HLC Accreditation 2020-2021

Evidence Document

The Capitol Graduate Research Summit in Topeka

18th Annual
Capitol Graduate Research Summit

Additional information: The annual poster competition organized through collaborative efforts between Kansas universities to provide an opportunity for selected graduate students to expose state government and education officials, as well as the general public, to the quality of graduate research performed in the State of Kansas.

18th Annual
Capitol Graduate Research Summit

February 18, 2021

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

Presenters and Poster Titles

Emporia State University

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Katlynn Decker	EVALUATING THE PROFICIENCY OF FOUR-BAND NAIP IMAGERY FOR DETERMINING WATER QUALITY IN FARM PONDS, FOCUSING ON BLUE-GREEN ALGAE DETECTION
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Karen Town	USE OF THE BOARD GAME *PANDEMIC* TO SIMULATE COOPERATIVE EMERGENCY RESPONSE FOR COMMUNITY/PUBLIC HEALTH NURSING STUDENTS

Ryan Brice	WHEAT PROTEIN-BASED BIO-SCAFFOLD FOR NEURAL REGENERATION
Judydiana Chavira	A SURVEY OF KANSAS SPEECH-LANGUAGE PATHOLOGISTS' KNOWLEDGE AND CONFIDENCE REGARDING LITERACY INTERVENTION
Munoyedi Egbo	OPTIMIZING THE THERMAL PERFORMANCE OF PHASE-CHANGE THERMAL MANAGEMENT SYSTEMS FOR UTILITY-SCALE APPLICATIONS IN KANSAS
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Ali Mokhtari-Modhadam	AN ENERGY CONSUMPTION MODEL UNDER TIME-OF-USE RATES FOR SCHEDULING OF MANUFACTURING SHOPS
Addison Powel	COMPUTERIZED SENTENCE BUILDING AS A TREATMENT FOR APHASIA
Lisa Vayda	WHAT FACTORS HAVE AN EFFECT ON THE LIFE EXPECTANCY OF KANSAS CITIZENS?

ANALYSIS OF OIL MARKET TRENDS IN THE EPIDEMIC ERA

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Our research primarily focuses on domestic petroleum (oil) trends with global input in an effort to determine whether or not the oil age is gradually coming to an end. This study directly pertains to the state of Kansas given that the state inhabits many oil producers, oil field suppliers as well as service companies directly related to the industry. Kansas is a significant oil-producing state. In fact, the Kansas oil and gas industry over the last decade has supported 118,000 jobs, generated $3 billion in family income, in addition Kansas ranks as the 9th largest in size oil producing state, a statistic that depicts its significance within the industry. Despite the incredible feats accomplished in the decade prior, the next decade may depict a much different outcome, our research will conduct a trend analysis in an effort to predict how the petroleum market will evolve over the next decade. Studying oil price trends during the epidemic will not only inform how the domestic as well as global economy is currently, but also detail what may happen in the future. The methodology of research is classified as secondary. Information has been collected from various census and government departments.

EVALUATING THE PROFICIENCY OF FOUR-BAND NAIP IMAGERY FOR DETERMINING WATER QUALITY IN FARM PONDS, FOCUSING ON BLUE-GREEN ALGAE DETECTION

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Small anthropogenic water bodies (e.g. farm ponds) represent significant but often-overlooked hydrologic features. Global inventories indicate that they are the most numerous type of water body but their hydrologic significance is largely ignored. Farm ponds can be highly complex as they contain not only standing water but also emergent and/or floating vegetation, organic detritus, mineral particles, and dissolved organic matter. Cyanobacteria, commonly referred to as blue-green algae, has become problematic in farm ponds because of its ability to limit sunlight penetration into water and deplete oxygen and nutrients within water. It can also make people and animals sick after contact. The Kansas Department of Health and Environment monitors cyanobacteria in public use lakes when blooms are most prevalent from April 1st to October 31st. To better understand water quality in farm ponds not continually monitored, this research performed supervised classifications on the 2015 National Agriculture Imagery Program imagery, containing one-meter pixels, to determine if the 20,000+ farm ponds within the Upper Neosho River Basin could be classified based on apparent water quality. Results differentiated clear water, dark-colored murky water, light-colored murky water, water with sun glare reflecting off its surface, water with cyanobacteria, and water with other aquatic vegetation among Kansas farm ponds. After performing a supervised classification using the six mentioned classes, it was determined that 56% of the water pixels in the ponds studied could be characterized as dark- or light-colored murky water, indicating turbidity, while only 2.3% of the water pixels indicated presence of blue-green algae.

THE EXPRESSIVE THERAPIES CONTINUUM AND DE-ESCALATION

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The positive impact of art therapy with Autism Spectrum Disorder (ASD) is well documented (Anderson, 1992). Clients with ASD often experience periods of escalation due to sensory overstimulation (Woo, Donnelly, Steinberg-Epstein, & Leon, 2015). Following the apex of a client's escalation, they begin to de-escalate and re-regulate to their surroundings; this experience can be disorienting and time consuming for the client and their therapist (Sanctuary Web, 2020). The theory of the Expressive Therapies Continuum (ETC), when utilized by an art therapist working with clients with ASD, can enhance the de-escalation process. The ETC consists of three levels; these levels are kinesthetic and sensory art-making, perceptual and affective art-making, and cognitive and symbolic art-making. In the ETC system, the sensory and kinesthetic experience of artistic expressions trigger emotionally affective and perceptual responses that help reshape psychological and decision-making processes (Hinz, 2009). In this research, I developed a survey to gather data on the ways in which the ETC is used by art therapists working with clients with ASD and if used during the process of de-escalation, which level of the ETC was most effective based on their experiences with their clients. The data from this research will add to the literature available on art therapy and clients with ASD as well the literature available for the way the ETC is utilized in the therapeutic setting.

COMPARISON OF UNAPPLIED VS. APPLIED LIQUID COSMETIC FOUNDATION USING ATTENUATED TOTAL REFLECTANCE- FOURIER TRANSFORM INFRARED SPECTROSCOPY

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Cosmetic liquid foundation can be found at crime scenes due to the transfer of foundation onto objects such as bedding and clothing leaving behind a smear which can be used as evidence in crime scene investigations. Discovering and analyzing liquid foundation can be difficult as methods and techniques are still underdeveloped. ATR-FTIR is an instrument that is commonly used in analyzing evidence because it is non-destructive, sensitive, reproducible, free from sample preparation, rapid, and can analyze small amounts of sample. Twenty-eight different liquid foundation samples were analyzed on the ATR-FTIR to compare unapplied and applied liquid foundation swatches. Unapplied liquid foundation swatches include directly administered wet swatches to the ATR-FTIR and dried liquid foundation. Applied liquid foundation is foundation administered to the face and taken off with a white knit rag at the dedicated time intervals of 0, 15, 30, 60 and 120 minutes. The unapplied spectrums on the ATR resulted in a 92.9% correct spectrum search match, while the applied spectrums resulted in a 13.3% correct spectrum match, meaning that reactions are occurring on the face changing the chemical composition of the foundation. The developed method shows the downfalls of analyzing applied liquid cosmetic foundation on the ATR-FTIR and shows that other, more complex methods need to be developed.

RARE DISEASE, RARE INFORMATION: USING SOCIAL MEDIA TO SATISFY UNMET INFORMATION NEEDS

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This study is focused on provider-patient (family) interactions relating to the information needs of individuals with a rare genetic disease. It is estimated that there are 6-7,000 rare diseases worldwide. Research-based evidence indicates that adequate medical and healthcare information is frequently not satisfactorily disseminated by providers to parents and/or caregivers of individuals with a rare disease. Through the lens of Elfreda Chatman's information poverty theory, a cross-sectional exploratory survey was created and conducted with parents and/or caregivers of an individual with Pitt-Hopkins Syndrome, an example of a rare disease minority group when it comes to access to medical and healthcare information. The location for this study was three social media environments that parents and caregivers resort to as electronic support groups when attempting to fulfill their urgent information needs about Pitt-Hopkins Syndrome. Results indicate that participants regardless of age, geographic locations, location population size, incomes, or regardless of number of days following birth before their child was discharged from the hospital usually feel unsatisfied with provided medical and healthcare information. Male participants and participants with higher levels of education were more likely to express satisfaction with healthcare information provided by hospitals. Participants' indicated that they prefer digital text, video, story, and article formats suitable for access using information communication tools such as personal computers and smartphones. Findings suggest implications for future research and possible new ways to shape a collective perception of critical information needs when living with and supporting individuals with a rare disease.

UTILIZING AN OSA SCREENING TOOL IN PRIMARY CARE

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Obstructive sleep apnea (OSA) is a sleep-related breathing disorder that results in lack of oxygen to the brain, despite a person's ability to breathe independently. OSA has been associated with long-term adverse effects including cardiovascular disease, neurologic disorders, and metabolic dysfunction. Shockingly, about 80%-90% of adults with OSA remain undiagnosed and fragmented quality of sleep continues undetected, despite the number of risk factors present. The consequences of undiagnosed and untreated OSA are economically costly and can result in medically serious conditions. It is essential that a convenient, inexpensive, and validated screening tool be utilized in the adult primary care setting. The purpose of this project was to implement the use of the STOP-BANG screening tool to increase provider identification of OSA risk factors, improve referral rates for polysomnography (PSG) testing in at risk patients, and facilitate prompt diagnosis and treatment geared towards improving one's quality of life. In a three-month timeframe, results show an increase in provider screenings as well as improved referral rates for PSG testing. These results can be directly correlated to the implementation of the STOP-BANG screening tool in a rural clinic in Western Kansas. The ultimate goal of this project is to change clinical screening protocols by promoting early identification of OSA risk factors, improve patient outcomes and their quality of life, and to reduce healthcare costs associated with undiagnosed and untreated OSA.

SEXUAL VIOLENCE IN RURAL PLACES: POLICY IMPLICATIONS FOR FIRST-RESPONDING LAW ENFORCEMENT OFFICERS

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Sexual violence is a public health issue impacting many Americans, with girls and women disproportionately victimized. While sexual offenses remain underreported, media has recently spotlighted high-profile cases. However, understanding sexual assaults in rural areas remains absent in mainstream conversation. Studies show rural communities are not smaller versions of their urban neighbors as they harbor old-fashioned values, maintain secrecy, and rely on informal social controls that influence how citizens respond to sexual violence, including law enforcement. Yet, existing literature on law enforcement responses to sexual violence are mostly centralized in urban areas with a focus on the investigative process—ignoring rural dynamics and the impact first-responding law enforcement officers have on survivor perceptions of policing practices. As such, the current review summarizes the impact law enforcement has on sexual violence survivors, focusing on rural policing, and ending with an all-encompassing policy to better serve both law enforcement and sexual violence survivors.

Jury Decision Making: The Influence of Mock-Juror Demographics on Verdict Outcomes

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Research has demonstrated that jury decision-making is complex, and jurors can be influenced by several factors in a criminal court case (ForsterLee, Horowitz & King, 2006; Kutys, 2012). Several defendant characteristics including gender (Davidson & Rosky, 2015), race (Poulson, 1990), attractiveness, mental illness, and socioeconomic status (Feingold & Mazzella, 1994) have been deemed as influential in jury decision making. With an abundance of research surrounding defendant demographics, there seems to be a gap in the literature when investigating juror demographics and the potential impact they may have on verdict outcomes. Within the limited amount of research available, there appears to be a connection between verdict outcomes and juror age in that mock-jurors who are considered "younger" propose a guilty verdict more often than older individuals (Mossière & Dalby, 2008). Moreover, female jurors are found to be more likely to elicit a harsher punishment than male participants, especially when the defendant is black (FosterLee et al., 2006).

The purpose of this study is to cast a spotlight on the jurors, rather than the defendant and find potential factors that may influence verdict outcomes. The findings from this study imply that several juror demographics do impact verdict outcomes. Males were more likely to select a verdict of guilty than females who also chose a verdict of Guilty but Mentally Ill more often than any other verdict outcome provided. Furthermore, participants who were Caucasian chose a guilty verdict more often than any other ethnic group. This information provides important implications regarding the jury selection process which in turn could benefit both the prosecution and def

PERFORMANCE OF AUTONOMOUS GROUND VEHICLE ON VARYING SLOPE

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In 12 Great Plains states, a total of 116,000 km2 area is currently under shrubs, or too steep slopes ranging from 6°-25° which are considered as marginal. Farming on these hills & uneven terrain is unsafe with large-conventional agricultural equipment's. Therefore, the project aims to design a fleet of small ground autonomous vehicles (GAV) to safely perform on hills-uneven terrain for agricultural operations (sowing to harvesting). A primary objective of this study is to understand how the GAV functions on varying slopes under variable load and operating speed, specifically focusing on traction parameters, drawbar power, travel reduction and power consumption. A small tracked GAV, fits in a typical 30 inch (0.762 m) crop row; fitted with an NI-myrio device in conjunction with load cell, encoders, and amperage-voltage sensors for data collection. The performance of GAV was evaluated on slope up to 0-180 both uphill & downhill operation at operating speed (20-100% duty cycle) and expressed in matrix: tractive efficiency (TE), travel reduction (TR) and power number (PN). TE of GAV was ranged between 4-16% and downhill operation delivers significantly higher TE compared to uphill operation. The TR was found to be increased with increase in drawbar. The PN was significantly influenced by the speed and drawbar pull. The preliminary results proved that AGV generate enough tractive power to perform the basic agricultural operation on slope. The collected data was used for energy optimization, simulations, vehicle mobility and route-optimization models.

DOES CAMPUS BIODIVERSITY MATTER FOR STUDENTS' PSYCHOLOGICAL WELLBEING?

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Students have been experiencing mental health problems, including stress, and depression. Many previous studies find that there is a positive association between campus green space and psychological wellbeing among students. However, few attempts have been made in exploring the role of green space biodiversity in psychological benefits. Purpose: This study investigates how two different levels of biodiversity (Low/High biodiversity) in the campus environment are related to the student's attention restoration and psychological wellbeing. 2x2 factorial design experimental research was conducted to examine the effect of biodiversity in green space on psychological wellbeing. Participants are randomly assigned to one of the two different environments (Low/High biodiversity) with sound and no sound by using virtual reality (VR) simulation for five minutes. One is a place with a high biodiversity environment, consisting of native tall grasses and meadow plants with sound and no sound. The other is a place with a low biodiversity environment with sound and no sound, comprising simple lawn yards. The survey was conducted to measure perceived restorativeness and psychological wellbeing. The result shows that students with a high biodiversity environment had a higher restorative effect and

psychological wellbeing, compared to those not, but natural sound can amplify psychological effect. The result suggests that high biodiversity in the campus environment has a higher effect on attention restoration and psychological wellbeing, but natural sound is also important with visual effects. Campus planners and administrators should consider planning and designing a healthier green environment for better mental wellbeing of students in Kansas.

SKIN BLOOD VESSEL RESPONSES FOLLOWING 5-FLUOROURACIL CHEMOTHERAPY ADMINISTRATION

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5-Fluorouracil (5-FU) chemotherapy is associated with the second highest rate of cardiovascular toxicity among cancer chemotherapies, and is generally manifested through the occurrence of chest pain, ECG abnormalities, and in severe cases, heart failure or death. Despite this, the mechanisms by which these toxicities occur are not well understood; however, alterations in blood vessel function have been implicated and are a known precursor to similar adverse cardiovascular events in other populations. As such, non-invasive measurements of the small blood vessels of the skin may provide insight, as others have demonstrated skin microvascular health is reflective of that of the coronary circulation. We tested the hypothesis that cancer patients treated with 5-FU would exhibit impairments in skin microvascular function following administration of acetylcholine (ACh) and localized heating when compared to age matched controls. Seventeen 5-FU patients (5-FU) and fifteen controls (CON) were recruited for this study. Baseline to peak vasodilatory responses following both localized heating and administration of acetylcholine (ACh) were calculated to asses skin microvascular function of the right forearm using Laser Doppler flowmetry. 5-FU exhibited a significant reduction in the vasodilatory response to localized heating (257 ± 71.8%) compared to CON (568 ± 78 %) ($p = .01$) whereas no differences were present in response to ACh (5-FU 842 ± 113%; CON 920 ± 107%) ($p = .49$). To date, our findings suggest 5-FU induces alterations in skin blood vessel function, perhaps, through mechanisms involving endothelial nitric oxide production.

THE ROLE OF PHOTOS TO ATTRACT MORE GUESTS FOR LOCAL COMMUNITY

Juhwan Lim and Jichul Jang

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Airbnb, a peer-to-peer accommodation sharing platform, contributes to local communities' development by attracting visitors and enhancing communities' image. In the United States, the estimated direct economic impact of Airbnb on local communities was $34 billion in 2018. Nevertheless, the Kansas State could not fully take this financial benefit due to the inactive Airbnb business. While attracting more Airbnb guests is the key to activate Airbnb business, guests focus on Airbnb's photos due to the intangible and experiential nature of Airbnb. The purpose of this study is to analyze the way of presenting photos regarding booking intention in the Airbnb context. We recruited 256 participants from Amazon Mechanical Turk. During the

experiment, participants were asked to see a series of Airbnb photos and evaluate their booking intention.The results showed that a higher number of photos, organized photos, and congruent first photo with a headline increase customers' booking intention. The findings of this study provide Airbnb hosts a practical and effective way of presenting photos to captivate travelers by making the best use of their photos. A higher booking intention would encourage more travelers to visit the State and consume products and services, which provides economic benefits with local businesses. Moreover, increased consumption would create more job opportunities in the hospitality and tourism sectors. Eventually, an increased number of Airbnb guests could contribute to the local economy and employment in the long term.

GENERAL TRADE POLICY UNCERTAINTY AND U.S. TRADE FLOWS

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The spectacular increase in the world exports in the last 50 years was made possible due to the presence of a rules-based international trade system sponsored by the General Agreements on Tariffs and Trade (GATT) and its successor agreement, the WTO. In the last decade, however, there has been a substantial increase in US trade policy uncertainty (TPU) towards US allies and other WTO members. This shift in policy has further undermined the WTO efforts to transform all trade barriers into tariffs. It is then imperative to better understand how TPU affects trade flows. We use a text-mining approach to construct a general index of US TPU at the bilateral (140 trading partners) and industry levels (2-digit of the Harmonized System) using newspaper articles from 2001 to 2017. We find that 1 standard deviation increase in TPU decreases U.S. imports by 1.2 percent and reduces US exports to those countries with large market powers by 2.15 percent. We also find that the effects of TPU are mitigated by the formation of preferential trade arrangements. Most importantly, we find that trade policy uncertainty is negatively associated with Kansas economic development and job creations such that 1 standard deviation increase in trade policy uncertainty leads to an 18% reduction in export growth and 20% reduction in the number of new jobs in trade-related industries in Kansas. Therefore, reducing the trade policy uncertainty by policy makers will significantly protect residences in Kansas from losing jobs and solid Kansas economic development.

IDENTIFYING ENZYMES LIMITING AN EFFECTIVE RNAI RESPONSE IN THE BITING MIDGE CULICOIDES SONORENSIS

Cameron Osborne, Lee Cohnstaedt, and Kristopher Silver
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The biting midge *Culicoides sonorensis* is a nuisance insect pest and a disease vector of livestock viruses in the United States. The impact of this midge on livestock herds causes substantial economic damage to producers annually. Conventional insecticides show limited success in controlling both the abundance of these insects and the spread of disease on livestock operations. RNA interference (RNAi) has the potential to provide a highly-specific and environmentally benign method of controlling these insects, which will supplement existing livestock producer management tools. RNAi, while promising, is not equally effective in all insect groups, and the mechanisms underlying this still need more investigation. My work focuses on identifying

enzymes, called double-stranded RNases (dsRNases), that may limit RNAi responses in *C. sonorensis* as they do in other insect species. Midge gene expression databases were mined for sequences similar to those dsRNases identified in other insect species. Seven candidate enzymes were discovered in the database, and they were compared with those described in related insect species. Software predictions show that these enzymes are secreted from midge cells; the implications of which will influence future strategies for implementing RNAi for *C. sonorensis* control. These enzymes will be characterized in different life stages of the midge to guide the development of route-specific control options for reducing the burden of these pest insects. This research will provide a foundation for a new generation of target-specific insect control.

SENSING NUTRIENT DYNAMICS USING SOIL-BASED MICROBIAL FUEL CELLS

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[1]Department of Agronomy, Kansas State University; [2]Department of Civil Engineering, Kansas State University

A soil-based microbial fuel cell (MFC) is a bio-electric device that uses the soil microorganisms to convert an organic substrate into electricity. This energy generation potential of MFCs can be exploited to 'sense' nutrient status of agricultural soils. Our study focused on developing a soil-based MFC that tracks down changes in nutrient availability and exploring relationships between nitrogen availability, microbial activity and MFC performance. In this study, we hypothesized that 1) change in the level of nutrients would give us a different microbial response, hence, a different electrical signal 2) introducing biofilm on anode would result in more microbial activity, and hence, produce a greater difference in voltage than control soil. Soil-based MFCs were set up using natural and sterilized soil at field capacity with fertilizers such as KNO3 and *Geobacter* enriched inoculum. The voltage generated was measured by a data logger and recorded every 15 minutes. Soil solution was analyzed to estimate dissolved nitrogen levels, and soil gas samples (CO2) were collected periodically as a proxy for soil microbial activity. We found that MFC performance was greater in higher nitrogen treatments than control soil and biofilm treatments showed initially higher output than soil without biofilm. For the future studies, we plan to improve separation of MFC signals by using selective polymer-based anode coating to restrict other available nutrients and selective inoculum of microorganisms for nutrient in question. If we can successfully model these relationships, this research could help improve crop production rates and ensure food security through 2050 demands.

FINE TUNING THE PHYSICAL PROPERTIES OF UREA FERTILIZER USING CRYSTAL ENGINEERING

Kelly N. Shunje and Christer B. Aakeröy

Department of Chemistry, Kansas State University

Urea remains the most prominent nitrogen-based fertilizer around the world, primarily because of its high nitrogen content and low cost. Unfortunately, only about 50% of the nitrogen applied is absorbed by crops and the rest is lost via leaching and/or as gaseous species which contribute to the greenhouse effect. This loss results in a significant economic and environmental cost to farmers and society at large. As such, there is need for development of technologies aimed at improving nutrient acquisition efficiency across the plant environments. Co-crystal technology involves manipulation of interactions between chemical compounds to design materials with desired functionalities. In co-crystals, an active compound (in this case urea) is combined with molecular partners (co-formers), to create new solids where physical properties, such as solubility, can be altered in a predictable fashion. The co-crystals will be investigated to establish whether they have improved physical properties such as controlled release of nitrogen into plants without negatively impacting soil nitrogen cycling, and plant growth. Co-crystals will also be studied to explore how co-formers can deliver micro-nutrients to plants while enhancing the presence of plant available nitrogen, and other essential elements. Liquid assisted grinding was be used to screen for co-crystal formation and solution crystallization to obtain single crystals for structure solution. Large scale synthesis of organic urea co-crystals was achieved with selected dicarboxylic acids and characterized using powder X-ray diffraction. The goal of this study is to develop sustainable, robust and scalable methods, based on co-crystal technologies, for improving plant nutrient acquisition efficiency.

DISCONTINUOUS DIET ALTERS FITNESS AND FLIGHT BEHAVIOR OF HIPPODAMIA CONVERGENS (COLEOPTERA: COCCINELLIDAE)

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Hippodamia convergens is a native insect predator providing widespread biocontrol of aphids and other insect pests in the High Plains. Agricultural crops are subject to harvesting cycles and other disturbances such as drought and pesticide usage, creating landscapes with discontinuous resource availability for insect predators. These temporal discontinuities in agricultural landscapes can interfere with feeding and overall performance for these biocontrol agents. We examined the impact of pulsed (i.e., discontinuous) feeding schedules versus continuous resource provisioning on the reproduction and flight capacity of adult H. convergens beetles, using tethered flight to determine movement capacity before and after 18 reproductive days. Adults were provided two levels of access to prey over 48h periods: 12h (high access) or 6h (low access) either continuously or discontinuously over two days. We found that fewer insects broke reproductive diapause on a discontinuous diet and both oviposition days and fecundity were reduced. Longer pre-oviposition periods reduced overall reproductive days and due to a strong positive relationship between ovipositional delay and fecundity likely lowers overall fitness. Low food treatments directly reduced oviposition days and indirectly reduced fecundity. Additionally, flight behavior and reproduction have reciprocal negative effects, showing past energetic expenditure can influence future metabolic effort. Negative effects of diet discontinuity at this small scale can indicate how resource availability gaps alter lady beetle population dynamics and ecosystem services in the wider agricultural landscape. Understanding how resource timing alters

lady beetle performance can improve conservation strategies for land management and conservation biological control.

DATA-DRIVEN STORIES OF OPPORTUNITY: DEVELOPMENT OF A COMPREHENSIVE COMMUNICATION PLAN FOR THE RILEY COUNTY OPPORTUNITY MAP

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Public health researchers have long been convinced of the impact of social and economic structures on health. Differences in these social determinants of health lead to many of the health disparities that impact Kansas communities. Realizing the need to highlight these disparities, in an easy to understand manner, the Flint Hills Wellness Coalition developed the Riley County Opportunity Map. This tool allows health disparities, between various census tracts in Riley county, to be visualized geographically. The purpose of this work was the development and implementation of a comprehensive communication plan that would provide relevant stakeholders access to and training about the Riley County Opportunity Map. A comprehensive communication plan was developed drawing on theoretical frameworks and strategies drawn from both the communication studies and public health disciplines. The plan considered the current limitations and challenges presented by the SARS-CoV-2 pandemic by utilizing virtual/interactive training sessions and social media tools. The Riley County Opportunity Map was launched towards the conclusion of this project and is currently being utilized within target communities. Several virtual training sessions were conducted, with additional sessions scheduled. Information contained within the Riley County Opportunity Map can be utilized to bring-to-light health disparities between Riley county communities and motivate stakeholders and policymakers toward meaningful change.

COVID-19 HEALTH INFORMATION SEEKING: KNOWLEDGE & VESTED INTERESTS IN MIDWEST POPULATIONS

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Emerging infectious disease communication research has roots in risk communication, crisis communication and health promotion literature. Today a combination of emerging infectious disease (EID) and re-emerging infectious disease (rEID) are occurring more frequently. This study examines health information seeking behaviors, COVID-related knowledge and attitudes in Midwest populations. Vested interest (VI) theory is used to understand individual attitudes toward preventative behaviors. Findings from this study add to our understandings of the social and cultural environment surrounding the early-stage U.S. COVID-19 global outbreak. Participants completed an online survey about coronavirus (COVID-19) which polled their knowledge, vested interests, and health information seeking (HIS) behaviors during the early stage of the EID outbreak that began circulating in the U.S. population in the Winter/Spring of 2020. A total of 222 respondents completed an online survey consisting of 67 questions. On average, 40% of the participants reported 'seeking, reading, and/or consuming information" about COVID-19 between 2-4 hours per day from interpersonal sources such as family members and friends, as well as subject matter experts. Results found individuals receiving information from schools 2-4 hours per day reported lower self-efficacy (M=4.93, SD=1.41) and lower personal susceptibility (M=3.66, SD=1.21) compared to those receiving no information from this source. Individuals receiving 4+ hours of information from social and digital platforms reported greater threat salience (M=6.05, SD=1.25) compared to others receiving less than 4-hours (M=4.99, SD=1.72) or no exposure (M=4.43, SD=2.00) through this medium.

NANOSTRUCTURED METAL OXIDES FOR FUEL CELLS AND METAL-AIR BATTERIES

Tenzin Ingsel and Ram K. Gupta
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Energy drives advancement in different sectors of human society. Cost-effective green energy sources are highly sought-after entities that can provide solutions to the worldwide energy crisis concerns. Among different types of green energy storage and conversion materials, energy via water splitting is regarded as one of the most assuring techniques to generate clean hydrogen fuel and oxygen for metal-air batteries. In this research, nanostructured metal oxides were synthesized through a facile hydrothermal process for water splitting application. Cobalt oxide was doped with iron where the elemental compositions of iron-cobalt were varied as x = 0, 0.2, 0.4, 0.6, 0.8, and 1 in FexCo3-xO4. It interests the scientific community in understanding the effect and role of dopant on materials electrocatalytic and electrical properties to deliver smart design for various applications. Among various samples, Fe0.6Co2.4O4 showed the best performance for water splitting by requiring the lowest amount of energy to generate hydrogen and oxygen. The synthesized materials were found to electrochemically stable and can be reused many times for water-splitting applications. Our research provides cost-effective materials for green energy production.

NANOZYME: A DEVELOPING NANOTECHNOLOGY FOR THE DETECTION OF FOOD-BORNE PATHOGENS

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The recurrent outbreak of *E. coli* necessitates the need of rapid and sensitive technology to detect bacteria in the food samples. *E. coli* O157:H7 is infectious at very low CFU counts (10-100 viable cells). Herein, we report a unique combination of magnetic and plasmonic properties in a single nanoplatform, which have superior peroxidase-like activity. This new nanosensor platform, magneto-plasmonic nanosensor (MPnS), is composed of superparamagnetic iron oxide nanoparticles (IONPs) and gold nanoparticles (GNPs) and stabilized with polyacrylic acid polymer, providing surface -COOH functional groups. By using EDC/NHS bioconjugation chemistry, the surface of MPnS is decorated with *E. coli* O157:H7-specific antibodies. We compared the catalytic activities of MPnS with that of GNPs, IONPs and traditional HRP and calculated Michaelis-Menten kinetics, which showed highest catalytic activity for MPnS. The ELISA-like experiments were performed using MPnS to detect E.coli within 30 min with higher sensitivity. We extended this detection study using milk and spinach samples. Various spectrophotometric and colorimetric experimental results in the specific detection of E.coli will be detailed in this presentation.

NANOCERIA-DELIVERED MAGNETIC RESONANCE PROBE: A MULTIMODAL THERANOSTIC TOOL TO IDENTIFY, TREAT, AND MONITOR CANCER

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In this study, a new multimodal theranostic tool is reported utilizing nanoceria delivery system conjugated with the ICAM1 antibody and a magnetic resonance (MR) probe as a prodrug with both MR and cytotoxic properties. The prodrug was synthesized from doxorubicin and phenyl-amine modified DTPA chelated with gadolinium utilizing dithiobis(succinimidyl propionate) (DSP) as a crosslinker. Nanoceria was synthesized from cerium oxide and polyacrylic acid using a water-based alkali precipitation technique. Doxorubicin and the synthesized prodrug were encapsulated separately within the nanoceria polymer matrix using a solvent diffusion method. The drug/prodrug-encapsulated nanoceria's carboxylated surface was functionalized with the ICAM1 antibody utilizing EDC/NHS chemistries and the resulting formulations were purified and characterized by DLS, zeta potential, UV/Vis, and MR. The efficacy of this platform was measured by treating MDA-MB-231 breast cancer (TNBC) cells and MCF-7 cells with the drug/prodrug-loaded, ICAM1-conjugated nanoceria and analyzing the results of the treatment. Results were evaluated by cytotoxicity assays (MTT), fluorescence microscopy, reactive oxygen species determination, and comet assays. In all, the results show the nanoceria platform is target-specific to TNBC, and the encapsulated prodrug is able to be activated releasing doxorubicin and initiating apoptosis in an *in vivo* breast cancer model.

ECO-FRIENDLY FLAME-RETARDANTS FOR BIO-BASED POLYURETHANE FOAMS

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Bio-based polyurethanes are the future of polymer industries as crops based chemicals provide a stable source of raw materials that are low cost and eco-friendly. Among those materials, carvone, an essential oil easily extracted from spearmint, dill, and bay leaf, was chemically converted to provide flame-retardant polyurethane foams. The chemical derived from carvone oil for polyurethane was characterized using the industrial standard to see its suitability for polyurethane industries. The carvone oil-based polyurethane foams were blended with aluminum trihydroxide and aluminum hypophosphite as flame-retardants to reduce the flammability of the foams. The foams were characterized by closed-cell content, density, compressive strength, thermalgravimetric analysis, and horizontal burning test. Results have shown that closed-cell content was about 95% which makes them very suitable for thermal insulation applications. It was also observed that the flammability of the foams was significantly reduced by the addition of a small amount of aluminum trihydroxide and aluminum hypophosphite. For example, the polyurethane foam containing about 15% of aluminum trihydroxide displayed a weight loss of about 12% and a burning time of 58 seconds, while the foam with about 13% of aluminum hypophosphite showed a weight loss of about 3% and a burning time of 5 seconds. The foams without the flame-retardants showed a weight loss of about 45% with a burning time of about 90 seconds. This research demonstrates that renewable resources can be used to prepare polyurethane foams with significantly reduced flammability making them very suitable for many applications such as in constructions and automobiles where flammability of polyurethane foam is a major hurdle.

MAPPING UNCHARTED BIOLOGICAL TERRITORY– DISCOVERING UNIQUE FACTORS FOR NOVEL THERAPEUTICS IN *Chlamydia*

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Chlamydia is the highest reported sexually transmitted infection (STI) in the United States and is caused by bacteria, *Chlamydia trachomatis*. Along with the health repercussion, chlamydia also has an associated financial burden as the costliest non-viral STI (>$500 million). According to the Kansas Department of Health and Environment (KDHE), the rate of *Chlamydia* infections has increased ~40% over the last decade. Since chlamydial infections often show no symptoms, they go untreated which can lead to infertility in women and sterility in men. Existing treatment options not only target *Chlamydia*, but also attack 'essential bacteria', contributing to antibiotic resistance. Moreover, *Chlamydia* can stay dormant, resulting in persistent infections. Different species of *Chlamydia* can also infect other animals, like pigs resulting in losses in the agricultural sector in states like Kansas. Scientists need to understand how the bacteria causes the disease and how it goes undetected. However, the major bottleneck in understanding chlamydial biology is, the function of ~30% of the chlamydial genome or genetic material, remains a mystery. One way to address this problem is by studying proteins 'produced' by such genes of unknown function and their role in *Chlamydia*'s disease-causing ability. By manipulating *Chlamydia*, we can study its functionality. Our study aims to determine the role of such genes and their effect on the disease-causing ability or survival of *Chlamydia*. Overall, our research is designed for establishing a strong fundamental understanding of chlamydial biology that can potentially lead to targeted therapeutics or vaccines, reducing the spread in Kansas and globally.

RAPID DRUG DISCOVERY FOR EMERGENCY HEALTHCARE INTERVENTIONS: IDENTIFYING MONOCLONAL ANTIBODIES AGAINST SARS-COV-2

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The historic emergence of SARS-CoV-2 into human populations has led to the spread of severe *coronavirus disease 2019* (COVID-19). Over 500,000 Kansans – about one in every five people – are at high risk of developing severe disease, as characterized by respiratory or cardiac failure and sometimes death. Treatment options for patients afflicted with severe disease are currently restricted due to limited drug supplies and difficult administration formats, creating life-threatening bottlenecks in patient care. While vaccination treatments are underway, a combination of vaccines and drug treatments will be required to defeat the virus. To combat the COVID-19 crisis, this research utilizes cutting-edge drug discovery technology to expand our repertoire of anti-SARS-CoV-2 intervention options. Extending upon Nobel prize winning *yeast surface display* technology, this research rapidly screens hundreds of thousands of *monoclonal antibody* (mAb) drug candidates to quickly identify potential antibody drugs that target vulnerable sites of weakness on the SARS-CoV-2 virus. Utilizing a strong interdisciplinary skillset we define the molecular neutralization mechanisms of a newly discovered antibody: *mAb 910-30 (patent pending)*, to fill critical gaps in our scientific knowledge of anti-SARS-CoV-2 immunity. The immediate results from this research help generate precision targeted medicines against SARS-CoV-2, and the larger impacts of this work serve to move our communities towards safer living conditions. Looking ahead, this research also lays the ground work needed to counteract future emerging biothreats by demonstrating the power of this technology to rapidly discover new drugs in a time of global crisis.

HUNGER AND HEALTH: UNDERSTANDING THE ACCEPTABILITY AND APPROACH OF A HEALTH COACHING INTERVENTION IN THE FOOD PANTRY

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Intersections between hunger and health are gaining traction. New interventions emphasize collaborations between the medical and social service sectors. With health coaching interventions showing promise targeting chronic disease management in the medical setting, this project aimed to understand the acceptability and approach of a health coaching intervention within a Douglas County food pantry. To explore this question, researchers used a mix of reviewing existing pantry data and conducting surveys and interviews with food pantry clients, staff, and volunteers. Existing pantry data revealed high rates of chronic disease and poor nutrition among pantry clients at large. Similarly, client participants in the current study reported high rates of both individual and household disease diagnosis, low consumption of fruits and vegetables, and low levels of physical activity. Interviews with pantry clients provided health coaching programmatic approach recommendations such as non-judgmental coaching, accountability, and participant

incentives. Volunteers and staff reported the need for client education in food preparation, basic nutrition and physical activity, and assistance through additional health expertise. All three stakeholder groups supported hosting a health coach within the pantry focused on overall health programming. In conclusion, high rates of chronic disease, partnered with low nutrition and physical activity literacy among pantry clients demonstrates the need to address health behaviors. Each stakeholder group provided program approach recommendations and indicated acceptability of a health coaching program. With this important feedback from key pantry stakeholders, findings will inform the development and implementation of a health coaching program pilot within the food pantry setting.

A SIMPLE TECHNOLOGY FOR MAKING VALUE-ADDED PRODUCTS FROM CORN LIGNIN

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Agricultural commerce makes the Midwestern U.S. an export powerhouse in the global economy. In 2019, Kansas alone harvested 22 million tons of corn—a $3 billion industry. Yet, harvests generate an equivalent mass of agricultural waste as stalks, leaves, and cobs. While some waste (corn stover) is collected, 4 million tons of cobs were abandoned in Kansas fields with little value. Portions of corn biowastes can be transformed into ethanol biofuel but profitability is challenged and often negated by high production costs. Creating value from the residual fraction, so-called lignin, is coveted. We report a technology that extracts lignin from corn waste then creates value-added compounds from lignin. This simple and efficient technology exposes dissolved lignin to ozone, an oxidant from air. To maximize contact between lignin and ozone, the solution is sprayed as droplets into dilute ozone at ambient pressure and temperature. The spray reactor rapidly yields value-added flavorings, vanillin and *p*-hydroxybenzaldehyde (*p*HB), while preserving the remaining lignin structure for additional value enhancements. Thus, lignin is completely utilized. Conservative estimates indicate the rich flavorings alone add an additional value of approximately $2 per gallon of ethanol produced or $128 per ton of corn waste. Ongoing optimization is expected to extract more value from remaining biomass to provide even more ‘internal subsidy’ for the ethanol industry. Thus, this technology has the potential to rejuvenate the distressed ethanol industry by providing more value for Kansas farmers in a modern bioeconomy.

MODELING LINKAGES BETWEEN EROSION AND CONNECTIVITY IN URBANIZING JOHNSON COUNTY, KS

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Erosion and connectivity are spatially varied processes key to determining movement of sediment to downstream water bodies (e.g. streams and reservoirs) which can negatively affect water quality and aquatic health. In this study, we couple two commonly used methods the Revised Universal Soil Loss Equation (RUSLE) and Index of Connectivity (IC), to generate a new

Erosion-Connectivity Mapping (ECM) framework to determine where erosion sources and pathways (connectivity) overlap to help aid in watershed management. We apply this model to five lowland watersheds in Johnson County, Kansas, USA, with urban land use ranging from 21% to 89%. Erosion modeling results indicate high risk areas near streambanks and roadway systems with similar patterns in connectivity modeling. The ECM framework results indicate that, on average, only 3±2% of the study area is highly erodible and highly connected. In contrast, the vast majority (62±2%) of the land is poorly erodible and poorly connected. Much of the landscape is highly connected but poorly erodible (31±2%), and the remaining land is highly erodible, but poorly connected (3±2%) indicating that erosion is more likely to be the limiting factor in sediment transport. A field assessment of 35 sites provides broad support for the ECMs in accurately modeling overlapping areas of erosion and connectivity. This study provides a method for combining RUSLE and IC in a new tool (ECM) to identify spatial patterns in sediment erosion-connectivity and to create a unified model to aid in the understanding and management of watershed sedimentation.

BENZOYLATION OF HISTONES AS A NOVEL THERAPEUTIC APPROACH FOR THE TREATMENT OF MULTIPLE MYELOMA

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Exploiting the weaknesses inherent to the mutated cells can lead to new treatments for multiple myeloma (MM), an incurable hypermutated cancer arising from plasma cells. BRD9647 is a small molecule identified in a screen of 24,320 compounds, selectively killing the MM cells in a model that recapitulates the MM native environment *in vitro.* BRD9647 is capable of efficiently delivering benzoyl groups to lysine residues, as a synthetic post-translational modification (PTM), primarily to the histone core proteins of MM. According to our hypothesis, the toxicity induced by these PTMs occurs due to the MM cell's inability to remove them. A further study reveals the development of resistance against BRD9647 in AZIN1 (antizyme inhibitor) mutated MM cell line. We hypothesize that this is an attempt by cancer to upregulate intracellular amine concentration and chemically quench the compound before it reaches histone. We will study the two outlined hypotheses for the selectivity of the synthesized compounds against MM. We plan to explore the status of histone deacetylases known to remove acyl histone marks. Further, we will seek to find the targets for BRD9647 using an affinity purification experiment of protein targets. We will also determine the basal levels of polyamines in MM and stromal cells and re-evaluate these levels in response to our selectively toxic molecules. Doing so will allow us to delineate the molecular mechanism of action of BRD9647 together with the possible mechanism of resistance through polyamine up-regulation, leading to a foundation for exploitation of this novel weakness in MM.

FIGHTING COVID-19: DISCOVERY OF MONOCLONAL ANTIBODIES AGAINST SARS-COV-2

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SARS-CoV-2 emerged in 2019 and has rapidly spread, overwhelming healthcare systems and greatly impacting economies. Two million people have died of the disease worldwide, and the state of Kansas has experienced more than 2[7]0,000 cases and over 3,[7]00 deaths. As a response to this threat, a global effort has been initiated to develop vaccines and therapeutic agents. Two vaccines and one medicine have already been approved by the FDA, but there is still great urgency for the development of more efficacious therapeutics for patients that contract COVID-19. In addition, multiple SARS-CoV-2 variants are circulating globally, some of them being more contagious and potentially deadlier than the original variant. These new variants are a challenge for public health because a more contagious virus leads to people having a higher susceptibility to become sick, which could result in higher hospitalization rates. Therefore, new treatments that could protect the population from all the new variants and a better understanding of how these variants affect our immune system are needed. In this context, the DeKosky lab at the University of Kansas has worked on the discovery of new monoclonal antibodies (mAbs) that can help fight COVID-19. Monoclonal antibodies can be used as extremely efficacious therapeutics, diagnostic tools, and help on the design of new vaccines. Using a novel yeast display platform, we have already discovered multiple antibodies. Currently, we are searching for new mAbs that could protect us against not only the original variant, but also against the UK, Brazilian, South African, and Californian variants.

A SUSTAINABLE PROCESS FOR RECYCLING OF LITHIUM-ION BATTERIES

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The lithium-ion batteries (LiBs) recycling market in the United States is currently estimated at $1.5 billion and is projected to grow to $ 18.1 billion by 2030. A major driver in this growth is expected to be the automotive industry. Increasing adaptation of hybrid and electric vehicles (HEVs) across the nation has driven the demand for LiBs. In Kansas, a 26% increase in the HEVs has been seen in the past five years. This has also been reflected in the dramatic increase in the prices of two key battery materials – lithium (Li) and cobalt (Co). Recent price spikes have raised concern's regarding the long-term supply for these materials. How the national prices of these metals diverge in the near future will obviously depend on battery demand, but also heavily on the recycling technologies present. To meet the critical metal requirement of HEVs, an energy-efficient, economical, and environmentally-friendly process is required. The oxalate-based $LiCoO_2$ recycling process developed and patented by the Shiflett research group at KU provides a route to efficiently recycle the Li and Co from waste cathodes at a temperature of 55 °C. This oxalate-based process can also be extended to extract critical metals such as aluminum from bauxite, titanium and zirconium from ilmenite; nickel and manganese from spent cathodes; and rare earth elements like neodymium from coal ash. The efforts towards maintaining the supply chain of the critical metals will position Kansas and KU as a center for the development of environmentally-friendly and economical critical metals recovery processes.

THE CHEMOKINE C-C MOTIF LIGAND 2 (CCL2) PLAYS AN IMPORTANT ROLE IN SKELTAL MUSCLE WASTING ASSOCIATED WITH BREAST CANCER

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The American Cancer Society estimates that in 2021 alone, approximately 2400 new cases of breast cancer will be diagnosed in Kansas. Up to 40% of breast cancer patients experience an understudied condition called Skeletal Muscle Wasting (SMW). SMW causes significant muscle loss, weakness, and fatigue, resulting in a severely reduced ability of patients to tolerate anti-cancer drugs. Although this condition is associated with significantly lower survival rates compared to patients with relatively normal muscle mass, we do not yet understand the mechanism by which it occurs in breast cancer patients.

SMW has been linked to elevated levels of CCL2, a chemokine highly expressed in breast cancer. CCL2 expression is associated with high mortality rates in breast cancer patients. To investigate the role of CCL2 in muscle wasting we treated mouse muscle cells with high levels of CCL2. This led to increased expression of markers of muscle degradation, MuRF-1 and Atrogin-1, with reduced muscle cell proliferation and muscle cell size. This indicates that high levels of CCL2 cause muscle degradation. In a mouse model of human breast cancer, CCL2 released from the tumors was found to reach skeletal muscle tissues, corresponding to increased muscle degradation. Our results indicate that CCL2 knockdown/removal in the primary breast tumor decreases the expression of markers associated with muscle degradation (MuRF-1 and Atrogin-1). Using a second model of aggressive breast cancer and following knockdown of CCL2 in the tumors, a Grip Strength meter was used to measure how strongly mice could grip onto a metal bar. Our results show that mice in which CCL2 was knocked down, exhibited greater grip strength than those mice in which CCL2 levels remained unaltered. Therefore, removal of CCL2 reduces muscle degradation and increases grip strength in a mouse model of breast cancer.

Our findings suggest that we can improve patient survival rates by developing therapies to combat muscle loss. Understanding the mechanism by which SMW occurs in breast cancer is necessary to provide insight into novel, targeted therapeutics to reduce SMW and enhance effectiveness of anti-cancer drugs.

Pregnancy and newborn outcomes in medication controlled GDM based on their treatment

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Introduction

Gestational diabetes mellitus (GDM) is a diagnosis that complicates pregnancy and continues to increase in prevalence. The first treatment recommendation is exercise and nutritional

modifications, but many cases require the addition of medication to fully control the diagnosis. While there are numerous drugs to choose from in order to control GDM, insulin remains the first line treatment. However, this recommendation is based on sparse published data. In 2017 the American College of Obstetricians and Gynecologists published updated guidelines that noted deficiencies present in our current knowledge of the safest and most efficient treatment options for pregnancies affected by medication controlled gestational diabetes (A2GDM). The purpose of this study was to determine if there was a difference in the incidence of adverse maternal-fetal and newborn outcomes based on exposure to either oral hypoglycemic agents (metformin and glyburide) or insulin in our patients affected by A2GDM.

Methods

After local IRB approval, we performed a retrospective cohort study with patient information obtained through our electronic medical record system. Data was collected between 1/1/2013-5/1/2018 and included all A2GDM mothers with a singleton gestation who delivered at KUMC. We excluded pregnancies with fetal chromosomal or major anatomical anomalies. Exposure Categories: Metformin only, Glyburide only, Failed oral with conversion to Insulin, Insulin only and Metformin/Glyburide Combined. Between these exposure groups we analyzed multiple maternal, fetal and newborn outcomes utilizing Chi Square or Fisher's exact tests, one-way ANOVA and a regression analysis once confounding variables were identified.

Results

856 mothers with A2GDM were included in the final analysis. Baseline characteristics demonstrated lower BMIs in those women who took metformin or glyburide and a higher incidence of preexisting hypertension and higher A1c values in those mothers managed with insulin. We observed a higher incidence of hypertensive disorders of pregnancy in those mothers managed with insulin. Newborns were less likely to be admitted to the NICU and had lower rates of hypoglycemia and respiratory distress syndrome if their mothers were managed with oral agents. Adjustments were subsequently made for confounding variables, and the metformin group showed a decreased incidence of NICU admission and newborn hypoglycemic events.

Discussion

Based on overall trends of adverse maternal outcomes, both metformin and glyburide appeared comparable for treatment of GDM. Based on overall trends of adverse neonatal outcomes, metformin appeared to be the drug of choice for these mothers. Based on combined adverse maternal and neonatal outcomes, metformin was associated with the fewest risks.

Coding Human-Animal Interactions in Homes of Children with Autism Spectrum Disorders

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Department of Therapeutic Science, University of Kansas Medical Center Autism

Spectrum Disorder (ASD) is a developmental disorder characterized by differences in social functioning, communication, sensory, and behavior. These differences invite an effort to understand the human-animal bond and its impact on families and children with ASD. The purpose of this study was to determine if the Observation of Human Animal Interaction for Research (OHAIRE) coding tool can be utilized in a home-based setting to code human-animal interactions in children with ASD. The OHAIRE is a coding tool developed to quantify the behavior of children when interacting with social partners and animals in naturalistic settings.

The tool has been tested for reliability and validity within structured, community-based settings, however, it has not been used in home-based settings. The second aim was to determine if inter-rater and intra-rater reliability could be reached between coders using data from the home-based videos. Nine minutes of video was obtained for the study. Participant provided video was challenging to obtain and presented some coding challenges as quality differed from training

videos. Inter-rater reliability agreement was reached between primary and secondary coders ranging from .842 to .888. Intra-rater reliability was met with substantial agreement to almost perfect agreement and ranged from .792 to .929. The OHAIRE coding tool is a promising measure of in-home human-animal interactions that may require adaptations for coding home-based interactions.

Keywords: Therapeutic recreation, Autism Spectrum Disorder, human-animal bond, human-animal interaction, OHAIRE coding tool, social interaction.

No Room for Narcotics: An International Comparison of Orthopedic Post-Operative Pain Outcomes

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Background: In the Summer of 2019, the Dr. Archie A. Heddings Special Program at the University of Kansas Medical Center (KUMC) began to sponsor the travel and lodging of students interested in collaborative research and international experience to Botosani, Romania. Dr. Heddings, a fellowship trained orthopedic traumatologist had connected professionally with the Orthopedic Traumatology department at this hospital and aimed to further create an educational and productive research collaboration between our two programs for the general improvement of patient care. Dr. Heddings established this special program with the strongly held belief that each department had techniques and unique practices that could be exchanged to promote an overall improvement in patient care for Romanian and American patients. This benefit is in addition to the personal and academic growth that could be had by the students of this program. The goal of this international collaborative undertaking is to compare and objectively quantify the difference in post-operative pain treatment and outcomes between two orthopedic traumatology departments. **Methods:** All patients who underwent surgical treatment by an orthopedic surgeon at the Spitalul Judetean de Urgenta Mavromati Botosani in Botosani Romania between May 23rd, 2019 and November 23rd, 2019 were assessed in real time by hospital staff, and their information was recorded on collection forms. Demographic information including the date of operation, indication for procedure, procedure performed, age and sex were collected. Nursing staff recorded all analgesic and anti-inflammatory medications given to the patients during the first and second 24 periods after their surgery, and a Romanian surgeon collected a 0-10 pain score from these same time periods. These sheets were scanned and securely transferred to the KUMC team for compilation into a Microsoft Excel spreadsheet for processing and analysis. A biostatistician from KUMC will help to determine which indications for treatment and treatments have statistical power

for comparison to KUMC patients. The Healthcare Enterprise Repository for Ontological Narration (HERON) search discovery tool will be used to collect the reciprocal data points from the KUMC Electronic Medical Record (EMR) for all patients treated at KUMC during this same

six-month period. Differences in post-operative 0-10 pain scores, as well as the quantity of post-operative analgesia and anti-inflammatory medication administered will be analyzed by a consulting KUMC biostatistician. The biostatistician will ensure appropriate statistical tests are used, and that results are reported accurately in subsequent presentations and publications of this research.
Results: 554 Romanian patients were treated in the six-month time frame, and their information collected for analysis. This study is pending biostatistician review to determine which indications for treatment and treatments have statistical power for comparison to KUMC patents.
Conclusion: From the subjective observation of two individual KUMC affiliated individuals who have visited the Spitalul Judetean de Urgenta Mavromati Botosani, there is a striking difference not only in how our attending surgeons and staff approach the management of post- operative pain, but also a difference in apparent post-operative pain outcomes. In an attempt to quantify these differences in an objective fashion, a study was developed with significant collaboration between the Orthopedic Traumatology departments of our respective institutions. This study aims to compare post-operative pain scores and the quantity of analgesic and anti-inflammatory drugs given to patients during the first two 24-hour periods after their operation. The field of post-operative pain management is growing, with a significant focus being put on improved patient post-operative pain outcomes while simultaneously limiting the use of narcotic pain medications. The results of this study and Physician practice changes that result from them can lead to improved patient care in the post-operative setting, reducing risk while promoting healing and physical recovery.

Use of the Board Game *Pandemic* to Simulate Cooperative Emergency Response for Community/Public Health Nursing Students

Karen Towne, MSN, RN,APHN-BC, PhD Student
University of Kansas School of Nursing, Doctor of Philosophy

Purpose. To simulate interdisciplinary public health emergency response (PHER) through cooperative gameplay for senior pre- licensure community health nursing students.
Background. Strategy board games develop the 21st century skills of communication, collaboration, creativity, and critical thinking. Pandemic™ game play emphasizes participatory decision-making to solve problems by requiring verbalization of critical thinking and prioritization. **Methods**. The commercially available board game Pandemic™ simulates a global PHER event as four communicable diseases spread throughout different regions of the world. In groups of four, students were assigned a unique professional role within public health, safety, research, or direct care. As an interdisciplinary team, players contain, mitigate, and treat outbreaks while discovering cures for each disease. Each professional role on the team is designed to provide an essential service with realistic advantages that must be coordinated strategically with the other roles to win the game. **Results**. All players contributed to shared decision-making by verbalizing critical thinking, debating priorities, and leveraging interdisciplinary roles to solve problems. Students enjoyed high levels of engagement.
Discussion. Cooperative gaming allows nursing students to experience the challenges and impact of PHER while conserving simulation resources. Students appreciate the complexity of outbreak prevention and response while recognizing the importance of interdisciplinary

collaboration, communication, and shared decision-making in the treatment and prevention of

communicable disease. The Pandemic™ game is an affordable one-time cost, requires minimal staging, and can be played anywhere, making it a prospective teaching tool for health-allied or interdisciplinary teams in Kansas academic settings or professional practice.

WHEAT PROTEIN-BASED BIO-SCAFFOLD FOR NEURAL REGENERATION

Ryan Brice and Li Yao
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Spinal and peripheral nerve injuries are common in both civil and military environments and are primarily the result of transection injuries or burns. In the majority of nerve injuries, the nerve ends cannot be directly sutured. Biomaterial conduits can act as a bridge to connect two damaged nerve ends together, providing channels to guide nerve growth. In the proposed project, we fabricated a novel multichannel neural conduit with a hybrid composition of collagen and wheat glutenin (WG) for nerve repair and regeneration. Collagen is a common biomaterial that mimics a microenvironment suitable for neural growth. However, collagen materials have weak mechanical properties. The WG component in the proposed neural conduit can increase its mechanical strength. In this project, a WG-collagen neural conduit has been fabricated and a number of studies are performed to characterize the mechanical, molecular, chemical, and biocompatible properties of the neural conduits. Because gliadin is toxic to animal tissue, the glutenin will be extracted from the wheat gluten and the gliadin component will be removed. Our preliminary study by western blotting showed that gliadin has been effectively removed from WG. Adult human astrocytes (HA) were cultured on top of WG-collagen and shown to support cell growth. The outcome of our study indicates that the neural conduit is suitable to be grafted into the injured rat nerve to investigate nerve regeneration and functional recovery.

A SURVEY OF KANSAS SPEECH-LANGUAGE PATHOLOGISTS' KNOWLEDGE AND CONFIDENCE REGARDING LITERACY INTERVENTION

Judydiana Chavira[1], Karissa Marble-Flint[1], Douglas Parham[1], Colleen Novak[1], and Katherine Mason Cramer[2]
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The connection between spoken and written language has been well established in the research literature. Spoken language is a crucial component in supporting the development of reading and writing. For the past 19 years, speech-language pathologists (SLPs) have had a role in providing literacy services. SLPs are trained in the areas of speech, language, and communication. Their knowledge and expertise regarding spoken and written language qualifies SLPs to intervene in the area of literacy. However, SLPs report that they are still not completely confident in providing services. A recent report indicated Kansas' students are not at grade level in reading and writing. This is alarming, as literacy is integral to be successful in college and the workplace. If literacy intervention is not provided, students will not be prepared to meet the demands necessary to contribute to the flourishing development of the economy in Kansas, as they will not have the necessary skills required when entering the workforce. The current study aims to (1) assess Kansas school-based SLPs' knowledge and confidence with providing literacy services through the distribution of an online survey and to (2) understand how to best serve children with written language disorders in public schools. This study replicates a published survey. Participants were recruited through the state association for Kansas SLPs. Preliminary results

indicate SLPs could benefit from professional development about literacy intervention for high schoolers. This survey research project will inform future studies and professional development opportunities for Kansas SLPs in the area of literacy intervention.

OPTIMIZING THE THERMAL PERFORMANCE OF PHASE-CHANGE THERMAL MANAGEMENT SYSTEMS FOR UTILITY-SCALE APPLICATIONS IN KANSAS

Munonyedi Egbo and Gisuk Hwang
Department of Mechanical Engineering, Wichita State University

Unlike the conventional cooling systems, phase-change cooling systems using wicks offer reliable high and effective heat flux cooling capability. However, the thermal performance of these novel thermal management systems which find applications in both small- (e.g., concentrated heat-dissipating microelectronics) and utility-scale (e.g., power-generating plants) systems are still limited due to some technical challenges. Our research is focused on trying to understand, fundamentally, the physics behind these limitations and addressing them. We dedicate our study towards designing, fabricating, and assessing novel cooling systems that employ sintered-particle metallic wicks and take advantage of the large latent heat of vaporization of liquid coolants such as water. The state of Kansas has numerous utility-scale systems that could benefit from the outcome of this research. For example, the power stations, including nuclear and coal powered plants, such as the Wolf Creek Generating Station and the Wester-Jeffery Energy Centre, employ conventional cooling systems that reduce fuel efficiency and increase carbon dioxide (CO_2) emissions. Therefore, employing these novel cooling systems would potentially increase fuel efficiency and reduce CO_2 emissions. This is very important considering the fast-depleting energy fuel reserves and the imminent danger of global warming. The food, water, chemical, and material manufacturing industries in Kansas that require either efficient, reliable, and cheap heat dissipation and/or steam generation would also benefit from the success of this work. And finally, the aerospace industry, some of which are in Kansas, is desperately in demand of this technology, and the present study could be the answer.

UNDERSTANDING THE PHYSICS OF DROPLET ELECTROCOALESCENCE IN A MICROTRAP

Bhargav Koppolu, **Faisal Bilal Memon**, and Sindhu Preetham Burugupally
Department of Mechanical Engineering, Wichita State University

This work details a parametric study for merging microscale water droplets, using an electric field, in a microfluidic device. This device, titled TAP (Trapping and Assisted Pairing) is a cell handling platform for conducting cell-cell (plant cell-microbe) interaction studies for identifying symbiotic/parasitic relationships and to help plant biologists devise approaches to maximize the symbiotic functions and minimize the parasitic functions. This work stems from the big picture idea of smart and sustainable agricultural practices to meet the future global crop production demands in the era of ecosystem degradation and climate change. TAP leverages droplet microfluidics to efficiently electrocoalesce multiple pairs of droplets — one set of droplets containing individual plant cells and another set of droplets containing individual microbes — to

initiate multiple cell-microbe interactions. As a first step, through numerical simulations we analyzed the physics of droplet merging and conducted a parametric study to analyze the effect of droplet/fluid properties and droplet gap on their behavior. This study resulted in the generation of a preliminary design-chart – a plot of the droplet fate (merged or non-merged) vs minimum droplet gap d – for a fixed actuation voltage (8 V) and fixed electrode gap (10 microns). We found that for successful merging of the aqueous droplets, the magnitude of the electric field strength E=V/d must be about 4.45 MV/m for γ =0.0025 N/m and about 17.8 MV/m for γ =0.04 N/m. These observations are in good agreement with the existing literature.

AN ENERGY CONSUMPTION MODEL UNDER TIME-OF-USE RATES FOR SCHEDULING OF MANUFACTURING SHOPS

Ali Mokhtari-Moghadam and Deepak Gupta
Department of Industrial, Systems & Manufacturing Engineering, Wichita State University

One of the most important contributors supporting economic prosperity in Kansas is attributed to manufacturing. It accounted for 16.30% of the output and 11.69% of the workforce (2020 Kansas Manufacturing Facts). In addition, small businesses employed 51% of the private workforce in 2016 (Kansas Small Business Profile, 2019). With such an importance of small businesses within Kansas, this research focuses on small manufacturing shops. Scheduling of manufacturing industries with the aim of minimizing makespan have been studied extensively over the last decades. Recently, green production scheduling considering energy efficiency is emerging as one of the important research areas. To address the critical issues concerning the increased energy consumption and environmental pollution, this research attempts to develop a multi-objective model for manufacturing shops, considering electric consumption cost under time of use (TOU) tariffs, worker's cost, and completion time of all products. Workforces with different performance are considered for machine tools adjustment. A multi-objective genetic algorithm (MOGA) is constructed to minimize not only completion time of all jobs, but also the total electricity costs (TEC) and worker' s costs. In order to check the performance of the proposed algorithm, different scheduling test problems are designed and a comprehensive computational experiment is carried out. The results indicate that the proposed MOGA algorithm is able to constructs different optimal scheduling scenarios for manufacturing shops, by which products are completed in a shortest time interval. In addition, total cost including energy consumption and workforces' costs are reduced to a great extent.

COMPUTERIZED SENTENCE BUILDING AS A TREATMENT FOR APHASIA

Addison Powell, Daphne Keese, and Erin O'Bryan
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Acute cerebrovascular disease (stroke) is one of the leading causes of death in the United States, and those who survive are often left with significant long-term disabilities. According to Kansas Health Matters, between 2016 and 2018, 14.7 out of every 10,000 Kansans were admitted to the

hospital due to stroke. Aphasia, which frequently occurs secondary to stroke, results in loss of the ability to speak freely. One cause of difficulty producing conversational speech is an impairment in the ability to build sentences. Existing treatments have shown improvement in spoken language (e.g., Thompson et al., 1997; Doyle et al., 1987), but treatments may not reach full recovery potential. People with aphasia express eagerness to find new therapy approaches to improve communication abilities and to have home therapy programs in addition to in-person therapy. There continues to be a need for effective sentence production treatments that can be easily translated into a home program. This presentation reports results from a treatment study examining whether a computerized sentence building task has therapeutic value for people with aphasia. The treatment is based on a sentence processing task known as the word maze, first developed by Freedman and Forster in 1985. Seven people with aphasia performed the task once or twice per week in forty-minute long periods for a total of 6-8 sessions. All participants showed improved task accuracy and increased scores on the Assessment for Living with Aphasia. Two participants showed an 8-point increase on the Western Aphasia Battery-R Aphasia Quotient.

WHAT FACTORS HAVE AN EFFECT ON THE LIFE EXPECTANCY OF KANSAS CITIZENS?

Lisa Vayda and Jodi Pelkowski
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Life expectancy is a common measure of public health and has been positively correlated with economic growth. This research focuses on how access to basic needs and socio-economic factors, often the focus of state-level programs and policies aimed at business and economic development, impact life expectancy of Kansas citizens. Information was collected on all 105 Kansas counties involving income, health care provider insufficiency, food insecurity, housing, living arrangements, computer & internet usage, education, transportation, insurance, metropolitan statistical area (MSA) and local health department funding. Multiple regression and individual single regression were used to analyze the magnitude and direction of the effect of the variables on life expectancy.

Preliminary analysis suggests controlling for other factors that shortages in primary care providers, food insecurity, local health department funding, internet access, median home values, and incomes are significantly associated with life expectancy. These findings could be employed to advance the policies, economic development, and business opportunities which best support the significant factors and corresponding programs affecting Kansans.

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