Mapping analysis resulted in a strong association to resistance on chromosome 6S. This study identified genomic regions involved in resistance to WCM in wild wheat. Further analysis of these regions will reveal if they are novel or already present in cultivated wheat varieties.

BAND OF BROTHERS (AND SISTERS): GENDER FRAMING IN U.S. ARMY COMMERCIAL ADVERTISING
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The U.S. Army spends over 7 billion dollars in recruitment advertising, with its largest percentages going toward television marketing. However, little research has been dedicated to military advertising besides strategic recommendations. This project offers a critical investigation on the depiction of gender in military advertising in relation to framing theory. A content analysis on a sample of 54 U.S. Army commercials produced between 2008 and 2018 offers an exploratory discussion on how gender is visually and verbally framed within the Army's advertising. Results indicated that the visual framing of gender surrounded by independent variables such as frequency, depiction, clothing, location, and overall visual focus were significant. Results indicated that the verbal framing of gender through variables such as narration and frequency of verbal focus within a clip were significant. This study found that males were more likely to be depicted in combat roles (97.8%), than females (2.2%). Although formally 'allowed' in combat roles, the commercials studied within this project still feature females more prominently in traditional gender roles such as civilian spouses (88.9%) and as medical aid (68.8%). Narration was always masculine. This study found significant correlations between gender and a range of variables in U.S. Army advertising. It also opened a new realm for possible exploration, looking at gender across Armed Forces advertising. Within this study, it appears females are featured less prominently than males in U.S. Army Commercials and in traditional gendered roles. However, future research is needed to study the implications of this study's findings.

SEASONAL EFFECTS OF COVER CROPS AND PHOSPHORUS FERTILIZER MANAGEMENT ON PLFA AND MICROBIAL BIOMASS IN A NO-TILL CORN-SOYBEAN CROPPING SYSTEM IN NORTH EASTERN KANSAS
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Soil microorganisms are integral to soil health, specifically in their contribution to nutrient cycling. Soil management techniques have been shown to impact the community structure of soil microorganisms. To better understand the interaction between crop management and soil microorganism composition, this study explored the effect of cover crop and phosphorus (P) fertilizer management on microbial community structure. Soil samples were collected from the Kansas Agricultural Watershed Field Laboratory to assess microbial community composition and size at one soil depth (0-5 cm) in spring 2018 and at three soil depths (0-5, 5-10, and 10-15 cm) in fall 2018. The experiment has a 2 by 3 factorial treatment structure with two levels of cover crop (with and without) and three levels of P fertilizer management (control, fall broadcast, and spring injected) in a randomized complete block design with three replicates of each treatment combination (18 plots total). Soil samples were analyzed for Phospholipid fatty acid (PLFA) and microbial biomass C and N. At the 0-5 cm depth, microbial biomass from PLFA analysis was significantly higher across cover crop treatments than in non-cover crop treatments, regardless of fertilizer treatment. The presence or absence of cover crops did not change the ratio of microbial composition in any category of the PLFA analysis which included a breakdown of fungi, bacteria, and eukaryotes. P fertilizer management was found to have a minimal impact on microbial biomass and PLFA analysis. This work further contributes to understanding how microbial communities respond to cover crop and P fertilizer management.

MEDICAL TOURISM PATIENT MORTALITY: HEALTH COMMUNICATION STRATEGIES TO REDUCE RISK & IMPROVE SURVIVAL

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Medical tourism is a process through which a consumer travels from his/her normal place of residence (usually to another country), receives medical treatment thus becoming a patient. Patients Beyond Borders (PBB) forecasts some 1.9 million Americans will travel outside the U.S. for medical care in 2019 (PBB, 2019). The present study explores media representations of patient mortality associated with medical tourism in the global news media between 2009-2019, in order to better understand how the deaths of medical tourism patients are framed to global audiences. A qualitative content analysis of 50 patient mortality cases originating in India, China and the West found that (1) a majority of global media representations of medical tourism patient death are middle-class, minority female populations between 25-55 years of age who seek cosmetic surgery internationally, (2) sudden death, grief and bereavement counseling is unavailable from medical tourism providers (MTPs) to the families and friends of these patients, and (3) the risk information from authority figures within the media reports is often vague and abstract. A detailed list of health communication recommendations and considerations for future medical tourists and their social support systems is provided. These findings call attention to the need for scholarly research to further explore the health information seeking behaviors and health literacy of medical tourists, and the development of intervention materials to guide patients through the medical, legal and financial planning process.

ARE ACOUSTIC LURES EFFECTIVE TOOLS TO INCREASE IMPERILED BAT CAPTURES?

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Tricolored bat (*Perimyotis subflavus*) populations in southeastern Missouri have declined since the introduction of white-nose syndrome (WNS) in 2012. Prior to WNS introduction, little research focused on the roosting ecology of tricolored bats in Missouri. Our research objective is to address this deficiency by identifying maternity day roosts through radio-telemetry of females; however, attempts to radio-tag and capture tricolored bats during our pilot season in 2018 were unsuccessful. We hypothesized that incorporating an acoustic lure during mist net surveys may increase mist net captures of tricolored bats, allowing us to tag more females. In our modified study during 2019, we mist netted at 14 sites across Shannon, Carter, and Reynolds counties twice, with and without the acoustic lure to measure its effectiveness. We supplemented our mist net surveys with acoustic detectors to account for tricolored bats responding to the lure, although not captured. We captured two tricolored bats with the lure and none without the lure. Our acoustic survey results are undergoing analysis. We anticipate expanding our research into a second year to try and increase our sample size. WNS-suspectable species such as tricolored bats are rare and difficult to capture, and a lack of captures should not conclude that the species is extirpated from an area. Instead, additional tools should be explored and integrated into mist net surveys, such as acoustic detectors and lures. Maximizing survey effort with multiple survey tools is a holistic and necessary approach for documenting WNS-susceptible species.

DOXORUBICIN-BASED PRODRUG AND ACTIVATABLE MR NANOPROBE FOR THE IMAGING AND TREATMENT OF CANCER

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Magnetic Resonance Imaging (MRI) is increasingly being used as a diagnostic tool for cancer. We propose a novel molecular probe, "Gadolinium-DTPA disulfide-bonded Doxorubicin (Gd-DTPA-SS-Doxo)" as an activatable prodrug for the treatment of cancer. In addition, this prodrug when encapsulated in iron oxide nanoparticles (IONPs), provides activatable MR imaging capability for the subsequent diagnosis of cancer. In this work, we first synthesized Gd-DTPA-SS-Doxo and characterized using various spectroscopic methods. Then, Gd-DTPA-S-S-Doxo was encapsulated within the poly (acrylic acid) (PAA) coating of iron oxide nanoparticles (IONPs), producing an activatable MR nano-prodrug (IO-Gd-DTPA-SS-Doxo) with quenched longitudinal spin-lattice MR (T1) signal. After receptor-mediated internalization, Gd-DTPA-SS-Doxo is released from the nanoprobe's polymeric coating due to the acidic microenvironment of the tumor. The results indicated that due to presence of higher concentration of glutathione in the cytoplasm, the disulfide bond of the molecular probe is cleaved and the molecular drug Doxo is released. This results in a subsequent T1 activation for MR imaging and cytotoxic effect to the tumor. The proposed research would provide a nanoplatform for the dual mode MR imaging and targeted treatment for cancer and the results will be highlighted in this presentation.

A COMPARISON OF PHYSICAL ACTIVITY AND CARDIORESPIRATORY FITNESS IN MIDWEST FIREFIGHTERS

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Firefighters (FF) are at a risk for cardiovascular events (e.g., heart attack) due to rise of physical inactivity and obesity. **Purpose:** To compare measured physical activity (PA) and cardiorespiratory fitness (CRF) between two fire departments (FDs). **METHODS:** Two independent FDs from the Midwest participated in the study. Waist circumference (WC) and body mass index (BMI) were used to classify obesity status. FFs were classified as obese if they had a WC$\geq$102 cm and BMI$\geq$30 kg/m^2. FFs wore an accelerometer to track PA and associated intensities for the duration of their department's tour, which consisted of on- and off-duty days. FFs completed a stage-graded treadmill exercise test in their bunker gear (pants, boots, and jacket) to determine maximal oxygen uptake ($\dot{V}O_{2max}$). **RESULTS:** FD one (FD1) had 29 FFs complete the study (age:34.45$\pm$7.15 years; BMI:28.97$\pm$2.52 kg/m^2; WC:96.48$\pm$7.45 cm) and FD two (FD2) had 11 complete the study (age:36.18$\pm$4.29 years; BMI:27.9$\pm$4.00 kg/m^2, WC: 94.95$\pm$6.41 cm). Six FFs were classified as obese. There were no differences between the two departments for sedentary (t(38)=-0.485, p>0.63), light PA (t(38)=0.167, p=0.87), and moderate-to-vigorous PA (MVPA) (t(38)=0.046, p=0.96), or in CRF between FD1 and FD2 with $\dot{V}O_{2max}$ of 40.82$\pm$6.95 and 39.51$\pm$4.77 mL·kg^{-1}·min^{-1}, (t(38)=-0.576, p=0.58). Both departments met the ACSM's recommendation of at least 30 minutes of MVPA per day. However, they did not meet the NFPA's CRF recommendation of $\dot{V}O_{2max}$=42 mL·kg^{-1}·min^{-1}. **CONCLUSION:** This data demonstrates the need for increased focus on improving physical activity levels to improve overall health and wellness in FFs.

EXPANDABLE GRAPHITE AS AN EFFECTIVE FLAME-RETARDANT IN BIO-BASED RIGID POLYURETHANE FOAMS

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Polyurethanes are an important class of polymers because of their various industrial applications in automobiles, construction, medicine, packaging, furniture, thermal, and electrical/vibration insulation. Polyurethane foams can be flammable due to their high surface area and porosity. The addition of efficient flame-retardants in polyurethane foams can suppress the flammability, bringing enhanced safety to building, constructions and enables it to be used even in firefight equipment. Blended flame retardants have advantages for presenting low energy use, easy processing and low cost. If compared with reactive flame retardants they are able to achieve almost similar properties with a lower overall cost. In this work carvone, a bio-based oil that has a characteristic aroma of the bay leaf was used as a starting material along with 2-mercaptoethanol for the synthesis of a novel polyol. The unsaturation in carvone structure act as a reactive site for the mercaptan under UV-light enabling the thiol-ene click reaction. Then expandable graphite and carvone based polyol were used to make flame-retardant polyurethane foams. All foams that were obtained showed a closed content cell around 95%. The sample with carvone based polyurethane blended with expandable graphite showed a compressive strength of 175 kPa and decreased the burning time from 87 seconds (40.70% weight loss) to 11 seconds (3.55% weight loss). By using the collected data it was possible to conclude that a facile and cheap carvone based polyol blended with expandable graphite yielded a very effective flame retardant with high compressive strength rigid polyurethane foams.

DEVELOPING SUSTAINABLE CITIES IN KANSAS: A FRAMEWORK AND METHODOLOGY FOR THE SUCCESSFUL REDUCTION OF GREENHOUSE GAS EMISSIONS

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The development of sustainable communities is beneficial to future of not just countries, but to states. With the negative effects stemming from globalization, including resource scarcity, increased immigration and migration, as well as climate change, being able to identify the key factors that lead to the sustainability of communities is imperative. This research provides an analysis of the trends in greenhouse gases from 2005-2017 in the city of Lawrence, KS and demonstrates how Lawrence has been able to successfully reduce its greenhouse gas emissions over the course of a little over a decade. At both the community and the government levels across multiple economic sectors, the city of Lawrence has successfully been able to meet its goals in greenhouse gas emissions reduction. This research provides a framework and methodology for local governments to identify and reduce greenhouse gas emissions. The results highlight the influence of business attraction, alternative and sustainable energy sources, as well as economic development and sustainable water supply implementation in the city. Recommendations for future policy in sustainability are provided.

ESTABLISHING INTEGRATED CARE FOR IMPROVING PREGNANT AND PARENTING WOMEN WITH OPIOID USE DISORDER

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The increase of opioid misuse has become an opioid epidemic and a major public health concern due its impact on the user, family, health systems, and children. Rates of neonatal abstinence syndrome (NAS) have increased by 500% nationwide, with an annual percent increase of 18. 9% in Kansas. Pregnant or post-delivery women with opioid use disorder (OUD) are at high-risk for adverse outcomes prenatally, birth, and postnatally. An integrated care approach can help improve pregnant women with OUD engage in care, access to physical and behavioral health services, lowering healthcare costs, and expanding health coverage. However, currently there are limited resources and no integrated treatment for expectant mothers with OUD. The University of Kansas Medical Center (KUMC) has diverse mother and infant medical providers that work with expectant mothers with OUD and infants with NAS but work in siloes. Still, KUMC is in the position to leverage the strengths of the departments and collaborate to provide one of the best integrated care services for mothers and infants with NAS in the state. Our objective is to provide a systematic evaluation of competing demands, information and resource gaps, patient and physician attitudes, barriers and time constraints using a collaborative facilitator (research assistant) by engaging mother and infant medical providers at KUMC. Identifying the needs of the departments, coupled with the needs of the families we can begin to develop strategies to overcome barriers and develop a well-defined integrated approach to treating, managing, and supporting mothers with OUD and their infants.

TEACHING AMIDST TRAUMA: IDENTIFYING THE IMPACT THAT TRAUMATIZED STUDENTS HAVE ON K-12 TEACHERS
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Teacher attrition rates in the United States continue to shock those outside the field of education. An astonishing 40-50 percent of novice teachers, those who have taught five or fewer years, leave the field of education altogether (Ingersoll, Merrill, & Stuckey, 2014). Every day, within our schools are large numbers of teachers who are no stranger to the emotional ups and downs of teaching. Many teachers are suffering secondary traumatic stress (STS). STS is characterized by the extreme stress experienced as a result of direct exposure to traumatized individuals. Key to the definition of STS is that its origins lie in the knowledge of the traumatic event (Figley & Kleber, 1995). It is with this knowledge that the transmission of trauma from student to teacher takes place. The symptoms of STS are akin to those of posttraumatic stress disorder (PTSD). The present research takes a sample of 36 elementary school educators in a Title I school in Kansas. Quantitative data were gathered using the Professional Quality of Life (ProQOL) instrument. The ProQOL measures compassion fatigue, burnout, and secondary traumatic stress. Data were analyzed both in a comprehensive picture of the school environment but also disaggregated by demographic questions which included years spent in the profession, gender, and history of personal trauma. This information will be useful in directing school leaders to identify ways to identify, prevent, and hopefully work to heal STS in their staff members. We must protect the most valuable resource in our public schools: teachers.

THE IMPACT OF MEDICAL MARIJUANA LAWS ON COLLEGE STUDENTS' MENTAL HEALTH, DRUGS SUBSTITUTABILITY, AND ACADEMIC OUTCOMES
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As of October 2019, 33 states and the District of Columbia have passed medical marijuana laws (MMLs). To the author's knowledge, there are no studies on the impact of marijuana laws on college students' mental health and only a few have examined their impact on students' academic outcomes. In this paper, I use restricted data from the Healthy Mind Study Questionnaires (HMS) from 2009 to 2017. I exploit the variation in marijuana laws and estimate the effect of marijuana legalization on students' psychological well-being, changes in psychiatric prescription and recreational drug use, as well as the academic outcomes. The results in this paper show that with legal access to medical marijuana, there is no evidence of changes in students' mental health. Yet, I find strong evidence of substitutability between medical marijuana and prescription drug use, as prescription drug use decreases by 9 percent following the passage of MMLs. In addition, while no association is found on behavioral changes on alcohol and cigarette consumption, recreational drug use of marijuana and cocaine has gone down by 1 to 5 percent post-legalization. It is suggestive that prior to MMLs, there had been self-medication involved among students. Lastly, MMLs are associated with better academic performance among college students. A potential mechanism could be medical cannabis is offering a better symptom control with fewer side effects than traditional prescription drugs which could be hindering students' ability to study and excel academically in the past.

HIGH-RESOLUTION SENSORS FOR ASSESSING THE IMPACT OF RAPID LAND USE ON WATER QUALITY VARIABILITY IN SURFACE STREAMS

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Water quality in surface streams is highly affected by upstream land use, including the contribution of point sources (e.g. wastewater treatment facilities) and non-point sources (e.g. leaching from agricultural landscapes). Recently, the development of high frequency sensors has revolutionized the world of water quality monitoring and enabled scientists to gain a better temporal insight into stream processes, which are otherwise overlooked using traditional weekly to monthly sampling. Here we use a suite of sensors, collecting 5-minute data, to quantify anthropogenically-induced variability in water temperature, dissolved oxygen, conductivity, pH, turbidity, fluorescent dissolved organic matter (fDOM), chlorophyll-a, phycocyanin, and nitrate (NO3-). Three watersheds in rapidly urbanizing Johnson County, Kansas, (population increase of 32% from 2000 to 2018) were chosen for this study, including the highly urbanized Indian Creek (98.3% urbanization), the mixed land use Mill Creek (67.4% urbanization), and the agriculturally dominated Blue River (20.8% urbanization). The watersheds provide a unique comparison as they are very similar in drainage area, soil composition, meteorological conditions, and geology, in addition to being adjacent to one-another, but vary considerably in land use and contributions from wastewater treatment facilities (WWTF). Our results show that Indian Creek has the highest mean value of organic matter and nutrients compared to Mill Creek and Blue River. Moreover, the results indicate that point-source loading of WWTF discharge, high in organic matter and nutrients, could persist within urbanized streams. Continuous water-quality monitoring of these sites is to be continued for comprehensive evaluation and understanding of constituents' variability and loading characteristics.

REDUCTION OF SUPERSONIC JET NOISE BY MODIFYING THE NOZZLE EXIT GEOMETRY

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One reoccuring issue that is imbedded with high-performance military aircraft is jet noise. The takeoff from an aircraft carrier involves supersonic jet noise that has proven to be a challenge to mitigate and control. As a result, flightdeck personnel working near these aircraft often receive auditory damage. In response to this issue, the Department of Defense (DoD) has invested heavily in federal research efforts such as the Strategic Enviornmental Research and Development Program (SERDP) to develop technologies to protect our servicemembers from such issues. This project, which has been conducted at The University of Kansas and funded by SERDP, aims to develop a new and innovative way to mitigate the excessive noise pollution generated by current supersonic military aircraft exhaust systems, thereby improving the DoD's ability to protect its flight deck personnel from dangerous levels of jet noise. The jet noise mitigation technique is performed by introducing swirl vanes within the supersonic region of the exhaust nozzle. The behavior of these vaned-nozzles were tested experimentally as well as computationally to analyze their acoustic signature from various far-field observer locations. It was found that these swirl vanes promote the mixing between the high-speed exhaust gases and the slow-moving atmospheric air. This enhanced mixing, through a complex interaction of physical phenomena, decrease the noise observed from a far-field observer by ~3dB.

University of Kansas

DEVELOPMENT OF A NANOFLUIDIC DEVICE FOR DETECTING CANCER

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We seek to interrogate cancer DNA found in circulating biomarkers of cancer, isolated from blood to enable precision medicine called liquid biopsy. To this end, we have fabricated a micro-nanoscale sensor featuring pillared arrays to perform solid-phase ligase detection reactions (spLDR) to analyze mutations responsible for cancer. spLDR products will be detected and identified by the travel times and current drop between polymer nanochannels having two in-plane nanopores. Simulations (COMSOL) for fluid dynamics and electrical currents modeled before fabrication indicate uniform flow though pillar regions and a majority of electric field drop across the flight tube. Both ensure the working principle of the device, having uniform DNA loading across the device and LDR product entrance into the flight tube, will be maintained. Micron scale access channels on a Si master were fabricated using photolithography and etching while nano-features were fabricated using focused ion beam (FIB) milling. Functional devices were then produced through nanoimprint lithography (NIL), a replication technique relying on pattern transfer from the Si master to polymer devices. Subsequently, fluid dynamic experiments using a fluorescent dye was injected to confirm the effective loading of products into the nanosensor. Further, short DNA strands were electrokinetically driven into the nanochannel which reaffirmed the results from COMSOL and assured the feasibility of the device to detect cancer DNA from blood. Further, spLDR will be performed in the device to establish more consistency to detect cancer clinically. Thus, this device will facilitate a more cost effective and an efficient way to detect cancer.

EXPLORING HOW AND WHY MUSIC INTERVENTIONS INFLUENCE THE ABILITY TO REMEMBER SPOKEN INFORMATION IN ADULTS WITH ACQUIRED BRAIN INJURIES

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The purpose of this research project is to examine music's influences on verbal memory (ability to remember spoken information) in adults with acquired brain injuries, such as strokes and traumatic brain injuries. Acquired brain injuries may cause difficulty remembering spoken information in some individuals, which can disrupt conversation and task completion. This research project analyzes how and why several music interventions influence verbal memory in adults with acquired brain injuries. The findings show that (a) daily 1-hour listening of preferred songs is associated with structural changes in the brain and verbal memory improvement in adults with acute strokes, (b) piano lessons are linked to structural changes in the brain and enhanced mechanisms involved in attention, learning, and memory retrieval in adults with mild traumatic brain injuries, and (c) learning verbal information through songs is more effective for memorization and recall than learning verbal information through spoken forms in adults with strokes. Although more studies are necessary, these music interventions appear to positively influence verbal memory in adults with acquired brain injuries. Their improved verbal memory may facilitate interactions with others, which can be especially meaningful for affected individuals and their loved ones. Moreover, verbal memory improvement may aid adults with acquired brain injuries in returning to work, and this outcome may lead to greater financial stability for affected individuals and their families.

COGNITIVE ASSESSMENT IN OLDER ADULTS WITH DIABETES MELLITUS: A RETROSPECTIVE ANALYSIS

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Approximately 10% of the United States (US) population has diabetes diagnosis, a condition that leads to multiple complications including cognitive dysfunction. Healthcare professionals are recommended to routinely screen diabetic patients older than 65 years for cognitive function. The MMSE and the MoCA are neuropsychological tests commonly used for cognitive assessments. However, it is not clear whether these tests have been performed to screen diabetic patients older than 65 years at the University of Kansas Hospital (KUH) outpatient clinics. De-identified biomedical data through June 2017 from 45,048 patients with diagnosis of diabetes mellitus, who were older than 65 years, and who had performed either MMSE or MoCA tests at KUH outpatient clinics was extracted from the Healthcare Enterprise Repository for Ontological Narration (HERON) database. From 45,048 diabetic patients older than 65 years, 366 (0.81%) had performed the MMSE and 393 (0.87%) had performed the MoCA; that is, 759 (1.68%) patients total. From out of this pool of 759 patients, 202 (26.61%) were also diagnosed with Alzheimer's disease, 279 (36.76%) also diagnosed with Parkinson's disease, and 192 (25.30%) also diagnosed with Mild Cognitive Disease. De-identified data on MMSE and MoCA scores were only found in patients seen at the KUH Alzheimer and Memory and Neurology clinics. This study highlights the underperformance of cognitive assessment in older adults with diabetes. Cognitive screening on older adults with diabetes may lead to early diagnosis of cognitive decline. Future studies should extend this investigation to patients without secondary neurological conditions, using more comprehensive databases.

SCREENING MILITARY VETERANS FOR POST-TRAUMATIC STRESS DISORDER (PTSD) IN THE CIVILIAN PRIMARY CARE SETTING

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Per the National Center for Post-Traumatic Stress Disorder (PTSD), practitioners under recognize PTSD, meaning patients with undiagnosed PTSD are not receiving necessary care. This quality improvement project implemented a screening and referral process in the civilian primary care setting for veteran status and PTSD. Veterans receive primary care in civilian clinics where primary care providers may not be equipped to evaluate for PTSD. The literature supports that screening patients for veteran status and PTSD symptoms is effective and feasible. The Primary Care PTSD Screen (PC-PTSD) and PTSD Checklist for Primary Care (PCL-5) are validated tools appropriate for civilian primary care clinics. Project implementation was at a rural Kansas primary care clinic. Over a three month period, all adult patients were asked about veteran status, and then administered PC-PTSD and PCL-5, as indicated by responses. Of 239 unique patients screened, 26 patients (10.9%) were veterans, and thus were provided with contact information for the Veterans Crisis Line, should this be needed at a later date. Out of the 26 veterans, one patient (3.8% of veterans; 0.42% of total screened) screened positive for PTSD symptoms, necessitating a need for referral to treatment for PTSD. In FY2017, 194,186 veterans were living in the state of Kansas. Unrecognized and untreated PTSD has been found to impact physical health, interpersonal relationships, work, and school, not only for the veteran, but the family and community. Therefore, implementation of routine screening in primary care has the potential to positively impact many Kansas residents, families, and communities.

TARGETING BLADDER CANCER WITH CINNAMALDEHYDE AND TRANS-CINNAMIC ACID

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Bladder cancer is the fourth most common cancer in Kansas men and among the top ten most common in Kansas women, yet treatment options remain limited. Cinnamaldehyde is a naturally occurring compound found in cinnamon and cranberry that has shown in-vitro and in-vivo inhibition of multiple different cancers. Cinnamaldehyde is predominately excreted in the urine as cinnamic acid, which has also shown promising anticancer properties. The ability of Cinnamaldehyde and Cinnamic Acid to target bladder cancer cell growth in-vitro is the subject of this investigation. Bladder cancer cell lines 253JBV, T24, UMUC3, and normal uroepithelial were selected. Hexosaminidase assay was used to assess proliferation. 500 viable cells were seeded and incubated for 10 days evaluated for colony formation. Cell cycle analysis was performed with FACS Calibur flow cytometry. Cells were cultured and assessed for spheroid formation at 5 days. Spheroids were trypsinized and analyzed after 5 days incubation for secondary spheroid formation. Cinnamaldehyde inhibited proliferation, colony formation, primary and secondary spheroid formation, and induced G2-M phase arrest in bladder cancer cell lines. Cinnamaldehyde increased Cisplatin and Mitomycin B cytoxicity and led to cancer cell apoptosis via Caspase3/7 induction. No inhibition of normal urothelial cells was seen until concentrations of cinnamaldehyde twice cancer cell IC50. Trans-cinnamic acid inhibited proliferation of bladder cancer cell lines. In conclusion, cinnamaldehyde and trans-cinnamic acid inhibit bladder cancer cell growth and cancer stem cells in-vitro, and in-vivo models are warranted.

CONCORDANCE OF BETA-AMYLOID PET IMAGES USING A GENERALIZED LOGISTIC MIXED MODEL FRAMEWORK

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Imaging technologies for detecting beta-amyloid in patients with suspected Alzheimer's disease have advanced. It is important to identify factors that contribute to diagnoses based on these images, especially qualities that contribute to reader concordance, as patients might seek a second opinion. There are statistical methods that quantify agreement, such as Cohen's kappa statistic, but none have clear interpretations, differentiate positive and negative agreement, or account for within rater variation. We propose utilizing a generalized logistic mixed effects model in order to calculate three probabilities of reader concordance: positive agreement, negative agreement and disagreement. Further, fundamental principles related to Cohen's κ were explored and linked to probabilities of concordance. Simulation results described concordance between readers at a range of fixed effects and demonstrated situations where disagreement may be high. Using this method, important factors, such as clinical presentation, could be identified and utilized to minimize disagreement of Alzheimer's diagnoses based on imaging.

INTERFERON INDUCED TRANSMEMBRANE PROTEIN-1 PLAYS A VITAL ROLE IN TRIPLE-NEGATIVE BREAST CANCER AND CAN BE TARGETED BY THE NATURALLY DERIVED COMPOUND PARTHENOLIDE

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The American Cancer Society predicts for there to be approximately 2,500 new diagnoses of breast cancer in the state of Kansas in 2020. Notably, 20% of these patients will be diagnosed with the deadliest subtype of breast cancer: triple-negative breast cancer (TNBC). TNBC tumors lack the common receptors used treat breast cancer, limiting the first line of treatment to non-targeted chemotherapy. Unfortunately, reports suggest 65-70% of patients will not respond to this treatment. Therefore, the purpose of this study was to identify novel molecular targets and agents for TNBC therapy. We identified that a protein normally only made by cells to protect against viral infections is highly expressed in TNBC cells and is associated with poor overall patient survival. This protein is called interferon induced transmembrane protein-1 (IFITM1). Through utilizing molecular biology techniques and mouse models, we show that loss of IFITM1 decreases TNBC growth and invasion. We then sought to identify novel agents that target IFITM1 expression. Through partnering with the University of Kansas, 3,500 drugs were tested in TNBC cells for potential repurposing. By assessing cytotoxicity, this screen identified a natural compound derived from feverfew used to treat migraines and arthritis, called parthenolide (PN). Notably, treatment of TNBC cells with PN reduces growth, inhibits colony formation, and promotes cell death. Moreover, PN decreases IFITM1 expression which we hypothesize to occur through PN mediated inhibition of two key tumor survival pathways: type-1-interferon and NF-kappaB. These results suggest that IFITM1 contributes to TNBC aggression and that PN might be an effective strategy to treat IFITM1 positive TNBC.

ASSESSING KNOWLEDGE AND ATTITUDES OF A RURAL PRIMARY CARE PRACTICE INITIATING SUBOXONE TREATMENT FOR OPIOID USE DISORDER

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There is an opioid epidemic in the United States. Healthcare providers in Kansas have consistently written more opioid prescriptions than the US national average. Additonally, opioid mortality has affected rural communities at a significantly higher rate than that of urban areas. One reason for this is that those with opioid use disorder in rural communities may not have adequate access to evidence-based treatment. The gold standard treatment is using Medication Assisted Treatment (MAT) with the use of a medication called Suboxone. This medication decreases withdrawl and cravings for opioids. Only providers that have completed specialized training can prescribe Suboxone. Despite having additional training, these providers can legally only treat 30 patients. This creates a significant barrier for those needing addiction treatment. The Centers for Medicare and Medicaid Services have made expanding access to Suboxone and MAT for the opioid use disorder patient a top priority. The main objective of this project was to assess knowledge and attitudes of a rural primary care practice in Kansas initiating Suboxone treatment for opioid use disorder. This study indicates that an education session over Suboxone and the opioid use disorder patient can improve knowledge and stigma. When knowledge and stigma is improved, more patients can get the treatment they need. This is the first step for Kansans to combat the opioid crisis.

THE CONTRIBUTIONS OF SOY PROTEIN QUATERNARY STRUCTURES ON VISCOELASTIC PROPERTIES OF POLYETHYLENE OXIDE/SOY PROTEIN COMPOSITES

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More than four-and-a-half million acres of Kansas land were covered in soybeans in 2018, with Kansas farmers harvesting an average of 44 bushels per acre worth a combined total of $1.6 billion. Soybeans are mostly used for animal feed, however the capabilities of soybeans to produce functional materials have the potential to benefit sustainable materials applications and the Kansas agricultural economy. The goal of this study is to determine how quaternary structures of soy protein isolate (SPI) affect the viscoelastic properties of polyethylene oxide (PEO)/SPI composites, subjected to various denaturation and aggregation conditions of SPI. Ball milled PEO/SPI composites (PEO/10wt%SPI-BM) showed little variation in viscoelastic behaviors with that of pure PEO, with typical liquid-like behaviors. Composites made with water (PEO/SPI-H_2O) at 10wt% SPI concentration exhibited a weakened frequency dependence of storage (G') and loss (G") moduli, indicating a transition to solid-like behavior. This solid-like behavior was even more pronounced in PEO/10wt% SPI-DMSO (dimethyl sulfoxide) composites. A Tan(δ) below 1 for PEO/10wt%SPI-DMSO composites indicated the presence of a strong SPI network, which was responsible for such a transition. Composites made with both solvents at 1wt% SPI loading produced the highest dielectric constants, with the SPI-PEO interactions created in H_2O favoring dipole motions more than those in DMSO. The α-relaxation of PEO also favored composites made with H_2O, with PEO/1wt% SPI-H_2O producing the fastest α-relaxation. However, network structures provided great resistance to α-relaxation, with PEO/10wt% SPI-DMSO composites producing the longest relaxation time, particularly at elevated temperatures.

HYDRAULIC FRACTURING NOISE AND HEALTH CONCERNS FOR KANSANS

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In 2016, Kansas had over 93,000 operational oil and gas wells. According to the Kansas Geological Survey, approximately 244,000 oil and gas wells were drilled in Kansas over a period of 64 years. As recently as 2015, residents of Harper and Sumner counties have voiced concerns over the wastewater content, as well as seismic activity produced by this industry. Air and water impacts have been studied throughout the US, but rarely is the noise produced around such sites investigated. The purpose of this study was to (1) measure sound pressure levels in neighborhoods adjoining hydraulic fracturing ("fracking") well pads and compressors and (2) collect survey responses from residents to determine if the fracking noise could potentially cause hearing loss, sleep disturbances, and/or overall health impacts. The surveys and sound level readings have the potential to provide evidence that the health effects from fracking noise are like those from other noise sources (e.g., highway, airport, railroad, etc.). Although these investigators have measured sound levels and obtained surveys from rural areas of Pennsylvania and Oklahoma, the findings have the potential to provide investors and perspective home owners within Kansas information concerning health and wellness as they relate to fracking noise. The varied levels of noise caused by truck traffic, drilling, and compressors, along with reported seismic activity and subsonic sounds produced by the drilling can create levels of anxiety and sleep disruption that has the potential to affect Kansans' health.

DEVELOPING PROCUREMENT STRATEGY BY APPLYING CLASSIFICATION ALGORITHMS FOR EFFECTIVE SUPPLIER ASSESSMENT

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The manufacturing sector ranks one of the top spots in the 2018 Kansas economy and this projection is predicted to continue with 0.5% growth in 2019. Within the manufacturing sector, aerospace is ranked fourth in Kansas with over 30,000 workers. Almost 44% of Kansans work for small businesses (less than 50 employees) and this percentage is expected to increase with the effective assessment of the suppliers in the supply chain network of the business in Kansas. This research aims to provide a comprehensive and robust assessment process for suppliers. Therefore, we propose the use of supervised machine learning algorithms to classify various suppliers into four categories: excellent, good, satisfactory, and unsatisfactory. In this research, supervised learning (classification) algorithms are applied to a supplier assessment problem where a model is trained based on the previous historical data and then tested on the new unseen data set. This method will provide an efficient way for supplier assessment that is more effective in terms of accuracy and time when compared to the multi-criteria decision-making approach. Classification algorithms such as support vector machines (with linear, polynomial and radial basis kernels), logistic regression, k-nearest neighbors, and naïve Bayes methods are used to train the model and their performance is assessed against a test data. Finally, the performance measures from all the classification methods are used to assess the best supplier in any business in Kansas.

RELATIONSHIP BETWEEN PSYCHOSOCIAL HEALTH AND SELF-REPORTED ORAL HEALTH AMONG SENIOR CENTER PARTICIPANTS IN WICHITA, KANSAS

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Poor mental health days are defined as, "mean number of days in the past 30 days adults reported their mental health was not good." According to America's Mental Health Rankings, the poor mental health days for women above 65+ years old in Kansas is greater (4.3) when compared to men (3.0). Oral health impacts mental health and thus, affects the health of Kansas residents. The definition of health has moved past free of disease and healthy mouth is an essential component of whole-person approach to health care. The relations between oral health and overall health of an individual are explicit and crucial. Poor oral health impacts nutrition, self-image, social interactions, mental and physical health, and health-related quality of life. The purpose of this study was to assess gender differences in psycho-social consequences of oral health at senior centers in Wichita, KS. The GOHAI (Geriatric Oral Health Assessment Index) survey was conducted and socio-demographic information was collected. Results of this survey showed higher impact of oral health on women as compared to men. Psychosocial well-being is an important component of mental health and this study assists to signify the mental health problems due to oral health. According to the Kansas Department for Aging and Disability Services (KDADS) report (2019), the behavioral health system is in crisis and the behavioral health problems include psychological distress. By improving oral health related quality of life, the psychological well-being and mental health among older adults can be enhanced.

URINARY FOLLICLE STIMULATING GLYCOFORM ANALYSIS BY AUTOMATED WESTERN BLOT

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Follicle-stimulating hormone (FSH) is a critical hormone for fertility in women. In females, FSH enables ovarian follicle development, thereby producing mature oocytes at ovulation. Studies from our laboratory have shown that human FSH exists as two major glycoforms, fully glycosylated FSH[24], which possesses two α-subunit and two β-subunit asparagine-linked oligosaccharides, and hypo-glycosylated FSH[21] or FSH[18] glycoforms, which both possess one FSHβ oligosaccharide and two α-subunit oligosaccharides. Pituitary FSH[21] abundance exhibits reduced relative abundance with increasing age in women. As FSH[21] exhibits greater FSH biologic activity than FSH[24], age- and cycle-related changes in glycoform abundance may contribute to fertility regulation. The goal of this project is to evaluate FSH glycoform ratios in female urine samples. Human FSH and other urinary proteins were precipitated with ethanol and FSH captured by immuno-affinity chromatography using the anti-FSHβ monoclonal antibody. Automated Western blotting of FSH samples was employed to measure the relative abundance of both FSH glycoforms based on the density of the 21kDa- and 24kDa-FSHβ subunit bands. FSH was captured from 6 postmenopausal urine samples by anti-FSHβ monoclonal antibody. Monoclonal antibody can capture the majority of FSH in precipitated urinary protein samples and it is feasible to measure FSH glycoform abundance in urinary protein samples. Finally, the results from automated western blotting is compared with published conventional western blot data.

INTERNET OF THINGS BASED CYBER-PHYSICAL SYSTEM FRAMEWORK FOR REAL-TIME OPERATIONS

Vatsal Maru, Krishna Krishnan, and Saideep Nannapaneni
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Automation on the production floor can improve production efficiency and human safety when performing hazardous tasks, particularly in Kansas where aircraft manufacturing requires handling large aerospace structures. To increase the edge in our aircraft manufacturing sector, incorporating intelligence into the robotic systems can improve their effectiveness on the production floor. Therefore, the objective of this research is to create an intelligent control system that performs operations based on object detection using machine vision. A Deep Learning (DL) technique was used to train a model to identify different types of objects and implement different control actions accordingly. We use a variant of Convolutional Neural Network (CNN) known as Faster R-CNN (R stands for the region proposals) for improved efficiency in the object detection process in Object Detection and Control Algorithm (ODCA). The faster R-CNN model was able to correctly identify different types of objects, which enabled a Universal Robot (UR5) robotic arm to perform different control actions. We demonstrate the proposed intelligent cyber-physical system framework to perform pick and place operations as they are one of the most widely performed operations on a production floor. This research immensely decreases the manufacturing and assembling costs by implementing intelligent robots compared to the sensor-based robotic systems.

PLANNING FOR IMPLEMENTATION OF SCREENING, BRIEF INTERVENTION, AND REFERRAL TO TREATMENT (SBIRT) FOR SUBSTANCE USE PREVENTION AT A WICHITA FEDERALLY QUALIFIED HEALTH CENTER (FQHC) CLINIC

Dulcinea Rakestraw[1], Fatima Rahman[2], Eyinade Kila[3], Christine Steward[3], and Charles Burdsal[1]
[1]Department of Psychology, Wichita State University; [2]University of Kansas School of Medicine-Wichita; and [3]Sedgwick County Health Department

Sedgwick County, home to 17.6% of Kansas' population, had 22.4% of all opioid-use related deaths in 2017. While opioid misuse in Kansas has not reached the same level of concern as other states, prevention strategies are needed to curb the growing crises. The Sedgwick County Health Department (SCHD) assisted a Federally Qualified Health Center (FQHC) in implementing Screening, Brief Intervention, and Referral to Treatment (SBIRT), an evidence-based practice to identify and prevent risky health behaviors related to substance misuse. A continuous quality improvement process, Plan-Do-Study-Act, was employed. During the Plan phase, SCHD received clinic electronic health record (EHR) baseline data, researched SBIRT processes, provided access to computer-based SBIRT training for clinic staff, secured clinic staff buy-in by facilitating conversations about SBIRT billing and screening for substance use, and recruited "champions" to assist with sustainability of the project. Baseline data from 2018 showed the clinic served 6,417 total patients and documented 47 adult SBIRT full-screenings with one billed. Through this project, 47% of clinic professionals were trained to provide SBIRT. Twenty-three staff members, from a variety of positions, attended a kick-off meeting; seven volunteered as "champions." Formative workflows were created, observations of 24 patient visits were completed, four SBIRT process maps were developed, and 20 recommendations were made for implementation. Thorough knowledge of SBIRT and related reimbursements along with the education of clinic staff were critical for planning SBIRT implementation. Next steps include SBIRT implementation and subsequent evaluation by SCHD to complete the Plan-Do-Study-Act cycle.

INTRUSION DETECTION FOR 3D-PRINTERS: AN ELECTRICAL POWER ANALYSIS APPROACH

Michael Rott and Sergio Salinas Monroy

Department of Electrical Engineering and Computer Science, Wichita State University

Manufacturing is one of the largest economic development drivers in the state of Kansas, accounting for more than $25 billion of annual economic output. In recent years, Kansas manufacturers have adopted Industry 4.0 technologies to improve their efficiency and productivity. Unfortunately, by making machine data available over computer networks, these technologies increase the risk of cyberattacks that inject defects into the manufactured objects, and thus can result in financial losses, loss of reputation, and, in safety critical applications such as aerospace, injury and loss of human lives. In this work, we focus on cyberattacks against additive manufacturing, also called 3D-printing. We propose a novel intrusion detection approach that can detect defect injection attacks and it is based on analyzing the 3D-printer's power consumption. Existing intrusion detection techniques are designed for IT systems and ignore attacks that compromise the electronic and physical components of 3D-printers. In contrast, our approach uses the 3D-printers' power consumption to detect malicious intruders that inject defects into the produced object. To analyze the 3D-printer's power consumption, we use a deep learning approach called a multi-layer neural network (NN). The main idea of the NN is to analyze previous power consumption measurements to predict future measurements. If the observed measurement differs from the predicted by more than a specified threshold, then it is likely that an intruder is maliciously manipulating the 3D-printer. Our results show that we can classify 3D prints as benign or malicious with an accuracy of 91.25%, allowing accurate detection of several tested defects.

SUSTAINABLE FRESHWATER HARVESTING FROM ATMOSPHERE THROUGH ELECTROSPUN SUPERHYDROPHOBIC POLYACRYLONITRILE NANOCOMPOSITE FIBERS

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The scarcity of pure drinking water has been one of the major humanitarian challenges in the globe. The world population growth, urbanization, depleting water resources and global climate change have intensified this crisis especially in arid and semi-arid regions. The concern is drastically increasing and therefore scientists and engineers are challenged with urgently developing viable solutions for this problem. The development of a sustainable, cost-effective, reliable and efficient water collection materials and methods for continuous freshwater production is crucial for many regions of the world. In this work, polyacrylonitrile (PAN) and Poly (methyl methacrylate) (PMMA) with various proportions of titanium dioxide (TiO_2) nanoparticles and aluminum (Al) microparticles were spun into superhydrophobic nanocomposite fibers using electrospinning technique followed by stabilization and carbonization to remove all non-carbonaceous material from the fibers and use for harvesting fog from the atmosphere. The fiber morphology, surface hydrophobicity and fog harvesting capacity of the nanocomposite fibers were investigated. Test results reveal that the carbonized nanocomposite fibers exhibit superhydrophobic characteristics with a water contact angle of 154.8° with efficient fog harvesting ability of 621 mg/cm^2-hr. The nanotechnology-based water collection systems are unique because of the multifunctional properties of the nano-membranes. Kansas is in short supply of freshwater and this technology will help sustainable economic growth in the region. The produced water can be used for drinking, agriculture, gardening, medical, industrial, and other purposes.

NOTES:

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