HISTORY OF ST. ALBERT’S DAY AT CREIGHTON UNIVERSITY

In 1997, faculty from the health science schools, as well as from the College of Arts and Sciences, expressed an interest in promoting the interaction between faculty scientists and students at Creighton University at both the undergraduate and graduate level. A series of discussions resulted in the first St. Albert’s Day celebration, which was held on November 24, 1997. Since 1997, the St. Albert’s Day poster session has been an annual event at Creighton University. In 2008, the event was expanded to include oral presentations as well as posters. In addition, this year awards will be presented for the ‘best poster’ in three categories, as well as for the ‘best presentation.’

St. Albert Magnus was born in 1205 or 1206, and as a youth was sent to pursue his studies at the University of Padua. He joined the Order of St. Dominic in 1223. He completed a Doctor’s degree at the university in Paris, which was celebrated as a school of theology. In 1254 Albert was elected Provincial of his Order in Germany. He resigned this office in 1257 in order to devote himself to study and to teaching. He was canonized in 1931. He is the patron saint of scientists and was the mentor of St. Thomas Aquinas. He was called the “Doctor Universalis” (Universal Doctor), in recognition of his extraordinary genius and extensive knowledge. He composed a veritable encyclopedia that contained scientific treatises on almost every subject. He was proficient in every branch of learning cultivated in his day, including physics, mathematics and metaphysics, and his writings did not distinguish between the sciences and philosophy.
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1. **Investigating Effects of Magnetic Resonance Imaging on Patients with Abandoned Epicardial Leads**


**Purpose and Motivation:** Nearly 3.8 million people in the United States live with cardiac implantable electronic devices (CIED) such as pacemakers and implantable cardioverter-defibrillator (ICD). About 50% - 75% of these patients are estimated to require an MRI during their lifetime, however, concerns about patient’s safety have in most cases, led to a denial of potentially crucial diagnostic imaging tests. Largely, these situations arise when patients have combination of leads and generators designated as MRI non-conditional. In the recent consensus statement by the Heart Rhythm Society (HRS), contraindications have been extended to include recent implants, fractured leads, epicardial leads and abandoned leads. While this classification relies on several research and clinical trials assessing radiofrequency (RF) induced heating in patients with transvenous leads, only few of such studies with epicardial leads have been reported. This study seeks to investigate the effect of MRI on patients with epicardial leads.

**Materials and Methods:** A phase 1 study will be carried out using numerical simulations to quantify induced electric current in epicardial leads of different configurations due to RF coupling, the heat generated and then predict the temperature distribution in surrounding tissues. Phase 2 study will involve experimental verification and validation of the simulated results. This will be carried out using a gel-saline phantom measurement according to the ASTM protocol. Also, a modification to the protocol to include possible cooling effects due to blood flow will be adopted to simulate typical cases in patients. The suitability of image-based MR thermometry technique will be verified simultaneously with the phantom studies.

**Keywords:** MRI, RF heating, Epicardial leads, Abandoned leads, cardiac pacemaker

2. **Improving Global Tuberculosis Treatment Through a Novel Inhaled Antibiotic Product**

   Prachi Agrawal, Kinnari Arte, Justin A. Tolman, E. Jeffrey North, Department of Pharmacy Sciences

Tuberculosis (TB) is the leading cause of death globally with 10 million new cases of TB and 1.3 million deaths as per annual report. Increasing rates of antibiotic resistance, long duration of treatment regimen, and high pill burden, challenges the treatment of TB and creates a social and economic burden in developing countries. Recent studies suggest clofazimine (CFZ) to be a potentially viable treatment option against drug resistant TB. However, its poor pharmacokinetic profile associated with oral route limit its clinical utility. Developing inhaled CFZ formulation that could be targeted at the site of action...
would circumvent the oral route and the allied adverse effects. The NIH requests proposals to ‘develop and commercialize a new, low cost, easy-to-use inhaled CFZ product that will support the global fight against TB’.

This research focuses on the development of cost-effective inhaler device, formulation of dry powder inhalation (DPI) of CFZ for targeted delivery, characterization and aerosol testing of the developed formulation followed by the formulation pk and toxicity studies. The DPI of CFZ would target the global TB endemic and the device would target global TB market. The goal of this project would be to develop an inhaled CFZ product with a unit dose cost of $5 so as to reach the developing countries with high TB burden at low cost and aid the global health missions of WHO and NIAID targeted 90% reduction in world TB deaths by the end of 2030.

3. DEVELOPMENT AND IN VIVO ANALYSIS OF INHALED CLOFAZIMINE FOR THE TREATMENT OF PULMONARY TUBERCULOSIS

Kinnari S. Arte, Justin A. Tolman, Jeffrey E. North, Harsh V. Chauhan
School of Pharmacy and Health Professions, Creighton University

RATIONALE: Tuberculosis (TB) is a leading cause of death globally despite current treatment options. An old oral antibiotic, clofazimine (CFZ), is a potentially viable treatment option against TB infections. CFZ is a highly hydrophobic. When given orally, it has poor pharmacokinetic and adverse drug reaction profile. Development of an inhaled CFZ formulation could achieve high drug concentrations in infected lungs and reduce systemic drug exposure and adverse effects associated with the oral delivery. This project explores the formulation and processing parameters for inhaled CFZ formulations and the amount of inhaled CFZ dose in vivo.

METHODS: Dry powder inhalations of CFZ or CFZ – salt (CFZ – Mesylate, CFZ – Tosylate, CFZ – Lactate) with dipalmitoylphosphatidylcholine (DPPC) were prepared in 80 : 20 ratios of CFZ or CFZ-salt to DPPC. The resulting powder formulations were characterized for, batch yield, drug content, particle size distribution, antibacterial efficacy, cytotoxicity, and solubility. Moreover, formulations were also characterized using differential scanning calorimetry, thermogravimetric analysis, infrared spectroscopy, X-ray powder diffraction and scanning electron microscopy. Lead formulation was dosed in BALB/c mice to analyze the amount of inhaled CFZ.

RESULTS: CFZ : DPPC formulation, among all others, had the highest batch yield, narrowest range of particle size distribution, and a roughly spherical morphology. Additionally, further characterizations also revealed that, CFZ DPPC was superior to other spray dried CFZ – salt DPPC formulations. Hence, it was selected as lead. In-vivo analysis of CFZ : DPPC in BALB/c mice revealed an inhaled dose of about 52.81 µg/g of wet lung.

CONCLUSION: CFZ-DPPC formulation was found to have the best outcomes as compared to other CFZ-salt : DPPC formulations with no compromise in anti-TB activity and acceptable inhaled amounts, in vivo, thus, being preferable for inhaled lung delivery.

ACKNOWLEDGEMENT: Funded by NIH/NIAID (272201800040C-0-0-1)
4. **Single Molecule Studies to Examine the PCNA-CAF-1 Interaction**

*Maggie Atkinson and Jacquelyn Wright*

**PI:** Dr. Lynne Dieckman

**RATIONALE:** DNA replication and organization are necessary for all living things. The organization of DNA to form nucleosomes, which are the basic units of chromosomes, dictates proper gene expression. Two proteins that assist in nucleosome formation are proliferating cell nuclear antigen (PCNA), which is a sliding clamp protein that recruits many other proteins to the DNA replication fork, including chromatin assembly factor 1 (CAF-1), which is a protein that recruits histone proteins necessary for compacting the DNA into nucleosomes. The interaction between PCNA and CAF-1 is required to ensure proper packaging of DNA into nucleosomes. However, the kinetics and affinity of the interactions of these proteins is unknown. By closely examining the interaction kinetics between CAF-1 and PCNA, it will shed new light on the understudied PCNA-CAF-1 interaction.

**METHODS:** We have been developing a method to measure the kinetics and affinity between CAF-1 and PCNA using total internal reflection fluorescence (TIRF) microscopy. We bound biotinylated CAF-1 to a quartz microscope slide coated with neutravidin and flowed fluorescently tagged PCNA on top. We used the TIRF microscope to image the interactions between these proteins. Then we analyzed the videos and track the kinetic interactions.

**RESULTS:** Using the TIRF microscope, we obtained images of 0.2-micron TetraSpeck microsphere control slides. Also, we obtained videos of fluorescently tagged PCNA and CAF-1 at various concentrations in order to test our method of binding CAF-1 to the slide and visualizing PCNA.

**CONCLUSION:** Our data suggests that we were successful in obtaining images of TIRF. From our PCNA and CAF-1 videos, we think CAF-1 is not properly attached to the slide. Future work will include investigating how to adjust the method to properly attach CAF-1 to the slide.

**ACKNOWLEDGEMENTS:** CURAS Summer Undergraduate Research Fellowship Scholarship, CURAS Faculty Research Fund; Dr. Nichols, Anh Mai M.S., Creighton University Physics Department; Integrated Biomedical Imaging Facility at Creighton University; NE-INBRE DRPP Grant
5. **ASSOCIATION OF HYPOXIA AND MITOCHONDRIAL-DAMAGE ASSOCIATED MOLECULAR PATTERNS IN THE PATHOGENESIS OF VEIN GRAFT FAILURE**

Joseph G Ayoub¹, Finosh G Thankam², Mohamed M Radwan Ahmed², Aleem Siddique³, Thomas C Sanchez¹, Rafael A Peralta¹, Thomas J Pennington¹ and Devendra K Agrawal²*

¹Creighton University School of Medicine, Omaha, NE, ²Western University of Health Sciences, Pomona, CA, ³University of Nebraska Medical Center,

**RATIONALE:** Mitochondrial dysfunction in the vessel graft due to hypoxic/ischemic episodes disturbs the vascular homeostasis resulting in the hyperplasia of SMCs. Various stimuli including hypoxia alters the mitochondrial function and results in the de-differentiation of SMCs from contractile phenotype to proliferative synthetic phenotypes which in turn results in intimal hyperplasia. However, the molecular signaling that triggers the mitochondrial dysfunction, sterile inflammation and subsequent vein graft failure has not been explored. Moreover, the pathological signaling by various mitochondrial-DAMPs (mt-DAMPs) released from the mitochondria of injured/stressed cells under hypoxic/ischemic stress were reported to accelerate the inflammation in diverse tissue types. However, the involvement of mt-DAMPs in the pathogenesis of vein graft failure following CABG procedures and the effect of hypoxic insults in mt-DAMP release are largely unknown regarding the graft and vessels adjacent/associated with anastomosis.

Coronary artery bypass grafting (CABG) remains the ultimate treatment modality for the revascularization of the myocardium which has significantly increased the survival benefits of patients with multiple coronary artery diseases (CAD). However, the patency of the graft decreases over time leading to graft failure which in turn is associated with myocardial infarction (MI), recurrent angina, repeated coronary revascularization procedures and even death. Saphenous vein grafts (SVG), the widely used conduit for CABG in human, has the failure rate more than 25% within 12-18 months of the CABG procedure and the 10-year failure rate is 50-60%. Importantly, ischemic insult and subsequent inflammatory episodes lead to the hyperplasia of smooth muscles (SMCs) which in turn affects the hemodynamics and physiology of the graft and subsequent failure. The involvement of mt-DAMPs in vein graft failure has not been explored.

**HYPOTHESIS:** On this background, the focus of this study is to understand the association of the major mt-DAMPs in the occluded vein grafts and adjacent vessels followed by CABG procedure and to investigate the mt-DAMP release by SMCs under hypoxic conditions.

**METHODS:** This pilot study utilized the vein grafts and associated vessels from Yucatan micro swine CABG model and the isolated arterial SMCs. Immunofluorescence was used to quantify protein expression in tissue samples and cell cultures for proteins including: citrate synthase (CS), complex-1, mitochondrial pyruvate dehydrogenase (mt-PDH), PGC-1α, the hypoxia response mediator hypoxia inducible factor-1 alpha (HIF-1α), and mt-DAMPs including Cyt-C, Hsp-60, and mtTFA. Hypoxia was also induced on the SMCs to examine the mitochondrial oxidative stress (with the MitoSOX Red assay) and for mitochondrial pore integrity (using Image-iT LIVE mitochondrial transition pore assay Kit).

**RESULTS:** The protein expression status of the major mitochondrial biomarkers including citrate synthase, complex-1, mt-PDH, except PGC-1α and HIF-1α, were found to be similar
in the occluded graft and associated tissues. The mt-DAMPs (mt-TFA, Cyt-C and Hsp60) displayed a drastic increase in the graft and the associated tissues. The effect of hypoxia in the upregulation of mt-DAMPs were checked under in vitro cultured smooth muscle cells (SMCs) and all the mitochondrial biomarkers and the mt-DAMPs displayed a significant upregulation in the hypoxic SMCs when compared with the normoxic cells. The increased ROS content and compromised membrane integrity in the hypoxic SMCs were correlated with the increased mt-DAMPs.

**CONCLUSIONS:** The findings from our study revealed the association of mt-DAMPs in the graft and associated tissues implying their possible role in the pathogenesis of the graft failure, which was correlated with hypoxia using the cultured SMCs.

6. **Redox Regulation of* Borrelia burgdorferi* Gene Expression and BosR Function**  
**Michael J. Backer, Amanda K. Zalud, Travis J. Bourret**

**Rationale:** Throughout its life cycle, *B. burgdorferi*, the bacterium that causes Lyme disease, encounters oxidative stress through reactive oxygen species (ROS). The DNA-binding protein BosR (Borrelia oxidative stress regulator) regulates genes hypothesized to protect *B. burgdorferi* against cytotoxicity from ROS and genes required for completion of its infectious cycle. We set out to determine the role of BosR in regulating genes that are found to be affected by nitric oxide (NO), as well as whether BosR is a redox-active gene regulatory protein.

**Methods:** PCR product of *bosR* and the arabinose-inducible pBAD/HisA plasmid were subjected to restriction digestion and subsequently ligated together with T4 DNA ligase. These products were transformed into chemically competent TOP10 *E. coli*. Cultures were grown at optimal conditions and spin purification of the 6xHis-tagged proteins was performed using a cobalt resin. *B. burgdorferi* ML23 parent background (wild-type) and *bosR::Km (ΔbosR)* strains were grown under microaerobic conditions in BSK II medium, pH 7.6 at 34 °C. At early log phase, cultures were treated accordingly: A) untreated, B) 30 mM Sodium Acetate, C) 0.625 mM spermine NONOate (sper/NO), and D) 30 mM Sodium Acetate and 0.625 mM sper/NO. RNA isolation was performed, and RT-qPCR was utilized to determine gene expression.

**Results:** The expression of the *bosR* allele in *E. coli* harboring pBAD-HisA::bosR-FLAG was shown to be arabinose inducible. Optimal expression was found to be at 37 °C and 0.002% L-arabinose. Spin purification of the 6xHis-tagged BosR protein using a cobalt resin was successfully performed. Preliminary data indicates that BosR plays a role in regulating *rpoS and napA*, both of which are repressed by nitric oxide.

**Conclusion:** Oxidative stress appears to reduce expression of *rpoS* and *napA* in the *B. burgdorferi* ML23 ΔbosR strain. Purified BosR recombinant protein will be used to study the effects of ROS on BosR gene regulatory function using function assays (e.g. EMSA).

**Acknowledgement:** Special thanks to Dr. Randy Ferlic and the Center for Undergraduate Research and Scholarship for the generous scholarship award.
7. DEVELOPMENT OF METHODS FOR MITOCHONDRIAL AND ELECTROPHYSIOLOGICAL ANALYSIS IN ZEBRAFISH
   Carly Baker, Annemarie Shibata

   RATIONALE: Carnitine palmitoyltransferase II (CPTII) facilitates the conversion of palmitoyl carnitine to palmitoyl-CoA and is necessary for proper nervous system development. CPTII deficiency is associated with many developmental neurological and neuropsychological disorders such as epilepsy, attention deficit disorder, intellectual disabilities, autism, and schizophrenia. Our goal is to understand how deficiency of CPTII causes issues with the formation and function of the nervous system. We use the zebrafish model system to study the effect of CPTII deficiency on the development and function of the nervous system.

   METHODS: Among patients with CPTII deficiency, seizure activity can occur. For electrophysiological analysis we determined, through reading papers, that we will measure seizure predisposition in our injected zebrafish to test the relationship between a loss of function of CPTII and seizures. This will be measured by non-invasive electrophysiological recordings using a multi-electrode array. For analysing mitochondria in zebrafish, we read articles provided by the company that produces the Seahorse XF analyser. We determined a protocol that can measure oxygen consumed in the mitochondria.

   RESULTS AND CONCLUSION: Our preliminary research on how to conduct these procedures will allow us to begin physical testing on zebrafish embryos for electrophysiological date. Further research is required to understand how to properly isolate mitochondria from embryos since we determined a protocol to run isolated mitochondria in the Seahorse XF analyser, but not how to isolate the mitochondria. Our goal once fine tuning the process will be to analyse data in morpholino injected zebrafish who have CPTII loss.

   ACKNOWLEDGEMENT: I wish to show my appreciation to Dr. Annemarie Shibata for providing guidance at the beginning of these specific research processes and Yan Xie in Dr. Tu’s Lab for providing information on the Seahorse XF mitochondrial analyser.

8. EFFICIENT INTERSPECIES TRANSMISSION OF SYNTHETIC PRIONS
   Alyssa J. Block, Thomas E. Eckland, Anthony E. Kincaid, Ryan W. Walters, Jiyan Ma, and Jason C. Bartz

   RATIONALE: Prions (PrP^{Sc}) are the infectious agents responsible for transmissible spongiform encephalopathies (TSE) and are the misfolded isomers of a normal cellular protein, PrP^{C}. Prions are zoonotic, however the mechanisms that govern interspecies transmission are unknown, resulting in an inability to predict the zoonotic potential of emerging prion diseases. Recently, in vitro generation of prions from minimal components, synthetic prions, have provided insight into the mechanisms of PrP^{Sc} formation. It is unknown if synthetic prions can infect a different species, knowledge necessary to further understand the mechanisms behind interspecies transmission.
METHODS: Murine synthetic prions were inoculated into Syrian hamsters and animals were monitored for onset of clinical signs. CNS tissue was collected for biochemistry and histology. Migration of PrP\textsuperscript{Sc} was determined by SDS-PAGE and Western Blotting, conformational stability was determined by denaturation of PrP\textsuperscript{Sc} with guanidine hydrochloride, and PrP\textsuperscript{Sc} conversion efficiency was determined by protein misfolding cyclic amplification (PMCA). For pathological characterization, brains were fixed, embedded, sectioned, and then stained with hematoxylin and eosin to determine presence of spongiform degeneration. Immunohistochemistry determined PrP deposition patterns.

RESULTS: All hamsters inoculated with murine synthetic prions developed clinical signs of prion disease. Serial intraspecies transmission resulted in shortening and stabilization of the incubation period consistent with prion adaptation. Clinically, these animals are characterized by progressive weight gain. PrP\textsuperscript{Sc} from these animals exhibited a 21 kDa migration pattern of the unglycosylated PrP\textsuperscript{Sc} polypeptide. The PMCA conversion coefficient from these animals indicated a relatively slow rate of PrP\textsuperscript{Sc} formation. Conformational stability assays indicated a low conformational stability. Preliminary histology indicates the presence of spongiform degeneration and abnormal PrP deposition in the CNS of infected animals.

CONCLUSION: Synthetic prions efficiently cross the species barrier. The resultant disease phenotype is highly reminiscent of the brain-derived hamster-adapted strain 139H. Synthetic prions can be utilized to study interspecies transmission.

ACKNOWLEDGEMENTS: Thank you to Jiyan Ma for providing the murine synthetic prions for bioassay. Thank you to Thomas Eckland for assisting in care and clinical evaluation of the animals. Thank you to Anthony Kincaid for his assistance with histology and neuropathology. Thank you to Ryan Walters for his statistical expertise. And lastly, thank you to Jason Bartz for guidance, support, and espresso throughout this project.

9. UNCOVERING THE NEEDS OF THE OMAHA COMMUNITY: ASSESSING OMAHA JITTERBUGS’ CREATION OF INCLUSIVE, EMPOWERING SPACE
Kevin Boes

RATIONALE: This project was conducted for Omaha Jitterbugs, a swing dance scene in Omaha which seeks to use its space to create an empowering and inclusive environment for its members, encouraging greater interaction between members of different backgrounds. This project evaluates Jitterbugs’ program theory regarding this goal and assesses Jitterbugs members’ needs which must be met in realizing this goal.

METHODS: The study utilized a grounded theory approach, using Group Concept Mapping methods to create maps of members’ needs. In addition, semi-structured interviews were also conducted with members to produce deeper insights into the themes raised by the concept maps.

RESULTS: Jitterbugs members held differing paradigms for how Jitterbugs should operate: some viewed Jitterbugs’ action as occurring on an organizational level while others viewed its action as being conducted by dedicated members. Members identified
purposeful outreach for member sourcing, continuing education of new members, and community cohesion as the most important needs to meet, while they viewed bureaucratic improvements and avoidance of intentional integration as less important to meet.

**CONCLUSION:** This study determined that Omaha Jitterbugs could most effectively create an empowering and inclusive environment for its members by emphasizing community cohesion, investing in the continued education of its new members, and sourcing members through purposeful outreach. To do so, Jitterbugs must develop a shared paradigm of action which acknowledges members’ commitment to the scene through active outreach to unsourced communities and purposeful interaction with new members within the scene.

**ACKNOWLEDGEMENTS:** The author would like to thank the members of Omaha Jitterbugs and JIVE for their engagement and cooperation in data collection, Amjed Alsulaily for his assistance in survey data collection, Dr. Alexander Roedlach for his guidance as research mentor, and the Department of Cultural and Social Studies for its guidance and encouragement.

10. **Furthering Student Participation in the National School Lunch Program to Improve Nutrition and Satisfaction: Addressing Factors Contributing to the Decision to Purchase or Pack a Lunch**

   **Kevin Boes**

   **RATIONALE:** This project explores the factors contributing to student participation in the National School Lunch Program. The study was conducted in an Omaha school district referred to as Hilltop Schools, a public school district several elementary schools feeding into a singular middle and high school.

   **METHODS:** The study focused on the middle and high school lunch programs. Using the Framework of Care outlined by Kneafsey et al, I examine the factors contributing to students’ and parents’ respective decisions to purchase school lunches, utilizing spatial mapping, content analysis, and semi-structured interviews.

   **RESULTS:** Despite Hilltop Schools staffs’ feelings of benevolence, their lack of structural beneficence prevents students from seeing these feelings. The school district has not demonstrated care for the students through formalized elicitation of student feedback, causing students to seek other lunch sources which offer greater evidence of care.

   **CONCLUSION:** This project suggests that, even with a high quality lunch program, school districts must appeal to students’ social needs to improve student participation in the National School Lunch Program.

   **ACKNOWLEDGEMENTS:** The author would like to thank the CURAS Summer Undergraduate Research Fellowship for its financial and logistic support, the parents and staff of Hilltop Schools for their engagement and cooperation in data collection, Dr. Barbara Dilly for her guidance as research mentor, and the Department of Cultural and Social Studies for its guidance and encouragement.
11. WORK TOWARDS AN ELECTROGENERATED CHEMILUMINESCENCE–DNA BIOSENSOR LABELED WITH A RUTHENIUM COMPLEX

Natalie A. Bolton¹, Meredith B. Lloyd¹, Huy L. Bui¹, Kenneth N. Hipp², Rebecca Y. Lai² and Erin M. Gross¹

Electrogenerated chemiluminescence (ECL) based biosensors have high sensitivity while maintaining low cost, rapid reaction time, and minimal space constraints. A stem-loop DNA probe was bonded to a gold electrode via alkanethiol linkage, and the electrodes were fabricated with alkanethiols of C4, C6, C8, and C9 chain lengths. When a single stranded DNA target was added to the electrode environment in the presence of a tri- propyl amine co-reactant, the probe changed shape and altered ECL intensity. Sensors fabricated with different carbon chain lengths were investigated via capacitance measurements and cyclic voltammetry (CV) trials in an attempt to produce electrodes with higher stability and consistent ECL signal response. The sensors with longer carbon chains (C8 and C9) were found to have the highest stability through capacitance testing and most consistent signal response in CV testing. Previous experiments found that the sensors show signal-off behavior in the presence of 2-μM complementary C8 K-ras DNA target and have some level of DNA specificity when exposed to non-complementary DNA target sequences. We have redesigned the original C6 K-ras DNA target to become a C11 K-ras DNA target to obtain higher stability.

12. DESIGNING A USER INTERFACE FOR PHYSICAL THERAPY STUDENTS TO IMPROVE REHABILITATION RESEARCH THROUGH CLINICAL INVOLVEMENT

Srilekha Bonala, Alexis Rosales

RATIONALE: The outcomes of rehabilitation following stroke are currently limited in reducing long-term impairments in movements of the upper extremity. Research to enhance current rehabilitation practices should include investigations of the physiology underlying the recovery of motor control, but clinicians trained in rehabilitation often lack the computer programming and technical expertise to design and conduct such research. Thus, our objective was to create a framework that integrated multiple hardware components into a customizable interface that was easy to use by physical therapy students to investigate movement impairments in a clinical setting.

METHODS: The hardware included electromyogram and electrogoniometer sensors to record physiological data and an accelerometer and video camera to record movement of the upper extremity. Hardware was connected to a multi-channel PCI card to acquire data simultaneously and in real time. MATLAB was selected as the computer programming language to facilitate data collection and analysis. The framework was designed to meet the requirements of the research protocol in terms of data timing and validity. An iterative design approach was taken to refine the user interface with feedback provided by a physical therapy student, a novice to the field of computer science.
RESULTS: The resulting framework allowed the physical therapy student to investigate upper extremity movements through the synchronous control of hardware components from an easy-to-use interface. This can further allow clinicians to obtain valid physiological data from individuals during post stroke rehabilitation in a manner that maximizes safety and minimizes the time needed for participants.

CONCLUSION: With ongoing efforts to improve rehabilitation outcomes following stroke and other neurological injuries, the applications of computer science and engineering are essential for clinicians to conduct research in the rehabilitation environment without additional technical expertise.

ACKNOWLEDGMENTS: Faculty Sponsors – Brian Kokensparger, Rosalind Heckman Creighton University

13. RHETORIC VS. REALITY: THE FAILURES OF JIMMY CARTER AND POPE JOHN PAUL II IN THE SALVADORAN CIVIL WAR
Grace Boothe

This article examines the dynamic relationship that existed between President Jimmy Carter, Pope John Paul II, and the Jesuits of Latin America during the Salvadoran Civil War. It emphasizes the importance of the shared moral values of faith and human rights, and the influence that the Cold War geopolitics had on both figures’ identities. It argues that the fear of the spread of communism and the failure of United States foreign policy in Nicaragua led to the resignation of President Jimmy Carter and Pope John Paul’s faith-oriented influence in El Salvador, and ultimately enabled the merciless murder of thousands of innocent Salvadorans. The two figures then committed to an agenda of self-preservation through the continuation of religious rhetoric in speeches and papal letters. In the aftermath of the war, the lost lives were ultimately forgotten on the world stage, and the two succeeded in their self-presentation as beacons of morality and champions of human rights.

14. UTILIZING A FOUR-STEP APPROACH TO DEVELOP AND MAINTAIN PARTNERSHIPS WITH TYPE 1 DIABETES COMMUNITY STAKEHOLDERS
Boyle, E., Abbott, A. A., Jewell, V., & Knezevich, E.

Engaging patient’s in the research process is essential as it creates self-awareness, increases a collective understanding of needs and views, and allows for active participation in healthcare decisions. This stakeholder driven project aimed to develop a patient-centered research model to identify stakeholders of type 1 diabetes (T1D) for addressing the needs of patients and families in rural communities. From project inception, investigators used an innovative approach of incorporating stakeholders (e.g. patients/families, providers, medical supply representatives) in the entire research process. A four-step engagement plan using the Methods in Community-Based Participatory Research for Health (Wallerstein, Duran, Minkler, and Foley, 2005) guided the project. In the first strategy, assessment of both personal and institutional capacities
for active collaboration was completed. Specifically, the project lead (researcher, healthcare provider, and mother of a child with type 1 diabetes), caregiver, and advocacy organization executive met to discuss strengths and weaknesses and how to effectively collaborate. Next, identification of potential partners ensued with new and established networks, associations, and community leaders. We completed this step through years of networking and becoming involved within the community. Reframing the ultimate health issue for research was the third strategy. This was a dynamic, interactive process guided by a diverse group of stakeholder perspectives across two states in the development of a patient-centered research plan. Finally, developing and nurturing the sustained partnerships established between researchers and community partners was accomplished in strategy four. Specifically, the team developed a group process contract that allowed for fluctuation to meet individual and group needs. These relationships were built through sustained T1D community presence and networking. This shared decision-making process resulted in trust, accountability, and stakeholder empowerment while ensuring that individual’s voices were heard.

ACKNOWLEDGEMENTS: Benjamin Feiten, Sadie Schultes, Hoffmann, Lauray Eberly, Laci Naber, & Mary Dowd

15. ANALYSIS OF A PUTATIVE FRAMESHIFTING RNA STRUCTURE FROM THE FUNGUS Agaricus Bisporus (MUSHROOM)
Taylor Burke, Logan Baumberger, Garrett Soukup, Julianne Strauss-Soukup

RATIONALE: Riboswitches are segments of non-coding RNAs that bind specifically to cellular metabolites and undergo a conformational change that results in a change in gene expression. One putative eukaryotic riboswitch is the Ornithine Decarboxylase Antizyme (OAZ) RNA involved in polyamine synthesis. Polyamines are essential organic molecules that interact with DNA, RNA, and proteins and are involved in many cellular processes. The crucial role of riboswitches in metabolism allows for the development of potential antibiological and antineoplastic agents. My project focuses on determining whether a predicted frameshifting element in the fungus Agaricus bisporus exhibits characteristics of a riboswitch.

METHODS: One of the defining characteristics of a riboswitch RNA is that gene expression is altered upon RNA binding to a specific ligand as the RNA undergoes a conformational change. To gather evidence showing a change in gene expression, two plasmids were generated: one with the putative OAZ riboswitch RNA with Photinus (firefly) luciferase gene and another with Renilla (sea pansy) luciferase gene. Both plasmids were transfected into HEK-293 cells. The Photinus luciferase was used as the OAZ RNA reporter gene and the Renilla luciferase was used as a transfection control. Gene expression was quantified using a dual luciferase reporter assay (DLRA) by comparing the levels of Photinus luciferase and Renilla luciferase with or without the polyamine spermine.

RESULTS: The preliminary DLRA results indicate a 2.6-fold increase in Photinus versus Renilla luciferase activity in the presence of spermine.
CONCLUSION: The results from the DLRA indicate that the putative riboswitch exhibits a change in gene expression in the presence of the metabolite spermine.

ACKNOWLEDGEMENTS: Collaborators- Logan Baumberger, Juliane Strauss-Soukup and Garrett Soukup; NIH, NE-INBRE Program Grant no. 2P20GM10342714A1

16. IDENTIFICATION OF DIFFERENTIALLY EXPRESSED LONG NON-CODING RNAs IN Murine Microglia in Response to LPS

Olivia L. Burleigh¹, Nicholas W. Mathy², Xian-Ming Chen², Annemarie Shibata¹,
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RATIONALE: Activated microglia function in the central nervous system (CNS) as immune responsive cells. The pro-inflammatory state of microglia can cause cytotoxicity in the CNS and is associated with several disease states. Long non-coding RNAs (lncRNAs) are functional RNAs that do not encode proteins but help facilitate gene regulation. Certain lncRNAs may be important regulators of the pro-inflammatory state of microglia. Our hypothesis is that upon activation by pro-inflammatory stimuli, like LPS, microglia differentially express a set of lncRNAs that enhance the immune response.

METHODS: We used a genome-wide microarray analysis of LPS stimulated microglia compared to control microglia for both BV2 murine microglial cell line and primary microglia. The BV2 cell line was cultured in DMEM supplemented with 10% FBS and stimulated with LPS at 10 μg/mL. We identified several upregulated lncRNAs and validated the results using RT-qPCR. BV2 cells were stimulated with pro-inflammatory and anti-inflammatory cytokines; Poly(I:C), IFN-γ, TNF-α, and IL-4; over a time course of 24h.

RESULTS: After stimulating BV2s with LPS for 6h, there was a significant increase in the expression of lncRNA-25B, GM14005, AK15331, and the positive controls, lincRNA-Cox2 and lincRNA-Tnfaip3. The primary microglia stimulated with LPS showed a significant increase in lncRNA-25B, GM14005, and lincRNA-Cox2. The results showed a significant increase in lncRNA-25B expression in response to LPS, Poly(I:C), and IFN-γ, peaking at 6h, and TNF-α peaking at 2h. There was no significant differential expression in response to IL-4, an anti-inflammatory stimulus.

CONCLUSION: LncRNA-25B was identified as the most upregulated gene in BV2s and primary microglia. The expression levels for all treatment groups were not significantly different than control at 24h, suggesting that lncRNA-25B acts early in the immune response. Identification of lncRNAs that modulate the inflammatory response could provide a novel target for pharmaceutical therapeutics.

ACKNOWLEDGEMENT: CURAS Faculty Research Fund awarded by Creighton University.
17. THERMODYNAMICS OF THE INTERACTION BETWEEN CHROMATIN ASSEMBLY FACTOR-1 AND SUMO-MODIFIED PROLIFERATING CELL NUCLEAR ANTIGEN
Margaret Carrig and Lynne Dieckman, PhD

RATIONALE: Replication-coupled nucleosome assembly is the process through which newly-replicated DNA is packaged into tight structures called nucleosomes. This process is necessary for ensuring proper expression of genes in cells. Two proteins are the key mediators in this process: proliferating cell nuclear antigen (PCNA) and chromatin assembly factor 1 (CAF-1). The interaction between PCNA and CAF-1 is required for proper gene silencing. However, the mechanisms of binding between PCNA and CAF-1 are unknown.

We have identified a sequence in Cac1 (the largest subunit of CAF-1) which matches the consensus sequence for a PCNA-interacting peptide (PIP) motif. Furthermore, there is a consensus sequence for a small ubiquitin-like modifier (SUMO)-interacting motif (SIM) in Cac1. In vivo, PCNA is modified by SUMO during replication. We hypothesize that the putative CAF-1 SIM does in fact bind SUMO, and that SUMOylated PCNA is its target in cells.

METHODS: Isothermal titration calorimetry (ITC) was used to quantitatively characterize the binding between Cac1 and unmodified PCNA or SUMO-PCNA. The heats of binding were used to calculate stoichiometry and values for $K_d$, enthalpy, entropy, and Gibbs free energy.

RESULTS: The $K_d$ between unmodified PCNA and a truncation of Cac1 containing both the putative SIM and PIP was determined to be 6.6 $\mu$M. The $K_d$ between SUMO-PCNA and Cac1 was determined to be 0.7 $\mu$M. ITC studies were also completed using alanine mutants of the putative SIM and PIP. The $K_d$ between SUMO-PCNA and the SIM-mutant Cac1 truncation was 34 $\mu$M. The $K_d$ between SUMO-PCNA and the PIP-mutant Cac1 truncation was 3 $\mu$M.

CONCLUSION: These results indicate that Cac1 has a tenfold greater affinity for SUMO-PCNA than unmodified PCNA, with the SIM sequence having a greater affinity for Cac1 than does the PIP sequence. This suggests that the SIM on Cac1 is a critical site of interaction with SUMO-PCNA.

18. INVESTIGATION OF SMALL-MOLECULE B-RAF INHIBITORS FOR PROTECTION OF COCHLEAR HAIR CELLS FROM CISPLATIN TOXICITY
Lauryn E. Caster, Matthew A. Ingersoll, Eva M. Holland, Emma A. Malloy, Duane Currier, Jaeki Min, Taosheng Chen, Jian Zuo, Tal Teitz

RATIONALE: Hearing loss due to cisplatin toxicity, a chemotherapeutic drug, affects an estimated 40-60% of patients, while there is no FDA-approved compound available for treatment. The loss of hearing is caused by damage to the inner and outer hair cells, spiral ganglia, and stria vascularis in the inner ear. Therefore, compounds are needed as a preventative treatment for patients undergoing chemotherapy in order to protect their hearing throughout treatment.
METHODS: HEI-OC1 cell-based compound screening of 187 specific kinase inhibitors recently done in Dr. Teitz’s Lab revealed B-RAF as a potential therapeutic target to protect against cisplatin ototoxicity. Top hits from this study (Dabrafendib, PLX-4720, and RAF265) were tested in P3 mouse cochlear explants in order to determine their potency against cisplatin-induced damage. Compounds were assessed by determining IC50 and therapeutic index values and explants were analyzed by confocal microscopy and immunostaining.

RESULTS: RAF265 and PLX-4720 showed significant protection from cisplatin in explant at low concentrations (IC50 ~ 30 nM – 200 nM) and the inhibitors tested did not show toxicity when explants were treated with drug alone (TI ~ 300 – 2000).

CONCLUSIONS: Both PLX-4720 and RAF265 demonstrated significant protection, providing further evidence of B-RAF as a potential therapeutic target for cisplatin ototoxicity. The results suggest that B-RAF could be a viable target for hearing loss ex vivo, though in vivo studies would be the next step to prove their efficacy against chemotherapy-induced hearing loss.

ACKNOWLEDGEMENT: This work was supported in part by Dr. and Mrs. Randolph Ferlic Summer Research Fellowship to L. Caster and LB692/Creighton and Bellucci Translational Hearing Grants to T. Teitz.

19. DO PATTERNS OF FLUCTUATING ASYMMETRY REFLECT THE STRENGTH OF NATURAL AND SEXUAL SELECTION IN THE SAND CRICKET?
Krista Chang, Allie Jones, Keni Tamashiro, Matthew Whalen, Gabriel Rivera, Amy M Worthington

RATIONALE: Natural and sexual selection can shape morphologies to increase individual performance, and the degree of symmetry has been shown to impact the functionality of paired traits. As a result, traits vital for locomotion (legs or wings) or reproduction (ornaments or weapons) may rely more heavily on overall symmetry to remain functional than other non-vital structures, and therefore may be more developmentally constrained. Fluctuating asymmetry (FA) refers to deviations from perfect symmetry in bilateral structures and may serve as a useful tool in evaluating the strength of selection acting on individuals. In the sand cricket (Gryllus firmus), two distinct morphs with unique life histories exist: Short-wing (SW) morphs are incapable of flight but have high reproductive potential as early adults; Long-wing (LW) morphs have enlarged wings for dispersal but produce fewer offspring and do so later. Because the two morphs rely on different structures to maximize fitness, and many structures used by males for courtship and fighting do not serve the same function for females, we expect to see predictable differences in FA between morphs and sexes.

METHODS: We reared four groups of crickets: LW male, LW female, SW male, and SW female. Upon reaching maturity, they were frozen at -20°C for processing. The following structures were extracted and measured three times for greater accuracy: femurs, tibias, mandibles, maxilla, wings, tympana, and testes (for males). The data was
analyzed to determine the bilateral differences between right and left structures, and then relative levels of FA.

**RESULTS:** Data collection is not yet complete, but primary data set shows high levels of FA in SW morphs relative to the LW morphs for the foreleg femur and maxilla, and high levels of FA in females relative to males in the hindleg femur and hindleg tibia.

**CONCLUSION:** Data collection is not yet complete, but so far the results are inconclusive. Our primary data set shows significant variations in fluctuating asymmetry across the different groups, but not in the ways we expected.

**ACKNOWLEDGEMENT:** We want to thank Dr. Worthington for being a strong female role model in science, showing us the importance of working hard and taking pride in our work.

**20. Live Long or Prosper: An Investigation of Immunological Memory and its Reproductive Costs in Insects**

**Caroline Craig**

It was originally believed that invertebrates relied solely on non-specific immune responses to fight off pathogens, yet recent research suggests they may have an acquired immune response comparable to the mammalian immune system called immune priming. This response would allow invertebrates to retain a memory of pathogens and respond stronger and more quickly if they become infected a second time. Immune priming has only been tested in a few species of insect and requires more investigation to confirm that it is indeed occurring. Using the sand cricket, *Gryllus firmus*, I will experimentally test for whether crickets maintain memory of past pathogens and what negative effects this might have on their reproduction. To test the strength of the immune system after an injection with either a novel or familiar pathogen, I will measure two key immune parameters in the blood, as well as overall survival rates from an infection. I will also measure how these immune responses affect male investment in reproduction by quantifying the number and viability of sperm packaged in the spermatophore, and the quantity of a compound (arachidonic acid) that plays essential roles in both the immunity and sperm viability. However, these measures are still being collected. If the crickets given homologous challenges (i.e. injected with a familiar pathogen) have an increased survival/immune measures relative to those given heterologous challenges (i.e. injected with a novel pathogen), then my results will support the hypothesis that invertebrate immune systems are far more complex than originally thought. Additionally, by examining the reproductive trade-offs that occur in response to upregulating the immune system, this will be one of the first studies to identify whether immune priming has significant costs associated with this process important for survival.
21. THE INTERACTION BETWEEN GREEK AFFILIATION AND RELIGIOSITY ON PROBLEM DRINKING
Sophia S. Daley, Romi E. Dazzio, Thomas L. Budesheim, Ph.D., and Alicia K. Klanecky Earl, Ph.D.

RATIONALE: Problem drinking on college campuses is a mainstay and can lead to consequences such as physical injury, sexual assault, and death (NIAAA, 2019). One factor implicated in increased quantity and frequency of drinking is Greek affiliation (Hummer et al., 2012; Park, Sher, & Krull, 2008). In contrast, involvement in religious practices seems to be a protective factor in diminishing the likelihood of consuming alcohol (Bodford & Hussong, 2013). To our knowledge, research to date has yet to examine the interaction between Greek affiliation and religiosity on problem drinking in college, so the current study examined this relationship.

METHOD: Undergraduates (N=411) completed an online survey battery at the end of their freshmen spring semester. Religiosity measures included public religiosity, frequency ratings of formal religious attendance, and private religiosity, a rating of prayer frequency. Analyses utilized hierarchical regression and simple slopes analysis.

RESULTS: After accounting for participants’ gender and history of mental health difficulty, the main effect for Greek status was significant, where total problem drinking increased based on Greek affiliation (p=.02). Further, the two-way interaction between Greek status and formal religious attendance was significant ($R^2=.05$, $R^2\Delta=.01$, $F\Delta(1, 405)=4.57$, $p=.03$). Results indicated that for Greek students, total problem drinking increased as reports of religious attendance increased. This pattern was not visible for those outside of Greek organizations. The two-way interaction between Greek status and prayer frequency was not significant ($p=.42$).

CONCLUSION: Findings may suggest that Greek involvement overrides the protective authority of religion against problem drinking, as Snipes et al. (2015) found in the case of the non-medical use of prescription medication. Alternatively, it may also give credence to the theory of moral licensing, whereby morally sound behaviors such as religious attendance may excuse problem drinking in the future (Effron & Conway, 2015; Merritt, Effron, & Monin, 2010).

22. PARASITE PERSISTENCE: HORSEHAIR WORM [NEMATOMORPHA] PREVALENCE IN EASTERN NEBRASKA
TWENTY YEARS LATER
Sydney Dang and John Shea, PH.D, SJ

Horsehair worms [Nematomorpha] have complicated life cycles that consist of two arthropod hosts, one aquatic and one terrestrial, as well as a short aquatic free-living adult period. They also encyst in aquatic snails, which are infected easily because snails have relatively poor internal defenses. Thus, we can survey horsehair worm prevalence at various aquatic sites by counting cysts found in aquatic snails.

RATIONALE: Because of their complicated life cycles, we predict that the presence of horsehair worm cysts will serve as an indicator of water quality.
METHODS: To test this, we expand upon a 2001 study to determine the prevalence and intensity of horsehair worm cysts in 20 snails collected from 50 sites, varying in water quality. Each snail is examined for cysts following the original study’s methods. A YSI probe collects data on the temperature, pH, dissolved oxygen, nitrate, and salinity of each site.

RESULTS: Current data is compared to 2001 data and correlated with water quality data. Preliminary data from one site (Site 28) yielded a prevalence of 0.9 and mean intensity of 39.95, which compares to the 2001 study that yielded a prevalence of 1.0 and mean intensity of 115.2. Based on this preliminary data, we predict a general decrease in horsehair worm prevalence and intensity at sites with poor water quality.

CONCLUSION: Our results will help assess the feasibility of using horsehair worms as indicators of water quality. It will also help assess the resilience of this host-parasite system to survive environmental change.

ACKNOWLEDGEMENTS: Quinn Sano, Patrick Kuwong, Simeon Gboun, Janet Huynh, Yonjae Im, Travis Ibera, Matthew Wong, and Creighton Biology department for supporting this work.

23. POVERTY: THROUGH THE LENS OF DEVELOPMENT ECONOMICS & LIBERATION THEOLOGY
Annette Davis

RATIONALE: Across the globe, there are over 736 million people living in poverty, according to the World Bank Group. When it comes to issues like this, any would assume that economics and theology are like oil and water, holding contrasting viewpoints on how to approach the issue of poverty, but is this really the case?

METHODS: I look specifically at disciplines within economics and theology that place heavy emphasis on the issue of poverty: development economics and liberation theology. I begin by looking at the way each defines “poverty,” and then compare their understandings of this meaning. Lastly, I compare the approaches that each would take to solve the issue of poverty.

RESULTS: Both development economics and liberation theology begin with the definition of poverty as a lack of basic resources necessary to uphold human dignity. Yet, both understand this through different lenses. Development economics looks at this in terms of human capabilities, in which people have the freedom and agencies to make choices. In liberation theology, this is understood as the ability to live the life that God intended for them—often discussed using the language of sin and salvation.

CONCLUSION: Different understandings of the concept of poverty lead to different approaches to the issue, yet I conclude that there is still a place for economics in theology. The two are not like oil and water for two reasons. The first being that liberation theology and development economics both use the language of human dignity, as both see human beings as the central concern of the discipline. Second, there is a place for economics in liberation theology, as it is useful in order to understand the root causes of a situation.

ACKNOWLEDGEMENT: I would like to thank the Gail Werner-Robertson Research Fellows for financial support for this research.
24. POSTURAL CONTROL IN INFANTS AT RISK FOR AUTISM SPECTRUM DISORDERS
Megan Dempsey1, Kayli Christensen1, Caity Angel1, Amelia Neal1, Sara Kneifl2, Paris Mather2, Shari DeVeney2, Dimitrios Katsavelis3, Anastasia Kyvelidou1.1 Creighton University, Department of Physical Therapy, 2 University of Nebraska at Omaha, Special Education and Communication Disorders, 3 Creighton University, Department of Exercise Science and Pre-Health Professions

INTRODUCTION: Autism spectrum disorder (ASD) is characterized by social and communication deficits, as well as repetitive behaviors. Early signs of ASD may first become noticeable within the development of the motor system, since it may affect object exploration skills, learning and subsequently cognitive, language and social development. Therefore, the purpose of this study was to identify early motor behavior differences between infants at low- and high-risk for ASD.

METHODS: Two high-risk groups, which were infants that are siblings of children with ASD (4) and infants born prematurely and with low birth weight (4) and one group of low-risk infants (12) with no familial history of ASD participated in the study. We collected center of pressure data while infants sat on a force platform in their home at the onset of sitting. Dependent variables were range and root mean square (RMS) in the anteroposterior (AP) and mediolateral (ML) directions as well as sway path, median frequency and sample entropy (SampEn) in the AP and ML directions.

RESULTS: Sitting postural control revealed multiple differences among the three groups, with all dependent measures. Median frequency, sway path and SampEn in both AP and ML, showed the highest values in infants born prematurely, while infant siblings and with typical development showed similar behaviors. Range in the ML as well as RMS in AP and ML directions presented the highest values in the infant sibling group. Interestingly, the two high-risk groups did show differences in postural control behavior, which could be indicative of unique developmental trajectories between the two groups.

CONCLUSIONS: This preliminary study may provide the foundation to explore early postural control differences and the possible cascading effects of early motor delays in at risk populations for ASD.

ACKNOWLEDGEMENT: This study was funded by the Nebraska Research Initiative

25. TRENDS AND CHALLENGES IN RURAL HOMELESS POPULATIONS
Celena Derderian, Dr. Sriram Ramaswamy, Dr. David Driscoll, Dr. Anthony Easterday

RATIONALE: Homelessness continues to be a major public health issue in the United States. Rural areas have disproportionally more poverty. Additionally, veterans have been found to be at higher risk for homelessness than the general population. Our study compared differences between rural homeless veterans and non-veterans in Nebraska.

METHODS: The study sample consisted of 50 rural veterans and 64 rural non-veterans from micropolitan areas in Nebraska. Structured interviews with participants were conducted by research staff. The interview was comprised of a range of questions.
pertaining to sociodemographic (i.e. age, race, education, marital status, non-adult children, income), housing, clinical characteristics, health care and social service use, and psychosocial characteristics.

**RESULTS:** Overall, results demonstrated that homeless veterans were older, had obtained more education, and were more likely to have been married. Veterans spent more nights in a halfway house and fewer nights in a shelter than non-veterans. Clinically, veterans were more likely to report PTSD and substance use. Finally, veterans had closer access to health care services and utilized them significantly more than non-veterans.

**CONCLUSION:** These results add to a growing literature suggesting that these populations have unique needs. Learning about these distinct homeless populations will help future advocates create new, effective ways to provide for veterans and non-veterans in rural areas.

26. **CONFIDENCE IS NOT INFLUENCED BY PAIN, STRENGTH, OR INHIBITION IN EARLY REHABILITATION PHASES AFTER ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION**

Mark Dotseth, Minhwan Kim, Brooke Farmer, Dimitrios Katsavelis, Marcus Palimenio, Kimberly Turman, Terry Grindstaff

**PURPOSE:** The purpose of this study was to analyze factors such as confidence, pain, strength, and quadriceps inhibition in the early rehabilitation phase following ACL reconstruction (ACL-R). We hypothesize that patients with higher levels of pain, decreased quadriceps and hamstring strength, and increased quadriceps inhibition will demonstrate lower self-reported confidence scores in early stages following ACL-R.

**EXPERIMENTAL DESIGN:** Thirty-six participants (age = 19.6±5.4 years, mass = 70.6±11.7 kg, height = 171.9±8.3 cm, time since surgery = 4.0±0.8 months) volunteered for this study. Confidence was assessed using the ACL Return to Sport after injury scale (ACL-RSI) and pain was quantified using a visual analog scale. Quadriceps and hamstring isokinetic peak torque and quadriceps isometric peak torque was determined using an isokinetic dynamometer. Quadriceps inhibition (percent activation) was quantified using the interpolated twitch technique. A limb symmetry index (LSI=involved/uninvolved) was calculated for each strength measure. Pearson correlations were used to determine the relationship between ACL-RSI scores and outcome variables.

**RESULTS:** The average ACL-RSI score was 52.7% and current pain and worst pain were 1/10 and 2.7/10 respectively. The average LSI score for participants was 78.4% for peak torque, 83.9% for inhibition, 71.3% for isokinetic quadriceps strength, and 71.1% for isokinetic hamstring strength. No association was found between ACL-RSI and any of the outcome measures: current pain (p=0.48, r=0.13), worst pain (p=0.93, r=0.02), peak torque (p=.34, r=.17), inhibition (p=.56, r=-.11), isokinetic quadriceps (p=0.92, r=-.20), isokinetic hamstring (P=.49, r =-.14).

**CONCLUSION:** Despite substantially diminished confidence, strength and inhibition deficits, and low pain levels, we found no intervariable correlations. Future research should better determine factors that influence confidence and fear in the early stages of ACL rehabilitation such as self-efficacy, jumping mechanics, or patient-provider
relationships. Targeting these variables early in therapy may change the trajectory of rehabilitation to improve long-term reconstruction outcomes.

27. **Correcting Capitalism: Clarifying the Role of Economics in the Good Life**
   
   **Jack Eastman** under supervision of Dr. David McPherson

   **Rationale:** Recently, there has been a resurgence of the field of virtue ethics and the role this theory, developed by Aristotle, has on the philosophical good life. Also, an ever-expanding topic is the extent to which economic prosperity, specifically by way of capitalism, can guarantee a life well lived. In light of these dynamisms, I have chosen to attempt to bring together economics and philosophy in an “economic good life.”

   **Methods:** By analyzing works of several virtue ethicists, philosophers, theologians, and economists, I developed a coherent and holistic view of how different writers in different disciplines view the good life and capitalism’s role in it. Drawing from commonalities and identifying key differences allowed me to develop a viewpoint of the good life that is arguably applicable.

   **Results:** My analysis reveals that capitalism has inherent virtues (freedom, trust, competition, opportunity for vocation) as well as the propensity to cultivate certain vices deleterious to human flourishing, namely insatiability, injustice, and excessive individualism. An “economic good life” requires the fruition of capitalism’s inherent virtues as well as the promotion of the countervailing virtues to the aforementioned vices: contentedness, justice, and integrity aligned with the common good.

   **Conclusion:** Capitalism is a necessary but not all-inclusive aspect to the good life.

   **Acknowledgement:** Many people deserve thanks for their role in my research. Risking failure of listing them all, I would like to specifically acknowledge Dr. David McPherson for guiding my research, providing me with materials, and shaping my mind for the better. Many thanks as well to Drs. Michael and Diana Thomas, the entire GWR cohort, Dr. Jeanne Shuler, Dr. Anne Ozar, and anyone who, knowingly or unknowingly, helped me think deeper about the issues at hand.

28. **“I Want to Be Open, But What if I Say Too Much”: Tensions Parents Express in Conversations About Sex-Related Topics with Their Children**
   
   **Ellen Erie, Sarah Gilstrap, Katie Meinecke, Sophie Piskel, Nicole Rizk, Reghan Kort, Clare Fitzpatrick, Brittany Witt, & Amanda Holman**

   Adolescents are at high risk of negative sexual health and relational outcomes. Sexual behaviors, such as early sexual initiation, sex with multiple partners, and unprotected intercourse, may put adolescents in risk for sexually transmitted infections (STIs), pregnancy, and skewed view of healthy intimate relationships. One source for reducing these risks is parental communication about sex-related topics. From an early age parents are uniquely positioned to educate and influence their children on sex-related topics (e.g., puberty, intimate relationships, sexuality, and sexual health). Parents want to help their children understand important topics such as sexual health and
relationships, but these anticipated conversations leave many parents uncomfortable and uncertain about how to navigate these conversations well. Our study utilized focus groups to explore tensions parents (N = 78) express in navigating conversations about sex-related topics with their children. We identified four dominate themes in our analyses: (1) sexual education versus overexposure, (2) accurate information versus influencing sources, (3) family values versus breaking the cycle, and (4) parent control versus child autonomy. Each of these tension themes are constituted by varying experiences and examples that highlight parents internal and external struggle with having thoughtful and helpful conversations with their children.

29. COMMUNITY PHARMACISTS’ WORK ACTIVITIES, CHALLENGES, AND SOLUTIONS TO THE PROVISION OF PATIENT-CENTERED CARE IN NEBRASKA
Federico Facciolo, MS Candidate; Mark Siracuse, PharmD, PhD; Kimberly Galt, PharmD, PhD; Kevin Fuji, PharmD, MA; James Bramble, MPH, PhD
1Creighton University Center for Health Services Research and Patient Safety

RATIONALE/OBJECTIVE: To: 1) explore the work activities of Nebraska independent community pharmacists within the context of the pharmacy profession’s transition from a medication product focus to a patient-centered care focus; and 2) determine if a formal enhanced pharmacy service network impacted the provision of enhanced (patient-centered) pharmacy services.

METHODS: A survey was mailed to 193 pharmacists in charge of Nebraska independent community pharmacies classified into members and nonmembers of the Nebraska Enhanced Services Pharmacies (NESP) Network to collect data on enhanced pharmacy services offered, pharmacists’ attitudes toward enhanced services, and the planning, marketing and reimbursement mechanisms for the provision of enhanced services. Data were analyzed using descriptive and inferential statistics.

RESULTS: Overall survey response rate was 59% (n=113) with a non-NESP response rate of 53% (80/151) and a NESP response rate of 79% (33/42). Across all respondents the average number of enhanced services offered was 17 out of 47 services studied. Respondents strongly agreed or agreed that offering enhanced services creates greater value for patients (88%) and attracts more patients (77%). Comparison of means showed that NESP pharmacies provided more enhanced services (\(\bar{x}=20\)) than non-NESP pharmacies (\(\bar{x}=16\)), \(p=0.003\). Chi-square analysis showed that NESP membership was associated with the opinion that offering enhanced services increases profits, \(p=0.016\).

CONCLUSION: Independent community pharmacies commonly provide a range of enhanced services. NESP pharmacies provide more enhanced services than non-NESP pharmacies and are more likely to believe that enhanced services increase profitability. NESP membership may provide opportunities for pharmacies to offer more enhanced services to patients with the intent to improve patient-centered care.

ACKNOWLEDGEMENT: Funding for this project was provided by the Creighton University Center for Health Services Research and Patient Safety (CHRP).
30. **Barriers to Participation in Pediatric Adaptive Sports in the United States: A Systematic Review**

Ricky Figueroa and Rosalind L. Heckman, Department of Physical Therapy, Creighton University

**Purpose:** Children who participate in pediatric sports benefit from increased overall physical health, improved quality of life, and reduced risk of sedentary lifestyle diseases. Unfortunately, recent statistics show less than 60% of typically developing children in the United States were regular participants in organized traditional team or individual sports. If participation in traditional sports is that low, then participation for children with mobility impairments who require modifications through adaptive sports is likely even lower though the benefits may be as, if not more, important. To increase sports participation among children with mobility impairments, we need to understand the current barriers. Thus, the purpose of this systematic review was to synthesize the literature investigating barriers to participation in pediatric adaptive sports in the United States.

**Methods:** Primary sources were identified by searching the databases CINAHL, MEDLINE and SPORTDiscus. Studies were included if they investigated barriers to participation in adaptive sports for children with mobility impairments. Studies were excluded if they were conducted outside the United States or, included participants over the age of 21 or with an intellectual disability.

**Results:** The search resulted in 78 articles. Five articles met the inclusion/exclusion criteria. SCOPUS was used to identify articles citing the five articles identified from the search. An additional three articles met the inclusion/exclusion criteria resulting in a total of eight articles. Participants in these eight articles ranged from 3-21 years old and had the following diagnoses: Brain Injury, Cerebral Palsy, Spinal Cord Injury, Blind/Visually Impaired, Deaf/Hard of Hearing, Muscular Dystrophy, and Neurological Impairment. A systematic review of the articles identified barriers that were listed and organized them into three categories: physical/environmental barriers, interpersonal barriers, and other concerns. Physical/environmental barriers included a lack of adaptive sports programs or opportunities, equipment needs, and facilities that were not accessible. Interpersonal barriers were time, financial resources, and caregiver support. Other identified concerns included an emphasis on winning, a lack of trained staff in available adaptive sports opportunities and a fear of participation.

**Discussion:** This systematic review demonstrates that current literature on barriers to participation in pediatric adaptive sports in the United States is limited. Although three categories of barriers were identified, this review highlights a concerning need for increased attention to and discussion of adaptive sports programs for children. Future research and community efforts focused on adaptive sports programs and the barriers faced by children and families across the United States is needed to allow children with mobility impairments to experience the known biopsychosocial benefits of participation in sports.
31. Assessing Heart Rate Data Validity and Reliability Recorded Using a Prototype Wrist Worn Heart Rate Monitor Against a Market Comparison Watch
S. Giacomini, A. Kowalczyk, G. Kelly, L. Barker, J. Siedlik, R. Edmonds Creighton University

Rationale: A somewhat new technology in the field of heart rate (HR) measurement, photoplethysmography (PPG) has enabled HR measurement at alternate anatomical landmarks compared to the traditional chest-worn sensors. Given the increased popularity of wearable technology, new HR monitoring devices are beginning to saturate the health and fitness industry. Despite this, the accuracy and validity of these devices has not been examined in detail.

Purpose: To assess the accuracy of heart rate data recorded using a prototype wrist-worn heart rate monitor when compared against a market comparison heart rate monitor.

Methods: Participants (N=52; 29 male & 23 female) completed a series of activities (Table 1.) with a 30 second transition between each activity. Heart rate was recorded every second during the protocol using a prototype watch worn on the right wrist and a Garmin Forerunner 935 (Garmin Ltd., Olathe, KS) worn on the left wrist. Matlab (MATLAB 2019a, Mathworks, Natick, MA, USA) was used for data processing and statistical analyses. The level of agreement between the devices was assessed using a Bland Altman plot.

Results: Comparison with the Garmin device suggests that the prototype watch generally agrees but overreports by approximately 2.8 beats per minute (bpm) with a standard deviation of ± 7.7 bpm. The confidence interval of the bias estimate was large (-12 to 18).

Conclusions: While this is not necessarily worrisome for a wrist worn activity monitor, it may be problematic for a cardiac monitor.

Practical Applications: Users should take into consideration the potential limitations regarding HR accuracy when interpreting data recorded using newer wearable technology.

Table 1. Activity testing protocol.

<table>
<thead>
<tr>
<th>Activity Type</th>
<th>Duration</th>
<th>Start Time</th>
<th>End Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transition</td>
<td>0.5 mins</td>
<td>0 mins</td>
<td>0.5 mins</td>
</tr>
<tr>
<td>Sitting</td>
<td>1 mins</td>
<td>0.5 mins</td>
<td>1.5 mins</td>
</tr>
<tr>
<td>Transition</td>
<td>0.5 mins</td>
<td>1.5 mins</td>
<td>2.0 mins</td>
</tr>
<tr>
<td>Standing</td>
<td>1 mins</td>
<td>2.0 mins</td>
<td>3 mins</td>
</tr>
<tr>
<td>Transition</td>
<td>0.5 mins</td>
<td>3 mins</td>
<td>3.5 mins</td>
</tr>
<tr>
<td>Walking (2mph)</td>
<td>3 mins</td>
<td>3.5 mins</td>
<td>6.5 mins</td>
</tr>
</tbody>
</table>
Jogging (3-4mph) | 1 mins | 6.5 mins | 7.5 mins
Running (5-7mph) | 3 mins | 7.5 mins | 10.5 mins
Walking (2mph) | 0.5 mins | 10.5 mins | 11 mins
Transition | 0.5 mins | 11 mins | 11.5 mins
Sitting | 2 mins | 11.5 mins | 13.5 mins

32. STRUCTURAL ANALYSIS OF HUMAN OAZ1-PK RNA

Diego Gomez¹, Spencer Thompson¹, Siddharth Venkatraman¹, and Juliane Soukup¹
¹Creighton University, Department of Chemistry

Riboswitches are segments of noncoding RNA that bind to products of cellular metabolism in order to regulate the expression of downstream genes. Upon binding to a metabolite, many riboswitches undergo a conformational change that modulates the expression of genes involved in the synthesis of the cognate metabolite, thereby providing a mechanism of feedback regulation for a particular biosynthetic pathway. This form of genetic regulation has been widely studied in bacteria, but no riboswitches have been identified in animals. The Soukup lab is investigating a potential riboswitch involved in the biosynthesis of polyamines, small organic molecules that play a role in cell growth and differentiation and are frequently upregulated in cancer cells. Polyamine synthesis is dependent on the ornithine decarboxylase enzyme (ODC), which is negatively regulated by ornithine decarboxylase antizyme (OAZ). The expression of antizyme protein is regulated by polyamine-enhanced translational frameshifting of the OAZ mRNA. Specifically, a pseudoknot (PK) in the mammalian OAZ RNA may play a role in this frameshifting. Previous work in the lab strongly suggests the presence of a riboswitch in the mouse OAZ RNA by demonstrating specificity of polyamine binding as well as polyamine-induced conformational changes. In order to determine the presence of a riboswitch in humans, equilibrium dialysis techniques were used to examine the specificity of polyamine binding to human OAZ-PK RNA. Preliminary data suggests specific binding of the polyamine spermine. Future studies will use in-line probing techniques to investigate polyamine-induced conformational changes. The ability to target riboswitches and regulate metabolic pathways, such as polyamine synthesis, could lead to the development of novel antibiological and anticancer therapeutics.
33. Malrotated IUD Embedded into Uterine Wall, A Case Report
Jared Grootwassink B.S., Meaghan Shanahan M.D., Sarah Schultz M.D.

**Introduction:** Intrauterine devices (IUD) are a commonly used form of long acting reversible contraception. Copper IUD’s prevent pregnancy through causation of inflammation. Complications related to the placement and position of the IUD is rare, but can occur. Commonly, the complications are uterine perforation or embedment of the IUD within the uterine wall. IUD can be used to help safely position IUD’s or confirm their positioning.

**Case:** a 34-year-old G2P2002 had a Copper IUD placed in Mexico 10 years ago. She desired to get pregnant and asked for the IUD to be removed. On pelvic examination, IUD strings could not be located. IUD was visualized with Transvaginal ultrasound to be at least partially within the posterior myometrium, near the fundus. IUD could not be located on hysteroscopy and was removed laparoscopically by the stem from the posterolateral wall of the uterus.

**Discussion:** Uterine perforation, whether partial or complete often happens at the time of insertion of the IUD. When perforation occurs, it can be due to an inexperienced provider placing the IUD blindly with enough force to puncture the endometrial layer of the uterus and embed itself into the myometrium.

**Conclusion:** IUD’s are a commonly used form of contraception. Complications related to their placement can occur, including embedment and uterine perforation. Perforation can be associated with pain, but perforation and embedment can be asymptomatic. Ultrasound can be used to confirm proper placement during or after placement of the IUD to reduce the risk of complications.

34. Comparison of Periodontium among Subjects Treated with Clear Aligners and Conventional Orthodontics
Adrian D. Hankewycz, Saif M. Shah, Mark S. Jones

**Introduction:** With the wider therapeutic use of clear aligners the need to investigate the periodontal health status and microbiome of clear aligners’ patients in comparison with users of fixed orthodontic has arisen and is the objective of this study.

**Methods:** A clinical periodontal evaluation was performed, followed by professional oral hygiene treatment on a patient under clear aligner treatment, another under fixed orthodontics and two controls that never received any orthodontic therapy. One week after, supragingival plaque, swabs from the orthodontic devices, and saliva samples were collected from each volunteer for further 16s sequencing and microbiome analysis.

**Results:** All participants have overall good Oral hygiene. However, our results showed increases in supragingival plaque, higher number of probing depths greater than 3mm, higher number of bleeding sites on probing, and a higher amount of gingival recession in the subject treated with fixed orthodontics. A lower bacterial count was observed colonizing the clear aligners, with less diversity than the other samples analyzed. Clear aligners exhibited a higher proportion of genus *Porphyromona*, which has a well-known
periodontal pathogen, *P. gingivalis*. The genus *Aggregatibacter* had higher proportions on the subject with fixed orthodontics and the control with higher attachment loss. The species *Aggregatibacter actinomycetemcomitans* has been linked to aggressive forms of periodontal disease.

**CONCLUSION:** Clear aligners showed improved periodontal status indices when compared to fixed orthodontics. Overall, fewer bacteria were found on the clear aligner when compared to fixed orthodontics. Genera with known periodontal pathogens were found on both orthodontics devices.

**35. A HOST OF HARDSHIPS: CAN MALE CRICKETS INFECTED WITH LONG-LIVED PARASITES OBTAIN FITNESS?**

**Harders, Emily P., Huynh, Brenda T., Worthington, Amy M.**

**RATIONALE:** Parasites often manipulate their host’s behavior and physiology to their benefit, which can have significant and detrimental effects on their host’s fitness. We propose to test the ability of infected males to invest in energetically expensive courtship behaviors and to identify how infection affects female mate preference. We aim to uncover how parasites alter host reproductive success during and even after infection.

**METHODS:** We compare courtship behaviors, calling abilities, and mating success rate between infected and healthy males. Next, we conduct two different preference trials to determine if there is a correlation between infection status and female mate preference. 1) We conduct a hydrocarbon preference test to determine whether females prefer chemical signals from infected or healthy males. 2) We determine whether females prefer interacting with an infected or healthy male in a mating arena.

**RESULTS:** We found that 100% of healthy males called and their average total time spent calling was ~125 seconds. However, only ~70% of infected males called, and those that did call averaged 100 seconds. Surprisingly, we found that females spent more time interacting with hydrocarbons from infected males. With regard to mate preference, females spent the most time in the branch with a healthy cricket, followed by the branch with an infected cricket, then the sector with a no cricket. Lastly, healthy males mated successfully in 30% of pairings, while infected males were mated successfully in only 10% of pairings.

**CONCLUSION:** Based on this preliminary data, females prefer to mate with healthy males rather than infected males. Infected males lose fitness potential due to this long-lived parasitic infection. The future of this project involves increasing our sample size and writing the manuscript for publication!

**ACKNOWLEDGEMENTS:** Thank you to Amanda Cohen for stepping in when we need an extra hand.
36. ISOCHROMOSOME FORMATION INDEPENDENT OF GENE TRANSCRIPTION IN INVERTED REPEATS
Alec Harrington, Robert Todd, Annette Beach, Anna Selmecki

RATIONALE: *Candida albicans* (*C. albicans*) is a pathogenic yeast that has the ability to acquire antifungal drug resistance through amplification of particular genes. This can be done through the amplification of the left arm of chromosome 5 to form an isochromosome structure, denoted as i(5L). Isochromosome formation was associated with inverted repeat sequences surrounding the centromere, and likely occurs through a break-induced replication (BIR) event. However, the source of DNA double strand breaks are unknown. Interestingly, expression of *HSP12*, a gene within the inverted repeat sequences of centromere 5 (CEN5), is increased under stress conditions. We hypothesized that transcription of *HSP12* within the inverted repeat sequences is required for the generation of isochromosome structures through BIR.

METHODS: Produced 12 YPAD evolved and 12 YPAD-fluconazole evolved isolates from a strain of *C. albicans* that lacked *HSP12* (*HSP12ΔΔΔΔ*) using evolution experiments. Analyzed for the presence of i(5L) in all isolates using CHEF gel electrophoresis followed by Southern blotting with a CEN5 probe. Assessed for antifungal drug resistance of isolates using a MIC<sub>50</sub> assay.

RESULTS: YPAD evolved isolates did not present i(5L) nor resistance to fluconazole. 4 YPAD-fluconazole evolved isolates presented i(5L), but only 2 that did not acquire i(5L) presented antifungal drug resistance.

CONCLUSION: Transcription of *HSP12* within the inverted repeat surrounding the centromere of chromosome 5 is not required to produce i(5L). Formation of i(5L) did not lead to fluconazole resistance, however, other strains lacking i(5L) presented fluconazole resistance.

ACKNOWLEDGEMENT: We thank Dr. and Mrs. Randolph Ferlic and the Center for Undergraduate Research and Scholarship (CURAS) for supporting this project. We thank the members of Selmecki Lab for mentoring, training, and guidance in pursuing this project. Additional support for this research was provided by Nebraska LB692 Department of Health, Nebraska LB595 Cancer and Smoking Disease Research, and Nebraska EPSCoR FIRST Award.

37. INTERDISCIPLINARY LEADERSHIP OBSERVED: A GROUP CARE HOME DYAD
Ellie Heitzig, Student in the College of Arts and Science, Creighton University
Candace Bloomquist, PhD, Assistant Professor, Department of Interdisciplinary Studies, Creighton University

As health inequities continue to rise globally, the collaboration between organizations providing health and care services needs to be interdisciplinary and aligned with a commitment to implement leadership practices that bridge the divide and balance power between previously separate functions. The need to reduce inequities, increase prevention activities, and foster a culture of direct and fluid communication has propelled health and care organizations to begin using novel leadership practices, such
as Interdisciplinary Leadership. This study explores how two co-owners of a group home company have taken these initiatives in stride. The two owners’ diverse and complementary backgrounds create an interesting practice of Interdisciplinary Leadership—a healthcare dyad—in an intimate environment, to address resident needs. The observation of their dyad sheds light on strategies and practices that can be used to create and promote Interdisciplinary Leadership in healthcare. This research documents these contextual forces, strategies, and practices, expanding upon Dr. Candace Bloomquist’s previous work on Interdisciplinary Leadership in healthcare. Further, we propose Interdisciplinary Leadership as a unique leadership approach that can be used to address complex, wicked problems.

38. ISOLATED INTERHEMISPHERIC SUBDURAL HEMATOMA
Higuchi, L., Kuniyoshi, J.

**BACKGROUND:** An interhemispheric acute subdural hematoma (IASH) is a rare variant of a peripheral subdural hematoma that, depending on its size and location, may have various neurological deficits. There is no clear consensus on the proper management of IASH. The objective of this clinical case report is to highlight the successful management of an IASH via conservative measures.

**CASE PRESENTATION:** Here we report a case of an 88-year-old man who presented to the emergency department after a ground level fall with a Glasgow Coma Score of 15. There was trauma to his head, but he did not exhibit focal neurological signs. Cervical spine computed tomography (CT) scan was not significant for any acute abnormalities. Head CT revealed a small right frontal IASH without midline shift. He was subsequently admitted to the intensive care unit for monitoring and neurological checks. On hospital day 2 he tolerated the general diet, ambulated independently, and his pain was well controlled on oral medications. He was deemed stable on hospital day 3 and was discharged.

**CONCLUSION:** Current guidelines lack recommendations on the proper management of IASH. Current research suggests that patients with smaller hematomas without progression of focal neurologic signs can be managed conservatively. In contrast, patients with larger hematomas, deteriorating level of consciousness, and progressive worsening of focal neurologic signs should be managed surgically.

39. DEVELOPING A PATIENT CENTERED STAKEHOLDER TEAM IN TYPE 1 DIABETES RESEARCH
Shelby Hoffmann, Pharm.D. candidate, Emily Knezevich, Pharm.D., CDE, BCPS, FCCP, Vanessa Jewell, PhD, OTR/L, Amy Abbott, PhD, RN

**RATIONALE:** The Eugene Washington PCORI award strives to incorporate nontraditional stakeholders in the research process to enhance patient centered decisions for the community. Funding through this award allowed an interprofessional team of Creighton University faculty, students, and community stakeholders to develop a research agenda to address barriers to care of those diagnosed with Type 1 diabetes (T1D) in a rural community.
METHODS: A group of stakeholders, the patient-centered advisory team (PCART), was established and consisted of an interprofessional group of Creighton University faculty and students, as well as individuals having an association with T1D - an adult with T1D, a caregiver, an advocacy representative, and a diabetes educator. All team members had a stake in finding a way to improve care of those with T1D in rural Nebraska. The team underwent capacity building training focused on focus group facilitation, community-based research and comparative effectiveness research. Collectively, they established a group process and formed a set of questions to be asked at focus groups. The team shared in recruitment efforts and divided responsibilities of leading focus groups as well as recording participant statements.

RESULTS: From focus group transcripts, the group identified themes that were consistently expressed. The group also worked together to develop a brochure to disseminate findings to others impacted by T1D in rural Nebraska in an effort to generate awareness and change.

CONCLUSION: The variety of skills and insight of each PCART member enhanced the ability to develop robust question sets for focus groups, recruit a varied group of individuals to participate, and collaborate to assess focus group data and identify areas to highlight as essential to share with the Nebraska T1D community.

ACKNOWLEDGEMENT: Ben Feiten, Sadie Schultes, Elise Boyle, Vicki Brown, RD, Kim Radenz, Kameran Ulferts, and Laura Eberly

40. Hypernatremia & Birthweight as it relates to Neonatal Intraventricular Hemorrhage

Jacobson, Xu, Johnson, E., Brigham, K., and Zach, MD, T.

RATIONALE: Intraventricular hemorrhage (IVH) is a major contributor to infant mortality and long-term sequelae (i.e. developmental impairment) and the association between hypernatremia and IVH has encouraged restricting sodium intake in neonates. Additional risks for IVH include prematurity, low birthweight, sodium fluctuation, and hyperglycemia. We examined the relationship between sodium concentration for premature infants with comparison by birthweight.

METHODS: Retrospective collection of medical records for all neonates born at less than 29-weeks’ gestation. Collected data points included gestational age, birthweight, weight at 10 days, APGAR scores, sodium levels, blood pressure at admission, and the presence or absence of IVH. Grade III/IV IVH represented the severe category while grade I/II or no IVH was the control. Further analysis was based upon either extremely low (< 1,000 grams) or very low (1,000-1,500 grams) birthweight.

RESULTS: Gestational age for the severe IVH group was significantly lower with 24.33 versus 26.83 weeks (p=.0005). Birthweight for IVH group (778.67 grams) was significantly lower than the control (985.48 grams); p=.0452. Peak sodium levels were not different (p=.5520) between the control (148.05mM/L) and severe IVH (149.83mM/L). Extremely low birthweight neonates had a lower gestational age in the severe IVH group (25.85 vs 23.69 weeks; p=.0035). There was a lower APGAR score at both 1-minute (4.82 vs 1.75; p=.0045) and 5-minutes (7.06 vs 4.00; p=.0025) in the IVH group. There was no difference in birthweight, blood pressures, or peak sodium levels.
**CONCLUSION:** Neonates with severe IVH are born at earlier gestational ages, are smaller on average, and have decreased APGAR scores. Peak sodium levels did not correlate with severe IVH (grade III/IV) in neonates. However, we observed increasing sodium levels around day 1-2 and a later in days 8-10 in severe IVH neonates compared to non-severe IVH; this sodium flux was not present in the control group.

**41. Remembering Will Brown: Unearthing a Century of Nebraskan Hate Crime**  
*Saige Jager*

**INTRODUCTION:** The Red Summer of 1919 was a season of racial violence across the United States. On September 28, 1919, Omaha became a part of it with the lynching of Will Brown. Brown allegedly raped a 19 year-old white female. However, there is substantial evidence that suggests this is untrue. A crowd stormed the Douglas County courthouse where Will Brown was eventually handed over to the mob and brutally lynched. He maintained his innocence until the end. This project uses the lynching of Will Brown as a starting point of research for hate crimes that have taken place in Nebraska over the past century.

**METHODOLOGY:**
- For this project, archives of newspapers were used to look for instances of hate crimes in Nebraska since 1919. The FBI’s definition of a hate crime was used to determine hate crime instances.
- Key words were used to find instances that were not necessarily reported as hate crimes at the time.

**THE DATABASE:**
- FileMaker was the software chosen for this project’s database and all instances were categorized there.
- The hate crimes were categorized into a sub-categories of types of hate crimes. The location of each crime was recorded, along with the age, gender, sexuality, religion, and race of both victims and perpetrators where that information was available.
- FileMaker allows for the user to search by sub-categories to find hate crimes relevant to it.

**DISCUSSION:** This project revealed the extreme bias of early 20th-century news sources against marginalized groups, particularly African-Americans. It also raised questions of underreporting these types of crimes and the hesitation of news outlets to formally declare an incident as a hate crime. From the data gathered in this project along with the FBI’s information, it is seen that hate crimes involving race/ethnicity occur in Nebraska at a much higher rate than any other category.

**ACKNOWLEDGMENT:** Dr. Simon Appleford, Department of History Creighton Center for Undergraduate Research and Scholarship, Summer Undergraduate Research Grant
42. MODELING QUASAR OUTFLOWS AS ACCRETION DISK WINDS
Margaret Johnston, Jack Gabel

RATIONALE: Quasars, or active galactic nuclei, are the galactic supermassive black holes which have been observed to be accreting matter and emitting light. Quasar outflows are gas which is being ejected away from the central supermassive black hole, evidenced by blueshifted absorption lines in the ultraviolet portion of the quasar spectrum. The accretion disk wind model requires that these outflows originate very close to the black hole, but the best available measurements suggest that these outflows must be at a prohibitively large distance, more than ten thousand times further away than the prediction of accretion disk wind model.

METHODS: The photoionization modeling code Cloudy was used to simulate these outflows in order to determine what physical conditions could reproduce the best available measurements in the literature while assuming the small distances required by the accretion disk wind model. The luminosity and x-ray flux of the simulated quasar along with the number density and total column density of the outflow gas were varied widely in the search for a suitable combination of physical conditions.

RESULTS: Luminosities greater than $10^{38}$ erg/s and total column densities greater than $10^{21}$ cm$^{-2}$ were found to satisfy both the small accretion disk distance and the measured ionic column densities found in Miller et al. 2018 and Xu et al. 2018.

CONCLUSION: Additional work is required to determine limits for the x-ray contribution and the total number density.

43. DETERMINATION OF SULFITE CONCENTRATIONS IN WINE
Mitchell Kim-Fu, Raj Parikh, David Dobberpuhl

RATIONALE: Sulfites are widely used in winemaking for their antioxidant and antibacterial properties, playing a critical role in preventing oxidation and thus stabilizing a wine’s composition and its flavor profile. Total sulfites are classified as either free or bound, with the latter referring to sulfites attached to other molecules in the wine matrix. Work presented here focuses on the equilibrium between the bound and free sulfites with concentrations of free sulfites in various still wines determined by the Modified Ripper potentiometric titration along with colorimetric confirmation via a starch indicator. Free sulfites were titrated to their endpoints and then intentionally over-titrated to observe how the bound sulfites reacted with excess titrant over time. The goal was to not only determine the concentration of free sulfites in various wines, but also to understand the equilibria between the various forms of sulfites in both the free and bound states.

METHODS: This study investigated sulfite equilibria over a three-day period by reiterating samples of Riesling wine every 24-hours. The absorbance of the starch-iodine complex at 566-nm generated by excess titrant was also monitored over several hours to study the release of bound sulfites.

RESULTS: Results show that regardless of initial titrant amount, subsequent reiterations performed 24-hours later indicated similar concentrations of free sulfites, thus implying
a reestablishment of the free-sulfite equilibria. Furthermore, the release of bound sulfites and their subsequent reaction with excess iodine followed pseudo-first order kinetics.

**CONCLUSION:** Future work will focus on elucidating the kinetics and correlating sulfite concentrations with wine degradation studies.

### 44. DREAM: SLEEP STRATEGIES FOR HEART FAILURE PATIENTS

**Olivia Koontz, Amy Abbott, PhD, RN**

Heart failure (HF) affects 5.7 million Americans and causes sequelae from persistent fluid overload. This leads to difficulty breathing when lying flat/sleeping and is compounded by other psychological symptoms experienced including anxiety and depression. Sleep disturbance symptoms are commonly reported by those with HF. To address this problem, nurses can use the DREAM acronym, conceptualized as a bundle by the authors, to incorporate non-pharmacological sleep hygiene strategies into cardiac nursing practice. Each letter of the DREAM bundle represents evidence-based strategies documented in the literature to improve sleep quality for this population. The letter “D” stands for determination of underlying sleep condition(s). Polysomnography, a sleep study, is used by physicians to diagnose medical conditions impeding sleep quality. Nurses can use this data in conjunction with subjective data obtained from administering sleep questionnaires to patients on their sleep quality perception. Next, establishing an individualized relaxation routine (R) is imperative for creating a sleep-conducive environment. “E” represents eating and exercising since timing of these daily activities affects sleep quality. Stimulants, such as caffeine and electronics, contribute to poor sleep quality; therefore, avoiding stimulants (A) close to bedtime is also essential. The final component, massage (M), is an effective strategy nurses can perform that promote relaxation and sleep. Although studies used for this project focused on symptom relief for HF patients, these non-pharmacological interventions can improve sleep in numerous populations (e.g. oncology, shift workers/nurses). For nurses, improving one’s own sleep also allows for safer patient care delivery. Nurses must educate HF patients on their individualized plan of care prior to discharge and must be knowledgeable about the many inexpensive, evidence-based strategies of the DREAM bundle found to be effective for sleep quality improvement. Through this bundle, nurses can also promote self-care behaviors that directly reduce morbidity, mortality, and improve HF patients’ quality of life.

### 45. ANALYZING REDUNDANT IMAGING FOR LOW BACK PAIN IN NEBRASKA

**Madison Kreikemeyer, OTS, Cassie Maddigan, OTS, Nathaniel Marshall, OTS, Maggie Young, OTS, Joy Doll, OTD, OTR/L**

**BACKGROUND:** Excessive amounts of money in healthcare are wasted due to duplicated or unnecessary health screenings. For example, an estimated four million dollars was spent on wasteful or likely wasteful imaging for low back pain, a commonly treated condition
within healthcare. Research shows that two-thirds of people will present with low back pain at some point throughout their lifetime, but 20-50% of high-tech imaging procedures fail to provide information that improves the patient’s condition, representing unnecessary services.

**Purpose:** The purpose of this study was to evaluate the existence of redundant healthcare expenditures on imaging for low back pain throughout healthcare systems in Nebraska.

**Methods:** This study was a retrospective chart review of de-identified healthcare records focused on procedures related to imaging for low back pain extracted from Nebraska Health Information Exchange managed by the Nebraska Health Information Initiative (NeHII). The sample included 937 deidentified patients with a diagnosis of low back pain who received imaging in the state of Nebraska and whose health record was recorded in the Nebraska Health Information Exchange. To determine redundancy, records were categorized in three areas including necessary imaging, likely wasteful imaging, or wasteful imaging based on the criteria from the “First, Do No Harm” study conducted by the Washington Health Alliance.

**Results:** Results revealed a total of 51% of low back pain imaging was considered wasteful, 35% likely wasteful, and 14% necessary.

**Conclusion:** Based on these results, further research is warranted to determine specific demographics related to necessary, likely wasteful, and wasteful imaging and the purpose for performing these expensive imaging procedures. The findings also support research regarding incongruencies that exist in the healthcare system as it relates to expenditure.

**Acknowledgements:** We would like to acknowledge and thank the Nebraska Health Information Initiative (NeHII) for collaboration with this project.

**46. Purulent Pericarditis Presenting as Pericardial Effusion and Cardiac Tamponade in an Immunocompetent Young Adult.**

Jason Kuniyoshi, Azka Latif, Apurva Patel, Dennis Esterbrooks, Michael Del Core

Acute bacterial pericarditis is rarely encountered in the modern antibiotic era. Purulent pericarditis which is defined as presence of frank pus in the pericardium is a very serious form of acute bacterial pericarditis with significantly high mortality rate. It can rapidly progress to cardiac tamponade leading to hemodynamic instability, septic shock, and death if left untreated. Here, we present a case of purulent pericarditis with a large pericardial effusion and associated cardiac tamponade which was successfully managed with intravenous antibiotics and drainage with pericardial drain placement in a young immunocompetent male.
47. Ventricular Fibrillation as an Initial Manifestation of Cardiac Sarcoidosis
   Jason Kuniyoshi, Azka Latif, Apurva Patel, Nancy Koster, Michael Del Core

Cardiac sarcoidosis is a rare manifestation of systemic sarcoidosis that has the potential to produce life-threatening complications. As the non-caseating granulomas often serve as the foci for abnormal electrical automaticity, cardiac sarcoidosis often leads to arrhythmias and death if not properly managed. Here, we present a case of cardiac sarcoidosis with ventricular fibrillation and cardiac arrest that was diagnosed in a young female via cardiac Fluorodeoxyglucose (18F-FDG) positron emission tomography (PET) scan.

48. Pro-NP™ Protects from UV-Induced DNA Damage
   Patrick Kuwong1, Sarah Gwazdacz1, Matti Holmes1, Laura Weber2, Gary Madsen2, Laura A. Hansen1 Creighton University School of Medicine, Department of Biomedical Sciences

**Background:** Skin cancer is one of the most pervasive forms of cancer in the US, especially among adolescents and young adults. Skin cancers cause morbidity and engender severe economic consequences. According to the US department of Health, nearly 5 million people are treated for all types of skin cancers each year, resulting in an annual cost estimated at $8.1 billion. Previous studies show that ultraviolet radiation (UVR) is the primary cause of skin cancer. It exerts photocarcinogenic activity via direct DNA damage and generation of reactive oxygen species. UVR causes direct DNA damage via formation of cyclo-pyrimidine dimers (CPD) and 6-4 pyrimidine primidone photoproducts, and indirect DNA damage via formation of reactive oxygen species (ROS), which form 8-oxo-guanine and other DNA adducts. Current sunscreens are ineffective at preventing UV-induced DNA damage. Additionally, recent FDA studies have raised questions on sunscreen toxicity and long-term effects due to systemic absorption above 0.5 ng/ml into blood plasma of its active ingredients such as avobenzone and oxybenzone. Thus, safe, potent, and reliable products that protect from UV-induced DNA damage are urgently needed.

**Purpose:** To meet this need, the novel approach we explore combines nontoxic, biodegradable, and FDA-approved Poly(Lactic-co-Glycolic Acid) nanoparticles, with active and potent antioxidant enzymes, to supply keratinocytes in a sustained manner via topical application of Pro-NP™. Previous studies established Pro-NP™ efficacy at scavenging ROS in zebrafish models and human neuron cell cultures after oxidative stress. Our previous studies also show Pro-NP™ delivery of antioxidant enzymes to basal keratinocytes in human reconstituted epidermis. Thus, we hypothesize that Pro-NP™ can prevent UV-induced DNA damage in mouse models.

**Methods:** In order to determine the effectiveness of Pro-NP™, two dose-response experiments were performed, using several concentrations of Pro-NP™ with a single or chronic UV exposure. In the first experiment, mice (n=4), were topically treated with vehicle (Gransil Lotion, from Grant Industries) 0.1% Pro-NP™, 0.2% Pro-NP™, and 0.5% Pro-NP™ prior to a single 15kJ/cm² UV exposure, or sham-irradiation (negative control).
After exposure, we collected skin tissue, fixed in formalin, and tested for two DNA damage markers, CPD and γH2AX via immunofluorescence (IF). IF images were digitized using Olympus VS 120 Virtual Slide Scanner, and positively stained cells per length of tissue were quantified in an automated manner. Quantification of γH2AX IF for this experiment revealed a significant difference between the sham and vehicle treated-UV-irradiated (Vehicle-UV) groups, as well as a significant difference between the Vehicle-UV group, and the 0.2% and 0.5% Pro-NP™ treated UV-irradiated groups. 0.2% Pro-NP™ caused a 75% decrease, while 0.5% Pro-NP™ caused an 80% decrease in γH2AX. However, Pro-NP™ doses in this experiment did not reduce CPD compared to the Vehicle-UV group. For the second experiment, mice (with n= 6), were treated with 0.5%, 1% or 2% Pro-NP™ topically, prior to a 18kJ/cm² UV exposure or sham-irradiation, five times a week, for two weeks. As expected, UV exposure significantly increased CPD and γH2AX signals, which were undetectable in sham-irradiated controls in this experiment. Moreover, CPD IF was decreased by 30% in the 1% Pro-NP™, and by 40% in the 2% Pro-NP™ group (p = 0.05). Lastly, γH2AX quantification for this experiment revealed that 0.5%, 1%, and 2% Pro-NP™ treated groups showed a 75% decrease in γH2AX positive cells. One-way ANOVAs with Tukey’s multiple comparisons tests, and a set p-value of .05 were used for all statistical analysis.

**RESULTS:** Together, these data demonstrate that Pro-NP™ protects skin from UV-induced DNA damage, suggesting a potentially more effective alternative to sunscreen.

49. **CHARACTERIZATION OF THE PROGRAMIC PHASE IN THE AQUATIC MONOCOT STUCKENIA PECTINATA**

**Neha Lamsal, Monroe Pruett, Adam D. Wilson and Dr. Mackenzie L. Taylor**

**RATIONALE:** Water pollination (hydrophily) is a rare pollination mechanism by which pollen is transported to stigmas via the water surface or underwater currents. Little is known about the consequences of the transition to hydrophily for postpollination pollen development. The goal of this study was to characterize the progamic phase, the life history stage between pollination and fertilization, in the water pollinated monocot, Stuckenia pectinata.

**METHODS:** Flowers were hand pollinated and collected at 5-15 minute intervals for two hours after pollination. In order to document the timing of pollen germination, stigmas were removed, stained with aniline blue, and imaged with light microscopy. The germination status of each pollen grain was documented. In order to characterize pollen tube growth, carpels were cleared in NaOH, stained with aniline blue, and the length of the longest pollen tube was measured.

**RESULTS:** Pollen germination occurred as soon as 5 minutes after pollination. Pollen tubes reached the ovule as early as 30 map. The average pollen tube growth rate across all time points is 450 ± 45 µm/hr.

**CONCLUSION:** Results in Stuckenia will be compared to related hydrophilous species to better characterize this life history stage in water pollinated plants.

**ACKNOWLEDGEMENT:** Financial support was provided by the Clare Boothe Luce Program for Women in Science, the Creighton University Center for Undergraduate Research and Scholarship, and the Creighton University Biology Department.
50. LEVELS OF E. COLI BACTERIA IN FAUCET VS. FILTERED WATER IN DOMINICAN REPUBLIC VILLAGES
Jackie Laughlin, Samantha Mora, and Julia Jobanputra. Advisor: Dr. Michael Miller

RATIONALE: Drinking water in some regions of the Dominican Republic contains non-potable levels of E. coli bacteria. In response, the ILAC Water Quality Program has created and distributed filters to homes that do not have easy access to clean water. This project aims to collect and analyze the number of coliform colonies and Escherichia coli (E. coli) colonies found from water samples at different sources.

METHODS: Three villages were visited for water testing. Two water samples were collected from each home: one from the faucet water and one from the filtered water. The samples were set in petri-dishes with agarose and incubated overnight. The number of colony forming units (CFUs) was counted and recorded for both coliform colonies as well as E. coli colonies.

RESULTS: The data showed a significant difference in E. coli bacteria between faucet water and filtered water. Faucet water samples contained much higher levels of E. coli than filtered water. No correlation was found between the number of coliform CFUs and the number of E. coli CFUs from each sample. Filters cleaned with bleach contained lower levels of bacteria than filters cleaned with soap or sugar.

CONCLUSION: The filters are effective at removing E. coli bacteria from the faucet water and bleach should be the recommended cleaning agent for the filters. Source water samples were collected for future testing of metal ion elements in the water.

ACKNOWLEDGEMENT: Thank you to the Creighton Center for Undergraduate Research and Scholarship for funding this research. Thank you to the Global Engagement Office and Institute for Latin American Concern for their support and assistance arranging the setup for this research, and the Dominican families who welcomed us into their homes and allowed us to test their water.

51. VARIABILITY IN β-LACTAM SUSCEPTIBILITY IS NOT DEPENDENT ON PORIN LOSS ALONE IN SEQUENCE TYPE 131 AND NON-SEQUENCE TYPE 131 E. COLI
John Mangold, Yohei Doi, and N. D. Hanson Creighton University

RATIONALE: Sequence Type (ST) 131 E. coli (Ec) are an emerging group of uropathogenic E. coli that are associated with β-lactamase production and multidrug resistance. The purpose of this study was to evaluate the combination of porin loss and β-lactamase production with respect to β-lactam susceptibility in both ST-131 and Non-131 Ec.

METHODS: Multiplex PCR was performed to determine E. coli ST, and presence of specific β-lactamase genes. Susceptibility was evaluated by disc diffusion for 3 cephalosporins and 3 carbapenems according to CLSI guidelines. Immunoblots were used to evaluate the outer membrane protein, OmpC.

RESULTS: 7/16 urine isolates were ST131 Ec. OmpC was not detected in 1 ST131 Ec; it produced a CTX-M-14 and was resistant to cephalosporins and non-susceptible to 2/3 carbapenems. 3/7 ST131 Ec produced a CTX-M-15, all were resistant to cephalosporins and had mixed susceptibilities to carbapenems. 2/7 produced a KPC, were resistant to...
cephalosporins and non-susceptible to carbapenems. One Ec produced CMY-2 and was non-susceptible to cephalosporins but susceptible to carbapenems. 9/16 Ec were non-131. OmpC was not detected in 2 Ec. One produced a CMY-2, was resistant to cephalosporins, and had mixed susceptibility to carbapenems. The other produced a KPC and was resistant to all drugs. 3 Ec produced CMY-2 with OmpC present and had varying susceptibilities to all drugs. One Ec produced CTX-M-14, one produced KPC, and both were susceptible to carbapenems.

**CONCLUSION:** Porin loss contributed but was not necessary for carbapenem resistance in the absence of a carbapenemase. Carbapenem resistance in Ec producing carbapenemases was not dependent on ST or porin loss. Carbapenemase production in a non-ST131 Ec did not result in a carbapenem resistant phenotype. Varying expression levels of β-lactamase production in different isolates producing the same β-lactamase could account for variation in the observed susceptibility patterns.

52. **PLAYING BY THE RULE: TOWARDS A BENEDICTINE SPIRITUALITY OF SPORTS**  
**Anthony Maranise, M.A., Obl.S.B.**  
(Creighton University Ed.D. Program in Interdisciplinary Leadership, Cohort #47)

**RATIONALE:** For more than fifteen centuries, *The Rule of Saint Benedict* (Latin: *Regulae Benedicti*) has been a seminal classic within Western spirituality. Religious studies scholars have distilled from its contents a plethora of applicable practical, accessible, and transferable insights, skills, and adjuvants. To date, the ever-expanding field which examines valuable intersections between, sports, spirituality, and religion has seldom, if at all, explored this text. Surprisingly, *The Rule of Saint Benedict* contains several explicit references to various sporting activities including running, climbing, and training. Also present within its pages are other, yet more implicit, references to various activities which can rightly be associated with the popular cultural phenomena of sports such as manual labor, importance of a dedicated regimen, dietary habits, etc. In this paper, I will analyze these apparently overlooked sporting references from *The Rule of Saint Benedict* and propose a distinctly Benedictine spirituality of sports based out of the referents already present in *The Rule*.

**METHODS:** Systematic review of literature, in-depth conceptual analysis, theoretical formation substantiated by recent scholarship within field(s).

**RESULTS:** A thorough examination of both explicit and implicit uses of sports metaphors in *The Rule* evidences the ‘universal applicability’ of sports references as popular means of explaining spiritual ideas, goals, and/or pursuits. The use of such in *The Rule* also establishes both a tradition and text-based ‘place’ within Benedictine spirituality wherefrom further musings upon sports and spirituality may begin to emanate. The adaptable spirituality of Benedictinism, including a robust spirituality of work, establishes a link to valuable considerations of sports as a form or work as well as being understood as a legitimate spiritual practice, within the Benedictine lens.

**CONCLUSION:** As both an academic discipline and a deeply personal means of encounter with the Divine, spiritual theology must remain ever-poised towards adaptability. Though *The Rule* is an ancient text, the spiritual wisdom and principles contained
therein are ‘reinvigorated;’ that is, ‘given new life’ and relevance when interdisciplinarily applied to the popular cultural phenomena of sports. A distinctly Benedictine spirituality of sports is, thus, established surrounding a framework based in ‘the three I’s’ and which include: immanence, intentionality, and interiority.

53. A COMPARISON OF PHYSICAL ACTIVITY PERSPECTIVES DURING PREGNANCY AMONG ACTIVE VERSUS NON-ACTIVE MOTHERS UTILIZING THE THEORY OF PLANNED BEHAVIOR
Kimberly Masuda, Kailey Snyder, Danae Dinkel Creighton University & University of Nebraska-Omaha

RATIONALE: There are short and long-term benefits to physical activity during pregnancy however only about 1 in 5 women are meeting the physical activity recommendations of at least 150 minutes of activity per week. More research is need to understand women’s perceptions of physical activity during pregnancy.

METHODS: This qualitative study consisted of pregnant women (n=15) participating in a telephonic interview that lasted ~20 minutes. Women were interviewed based on constructs of the Theory of Planned Behavior: attitude, normative beliefs, and perceived behavioral control. Data were analyzed via NVivo qualitative analysis software through a process of immersion and crystallization.

RESULTS: Based on self-reported activity levels 7 women were considered non-active and 8 considered active. Related to women’s attitudes, the majority perceived physical activity as an unstructured activity (i.e., stroller walks, household chores) and viewed it as important due to the influence of role modeling for their children. When considering women’s normative beliefs, most reported receiving vague or general information from their doctor regarding exercise in pregnancy. Non-active mothers were more likely to report relying on the advice from their healthcare provider. Conversely, active mothers were more likely to seek out advice and information from family/friends or online. Specific to behavioral control, all women reported time as a barrier to activity however more active mothers felt they were the greatest influence over their own physical activity. While non-active mothers were more likely to feel children and/or spouses were in control of their physical activity.

CONCLUSION: Women reported similar attitudes and barriers to activity during pregnancy. However, active women appear to have greater behavioral control and utilize advice resources beyond the general advice given from healthcare providers.

ACKNOWLEDGEMENTS: The researcher acknowledges Creighton University’s Physical Therapy Department and the University of Nebraska at Omaha for their role in data collection and analysis assistance.

54. A NOVEL LONG NON-CODING RNA ENHANCES MICROGLIAL INFLAMMATORY GENE EXPRESSION
Nicholas W. Mathy, Xian-Ming Chen, and Annemarie Shibata

RATIONALE: Upon stimulation by inflammatory mediators, microglia, the resident immune phagocytic and secretory cells in the CNS, produce a profoundly neurotoxic
inflammatory response. Increased understanding of the regulatory factors controlling microglial activation may be critical to modulating inflammation in the CNS. Long non-coding RNAs (lncRNAs) are transcripts which lack protein coding potential, and have been shown to regulate gene expression via interactions with RNA-binding proteins, including transcription factors.

**METHODS:** The BV2 murine microglia cell line was cultured in DMEM supplemented with 10% FBS. Transfection was performed using Lipofectamine RNAiMax for siRNA experiments, or Lipofectamine 2000 for overexpression. LPS stimulation was performed for 6h at a concentration of 10 μg/mL. RNA immunoprecipitation was performed using 0.3% formaldehyde for crosslinking. NF-κB p65 (SC-8008) and normal IgG (SC-2025) were used for immunoprecipitation.

**RESULTS:** After cloning the full-length sequence of IncRNA-25B, we performed functional studies in which we overexpressed or used siRNA to knockdown IncRNA-25B. After stimulation with LPS, murine microglia with IncRNA-25B knockdown showed decreased expression of inflammatory mediators (iNOS, Ccl2) compared to a scrambled siRNA control. Conversely, overexpression of IncRNA-25B enhanced the induction of iNOS and Ccl2 upon LPS stimulation when compared to empty vector control. Given that these are both NF-κB target genes, we used RNA immunoprecipitation to test for a physical interaction between IncRNA-25B and NF-κB p65. In a basal state, we detected no enrichment of IncRNA-25B associated with NF-κB p65 compared to IgG control, however, upon LPS stimulation there was a significant enrichment of IncRNA-25B with NF-κB p65 compared to IgG control.

**CONCLUSION:** Together, the data shows that a novel IncRNA physically interacts with NF-κB p65 and which positively regulates the expression of iNOS and Ccl2. Understanding the mechanism of inflammatory gene regulation by novel IncRNAs could prove useful to the design of pharmaceutical therapies aimed at limiting neuroinflammation.

55. EXAMINING SUPPORT FOR AUTHORITARIAN ALTERNATIVES: THE GROWING POPULIST WAVE AND DEMOCRATIC DECONSOLIDATION IN WESTERN EUROPEAN REGIMES

**Matthew Matternas**

This study considers factors that influence the level of support for democracy among individuals in Western Europe. Explanatory factors include the respondent’s confidence in the government, confidence in the European Union, normative views on state immigration policy, normative views on state trade policy, and if the respondent supports a right-wing or left-wing populist party. I conduct my study via an ordered logistic regression test and using longitudinal data from the World Values Survey. My findings indicate that those who identify as a supporter of a right-wing populist party are more likely to support authoritarian alternatives to democracy while supporters of leftwing populist parties are not likely to support these same alternatives. The study concludes that confidence in the government, confidence in the European Union, views on immigration, views on trade policy, and supporting a right-wing populist party are all
statistically significant factors in determining a respondent’s support for authoritarian alternatives to democracy.

56. IMPLEMENTING A COMPREHENSIVE SCREENING TOOL IN THE MANAGEMENT OF COPD IN PRIMARY CARE
Sara Meyers

RATIONALE: The purpose of this quality improvement project was to implement a comprehensive screening tool in the management of COPD and to determine the utilization rate of spirometry testing in the diagnosis of COPD in primary care. The majority of patients with COPD are managed by their primary care provider (PCP). The most current GOLD consensus report recommends the use of a comprehensive screening tool to assist in guiding the treatment of COPD. The CAT™ screening tool is used to measure the level of symptom burden in patients with COPD. The use of spirometry testing is preferred method of diagnosis for COPD and other chronic lung disease.

METHODS: Two PCPs participated in this quality improvement project along with a convenience sample of patients with a diagnosis of chronic obstructive lung disease in a southeast Minnesota primary care clinic. PCPs were educated on administration and interpretation of the CAT™ screening tool. During the data collection period the screening tool was administered to patients meeting inclusion criteria. Retrospective chart review was performed to evaluate the use of spirometry testing for the purpose of diagnosing chronic obstructive lung disease. At conclusion a survey was sent to participating providers for feedback.

RESULTS: 23 (N=23) patients meeting inclusion criteria completed the CAT™ screening tool. 13 (n=13) patients had documentation of spirometry testing confirming the diagnosis of chronic obstructive lung disease. One (n=1) patient was referred for spirometry testing within to screening period. Post project survey perception was varied.

CONCLUSION: Spirometry utilization rates were low. Survey results were inconclusive regarding the CAT™ screening tool. Providers reported the tool did facilitate a discussion with patients regarding their diagnosis of COPD. Further research is needed to determine overall spirometry utilization rates. Further education regarding current GOLD report recommendations is needed for PCPs.

ACKNOWLEDGEMENTS: Dr. Nancy Bredenkamp, Dr. Elizabeth Williams, Nathan Koppe, CNP

57. MY INELASTIC DEMAND FOR ELASTICITY CONSIDERATIONS: WHY SUBSTITUTES MATTER FOR BEHAVIORAL MODIFICATION TAXES
Nathan Miller, under supervision of Dr. Michael Thomas

RATIONALE: Excise taxation is an easy way to gain revenue for governments by levying taxes on socially undesirable goods. However, if the justification to implement these
taxes is to alter consumer behaviors, we know this conclusion cannot coexist simultaneously with revenue generation.

**METHODS:** Through microeconomic analysis and examination of existing literature on excise tax behavioral modification, we looked at the many ways in which these taxes are justified and the potential results of taxation. One other area of interest was observing studies that draw unverifiable conclusions and lead to incorrect interpretations of excise taxation.

**RESULTS:** Elasticity considerations—such as related goods, institutional factors, and time—will help in supplementing the end goal of a behavioral modification tax, factors without which an effective taxation policy cannot succeed. Revenue gained from taxing inelastic goods requires expenditure on related services; if this does not occur, it is considered political rent-seeking. Elasticity for a good will increase with the availability of substitutes. Therefore, in order to truly enact behavior change, legislators must consider elasticity through the lens of substitutes for the good they are taxing.

**CONCLUSION:** Disfavored goods taxation as a form of behavioral modification is justified only by its ability to reduce overall consumption, and to do this, policymakers must be aware of the behavioral complexities that exist in switching consumers to substitute consumption patterns.

**ACKNOWLEDGEMENTS:** I’d like to thank Dr. Michael Thomas and the GWR cohort for their help and support along the way.

58. **IOWA SPORTS GAMING: ITS IMPACT ON CASINO REVENUE, STATE AND LOCAL TAX REVENUE, AND THE NATIONAL IMPLICATIONS**

*Peyton Miller, Mentor: Dr. Ernie Goss*

**RATIONALE:** In 2018, the Supreme Court overturned The Professional and Amateur Sports Protection Act, enabling state governments to pass regulation to implement legal sports gambling. The recency of this ruling leaves the economic impact of sports gambling legalization unknown. This study uses Iowa as a case study to explore the national implications of sports gambling legalization by evaluating how Iowa’s adoption of legal sports gambling impacts casino revenue distribution between different forms of gambling, as well as how these findings influence state-level policy conclusions.

**METHODS:** The key dynamic that this study investigates is cannibalization - the potential that introducing sports betting will cause revenues to be drawn from other forms of gambling. Historically, the introduction of other forms of gambling has resulted in observable cannibalization within the larger gambling market, suggesting that the implementation of sports betting should result in cannibalization within the Iowa gambling market. To quantify this specific instance of cannibalization, this study uses OLS regression to model AGR and tax revenues primarily as functions of sports betting revenues.

**RESULTS:** This study finds that cannibalization is observed in the Iowa gambling market and that it negatively impacts both AGR and tax revenues beyond specific levels of
sports gambling revenues. Additionally, mobile sports betting is found to have a heightened cannibalization effect, as cannibalization is seen at lower levels of sports gambling revenue than in casinos that offer mobile sports betting.

**CONCLUSION:** Both casinos and states that consider implementing sports gambling should evaluate how cannibalization, in light of the influence of mobile sports betting, will impact their ability to maximize tax revenues or gambling profit respectively if they choose to implement sports betting.

**ACKNOWLEDGEMENT:** This research was supported by my research mentor, Dr. Ernie Goss, and funded by the Institute for Economic Inquiry’s Gail Werner-Robertson Research Fellows program.

**59. CONSTRAINTS ON THE GEOMETRY OF QUASAR SPECTRA**

*Moraczewski, Leo*

Current quasar models assume a super massive black hole in the center of the quasar, with an accretion disk surrounding it. The accretion disk is believed to be a rapidly rotating, geometrically thin but optically thick disk. The orientation of the accretion disk is predicted to have a significant effect on the observed spectral emission features of quasars. We present initial results testing that model based on a study of the rest frame UV and optical spectra using the data in the Sloan Digital Sky Survey quasar spectral database, Data Release 12. Using the [OIII] emission line equivalent width as a measure of the disk inclination angle, we test various emission line and continuum features in different parts of the spectrum, which could provide insight into outflowing winds and the overall geometry of quasars.

**60. SYNTHESIS OF A PERDURABLE CHROMENOID INSECT REPELLENT.**

*Allie Morrow, Dr. Martin Hulce, James Sickler*

Impacting millions globally, mosquitoes are known for their transmittance of parasitic and viral diseases. Among these are malaria, dengue fever, filariasis, yellow fever, Zika fever, West Nile virus, and various encephalitides. To control the spread of these diseases, industries have turned to mosquito population reduction through the development of insecticides and larvicides, as well area and personal mosquito repellents. As the effectiveness of these latter repellents decreases over time, they must be applied both prior to mosquito exposure and regularly after. The attachment of known topical repellents to skin-binding sugars by a hydrolyzable linker group was investigated in order to develop a perdurable mosquito repellent. The repellent (2,2-dimethyl-2H-chromen-5-yl)methanol was made in three steps from methyl-3-hydroxybenzoate: The conjugate base of methyl-3-hydroxybenzoate was reacted with 3-chloro-3-methyl-1-butyne to give methyl 3-(1,1-dimethylprop-2-ynyloxy)benzoate, which was cyclized in refluxing N,N-diethylaniline to obtain methyl 2,2-dimethyl-2H-chromene-5-carboxylate after chromatography. The reduction of this ester with lithium aluminum hydride gave the desired repellent. A hydrolyzable linker was added to this
repellent using bromoacetyl chloride to give a mixture of (2,2-dimethyl-2H-chromen-5-yl) bromo- and chloroacetate. These, when stirred with \(N,N,N',N'\)-tetramethylethylene diamine in acetonitrile, returned the corresponding ammonium salts, dimethyl\((N,N\text{-dimethylaminoethyl})[(2,2\text{-dimethyl-2H-chromen-5-yl})\text{methoxycarbonylmethyl}]\) ammonium bromide and chloride, ready to be appended to skin-binding sugars.

61. **Kinesthetic Awareness Training and its Role in Movement Pattern Correction**

Lauren Netzel, Department of Pharmacology & Neuroscience, Creighton University School of Medicine

**Rationale:** Proprioception allows for stability and precision, qualities that are highly valued in baseball pitching technique. Optimal load on the back leg begins the kinetic transfer of energy necessary for maximum push-off force and accuracy for athletes to be effective. Kinesthetic Awareness Training (KAT) is a wearable motion capture and correction system that aims to develop proprioception. Neural activity will be collected during visualization of motor skills practiced with the KAT. Literature has indicated that frontal lobe alpha band frequencies have greater amplitudes during initial stages of learning and attenuate after learning is achieved, making them a possible neuromarker to predict proprioceptive learning. We determine whether frontal lobe alpha band frequencies attenuate with use of the KAT system for developing back leg bend kinematics in high school baseball pitchers.

**Methods:** High school baseball pitchers with the KAT placed on their back-leg quadriceps to measure kinematic values will be assessed during pitching practice. Sensory feedback will be delivered when a target range for optimal back-leg load is achieved. Pre- and post-test visualization during EEG data collection will be examined for changes in frontal lobe alpha (8-12 Hz) waves.

**Results:** We anticipate use of KAT will lead to increased accuracy of back leg load while performing a task, as determined by KAT metrics collected in trials without sensory feedback, and visualization of back leg load following use of KAT will lead to decreased frontal lobe alpha waves, as determined by baseline and post-task EEG data.

**Conclusion:** KAT acts as a pedagogical technique to increase proprioception and sensorimotor adaptation as determined by EEG. Results will provide a better understanding of training baseball pitchers to improve consistency and accuracy in lower body kinesthetics and neural biomarkers of learning in regard to motor performance.
62. Microfluidics for the Physics of Cancer Using Soft Lithography
Chisom Nwakama¹, Ashley Abraham², Megha Jacob², Gargee Khaparde², Mackenzie McCuddin² and Dr Andrew Ekpenyong³. ¹Department of Chemistry, Creighton University, Omaha. ²Department of Biology, Creighton University, Omaha. ³Department of Physics, Creighton University

Purpose/Rationale: Soft lithography denotes techniques for fabricating or replicating structures using elastomeric stamps and molds. Microscopic structures within the body such as the pulmonary microcirculation and the microenvironment of cancer cells can be mimicked in vitro using microfluidics. Such mimicry is an important tool for the physics of cancer, a new research frontier that seeks to unravel the role of mechanical properties, forces and interactions on cancer metastasis with the aim of enabling new therapeutic strategies against metastasis. Here, we use soft lithography to make microfluidic devices for the physics of cancer.

Methods: Basically, we make a mixture of polydimethylsiloxane with a curing agent, pour it on to silicon molds made by photolithography, oven-bake it into a solid structure and bond glass cover slips under vacuum and air plasma. The device is called microfluidic microcirculation mimetic (MMM). The passage of cells driven through MMM should be correlated with the mechanical properties of the cells.

Results: MMMs with 5 and 7 μm as the smallest constriction widths (maximum width 15 μm) are made with a constant height of 15 μm. The inlet and outlet of the devices are connected to a syringe pump and the setup is placed on an inverted microscope for experiments. We have successfully made hundreds of these devices for experiments.

Conclusions/Significance: The MMM is a physiologically relevant lab-on-chip device for mimicking various microscopic events going on in the body including the circulatory phase of cancer metastasis. This mimicry may enable the development of better diagnostic and therapeutic strategies against cancer metastasis.

Acknowledgements: Creighton University CAS Startup (to Dr. Ekepenyong) Clare Boothe Luce Research Scholarship (to Chisom) Translation Biomedical Physics Group

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Cutaneous squamous cell carcinoma (SCC) is the second most common malignancy in humans. Despite its prevalence, treatment options are limited for patients with this disease. CDC25A, a cell cycle regulator, inhibits apoptosis in SCC cells, a function requiring CDC25A binding to 14-3-3 proteins. One 14-3-3 isoform, 14-3-3ε, is overexpressed during SCC progression, where it is able to inhibit apoptosis. A novel peptide, ES1P2, was developed to specifically target 14-3-3ε heterodimers in SCC, leading to increased apoptosis. The ES1P2 peptide proved its ability to block 14-3-3ε heterodimerization with 14-3-3ζ and 14-3-3γ, its preferred binding partners, by 50% and induce cell death in SCC cells (IC50=20.6 µM). Due to the relatively high IC50 of ES1P2, a
second generation of novel peptides were designed based off of molecular dynamic (MD) simulations of the 14-3-3ε-ES1P2 complex. We hypothesized that these second-generation peptides, ES1P3 and ZF57-88, would more effectively block 14-3-3ε-14-3-3ζ/γ dimers and induce greater cell death at a lower IC50 in SCC cells. Neutral Red Viability Assays were utilized to compare the IC50 of the common drug for treating actinic keratosis, 5-fluorouracil (5-FU) to that of the new generation of peptides in SCC12B.2 cells. This series of experiments revealed 5-FU had an IC50 of 2.3 µM, ES1P3 showed minimal cell death at 40 µM and ZF57-88 showed no observable cell death at 40 µM. Preliminary data was also collected in SCC13 cells treated with ES1P3 which revealed no cell death at 40 µM. Markovian state model analysis of MD simulations of the 14-3-3ε-ES1P3 complex showed no preferential peptide binding to 14-3-3ε, supporting the experimental data. Similar analysis is underway for ZF57-88. Although ES1P3 and ZF57-88 were not more effective than ES1P2 in this cell line, there is potential that they will have increased efficacy in other SCC cell lines and gave us important information in the binding of novel peptides to 14-3-3ε.

64. WHAT PROCESS FORMS ‘GOOD’ POLICY? A GROUNDED THEORY OF HIV/AIDS PHARMACEUTICAL MANAGEMENT POLICY DEVELOPMENT COMPARING THE UNITED STATES AND SOUTH AFRICA
Jennifer Omuri, MS Candidate¹; Kimberly Galt, PharmD, PhD¹; Kevin Fuji, PharmD, MA¹; Mark Siracuse, PharmD, PhD¹; James D. Bramble, MPH, PhD¹ ¹Creighton University Center for Health Services Research and Patient Safety

BACKGROUND: Infectious disease transmission due to increased zoonotic contact by humans, migration and the disparate culture of people is a global concern. Worldwide effective pharmaceutical management policies are needed to manage transmission, outbreaks and reduce casualties. As the “best” policy approach is unclear, countries have approached this problem in different ways. The United States (U.S.), for example, employed scientific evidence in the approval of zidovudine (AZT) for the management of AIDS despite the fear and warring social views of its citizens. In contrast, South Africa’s response was primarily driven by personal beliefs of its political leaders. These policy decisions may have resulted in 0.33% of the U.S. population living with HIV, compared to South Africa’s 13%. Consequently, there is a need to understand how to create policy that results in improved health outcomes. This research-in-progress is a retrospective study of the global AIDS policy evolution, which will provide a theory to improve our understanding of the policy development process.

PURPOSE: To outline the process of making ‘good’ pharmaceutical policy decisions when faced with the emergence of an infectious disease by comparing how pharmaceutical management policy for HIV evolved in the U.S. and South Africa.

DESIGN AND METHODS: Data is collected via a systematic review of scientific and grey literature, technical papers, websites, and cultural artefacts starting with the emergence of AIDS and AZT’s introduction through present day. A grounded theory approach is employed to analyse and interpret the data collected followed with a comparative analysis of these countries’ pharmaceutical policies.
**CONCLUSION:** A story of process theory that describes strategies for effective policy formation and implementation in the pharmaceutical management of transmittable infectious diseases will be presented.

65. A CASE OF THYROTOXIC PERICARDITIS

Connor O’Neill-Dee, Dr. Joseph Thirumalareddy

**INTRODUCTION:** Hyperthyroidism is known to widely affect the cardiovascular system however, the pericardium is not typically involved. We present a case of pericarditis induced by thyrotoxicosis.

**CASE PRESENTATION:** 39-year-old female with PMH of anxiety presented to the hospital with sharp, pressure-like, substernal chest pain that radiated across her chest and shoulders, associated with SOB and worsened by deep inspiration. ROS revealed a 40 pound weight loss over the previous 4 months. Vitals included BP of 155/83, HR of 122, and RR of 30. Physical exam revealed an enlarged thyroid and chest that was tender to palpation. Laboratory testing was significant for leukocytosis, low TSH, elevated free T4 and T3, elevated BNP and elevated alkaline phosphatase. Troponins were negative and initial EKG revealed sinus tachycardia. CT scan of the chest demonstrated enlarged pulmonary arteries with enlarged right ventricle and enlargement of the thyroid. Upon admission, pain control and hyperthyroidism workup were initiated. The patient’s chest pain failed to improve and she began to complain of blurry vision and palpitations, prompting further work up. Repeat EKG showed patterns consistent with pericarditis. CRP and ESR were both elevated. The patient was started on colchicine and ibuprofen for pericarditis at which point her thyroid workup results returned. Anti-Thyroid peroxidase antibodies returned positive and thyroid ultrasound demonstrated enlarged thyroid gland with heterogeneity with increased vascularity. The patient was started on Methimazole and Propranolol for presumed Graves’ disease. The patient’s condition subsequently improved with medication and was discharged from the hospital.

**DISCUSSION:** Pericarditis is a rare but serious result of untreated hyperthyroidism. The exact mechanism by which this manifests is debated and autoimmune, metabolic and even coincidental etiologies have been debated. Nevertheless, it is important to recognize this rare sequelae and treat patients appropriately.

66. CD4 FUNCTIONAL RESPONSE BASED ON BODY COMPOSITION AND QUALITY OF LIFE METRICS

Michael Padgett, Jaclynn Sparks, Dr. Siedlik, Dr. Bredhal

**RATIONALE:** To quantify the relationship between body composition and CD4⁺ T cell activation states following *in vitro* cell stimulation.

**METHODS:** Using an observational study design, fourteen (12 males, 2 females) subjects (age: 24 ± 6 yr; height: 180 ± 7 cm; weight: 86.1 ± 9.2 kg) participated in this study. Body fat percentage was measured via air displacement plethysmography and each subject completed an extensive health history questionnaire. Fasted venous blood samples (20ml) were collected and CD3⁺ T cell isolation from peripheral blood was conducted.
through negative selection using a Human CD3+ T cell enrichment kit. Cells were stimulated via plate bound antibodies and analyzed in response to co-stimulation through CD28. Cells were incubated for 3 d and then analyzed by flow cytometry.

**RESULTS:** Neither body fat percentage ($\beta = -0.03$, $p = 0.3$) nor age ($\beta = -0.07$, $p = 0.2$) were significant predictors for the percent of CD4+CD25+ T cells following stimulation. Intensity of CD25 expression (MFI) was not significantly predicted by either body fat percentage ($\beta = 0.04$, $p = 0.09$) or age ($\beta = -0.05$, $p = 0.3$).

**CONCLUSION:** The generalizability is limited due to the small sample size. The effect of age remains stable in that markers of activation are inversely related to age. Higher body fat percentage exhibits a more ambiguous effect as intensity of CD25 expression appears to be increased in cells that do activate in response to stimuli but the magnitude of the response (i.e. percent of cells activating) is inversely related to percent body fat. Other health variables need to be controlled for and will be included in statistical models as sample size increases.

**ACKNOWLEDGEMENT:** CURAS summer research grant for the ability to investigate my research question. Additionally, I would like to thank Dr. Siedlik for his continued support and help.

67. THE EFFECT OF CREATINE AND CREATININE SUPPLEMENTATION ON DOXORUBICIN TREATMENT OF WALKER 256 MAMMARY CARCINOMA CELLS IN VITRO.

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**BACKGROUND:** Doxorubicin (DOX) is a powerful chemotherapeutic agent with potent cytotoxic effects that result in increased rates of cell death and reduced viability. Recent evidence has shown that creatine (Cr) may minimize DOX-induced cytotoxicity to non-cancerous tissues; however, few studies have investigated the effect of Cr on tumor proliferation with or without DOX.

**PURPOSE:** To determine if supplementation with Cr or creatinine (CrN) alters cell viability in a tumor model when combined with DOX over a 48 hr time period.

**METHODS:** Walker 256 mammary carcinoma cells were cultured in growth medium (90% DMEM 10% FBS) until they reached 90-95% confluency. Cells were seeded on to a 96-well plate at a density of 10,000 cells/ml with fresh growth media and incubated for 24 hr. Cells were then exposed to growth media containing either 10 μM of DOX, 10 mM of Cr, 10 mM CrN, 10 μM DOX + 10 mM Cr, 10 μM DOX + 10 mM CrN, or regular growth media as a control for an additional 48 hr. Cell viability was assessed at 0, 12, and 48 hr using an EarlyTox™ Cell Integrity Kit and analyzed via a Nikon live cell confocal imaging system.

**RESULTS:** At 12 hr post-treatment, DOX and DOX+Cr had significantly lower cellular viability compared to baseline ($P <0.05$). At 48 hr, Cr, CrN, and DOX+CrN had significantly lower cellular viability compared to baseline ($P <0.05$). No significant differences in viability were found in the control group.
CONCLUSION: The addition of Cr or CrN did not affect the cytotoxic effects of DOX.

68. CLASSIFICATION OF UTERINE CANCERS IN LYCH SYNDROME MUTATION CARRIERS
Dominique T. Pataroque, Sarah J. Aurit, Catherine T. Stoos, Murray Joseph Casey
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RATIONALE: Lynch syndrome (LS) is an autosomal dominant hereditary cancer susceptibility to several cancers, linked to aberrant mutations and silencing in mismatch repair (MMR) genes. Female LS patients bear a 40-60% lifetime risk of developing uterine cancer. Preliminary review of the Creighton Hereditary Cancer Registry (CHCR) found that uterine cancers in LS mutation carriers were not consistently registered by standard and current classifications. This project was undertaken to correct and update the registration of these tumors according to FIGO 2009, WHO 2014, and ESMO-ESGO-ESTRO 2016 classifications by medical records and light microscopy review.

METHODS: 78 cases with complete HIPAA forms and surgical pathology reports were available in the CHCR, but diagnostic tissues were available from 19 of these cases. Only four of these had complete surgical-pathology specimens. Data from submitted pathology reports permitted WHO 2014 binary classification of 59 uterine cancers as either Type 1 endometrial low-grade endometrioid carcinomas or Type 2 endometrial high-grade carcinomas. This allowed statistical analysis of prognostic variables to compare several selected parameters often associated with relative prognoses for uterine cancers and to compare the survival of patients with Type 1 cancers versus those with Type 2 cancers.

RESULTS: There were fifty Type 1 endometrioid carcinomas and nine Type 2 carcinomas. Analysis found no significant differences in age of diagnosis, stage, mutated MMR gene, or the presence of endometriosis between these groups. There was no difference in 20-year survival between Type 1 and Type 2 endometrial carcinomas in this population.

CONCLUSION: Although many LS mutation carriers with uterine cancers were accrued to the CHCR over the past 60 years, the limited useable diagnostic tissues were insufficient to classify most cases according to current standards or for meaningful comparisons of their parameters for prognosis and survival, which could be useful for management in the future.

69. PREVALENCE OF CHILD MARRIAGE: VARIATION IN NATIONAL MARRIAGE LAWS
Shambhabi Paudyal

Twelve million girls are married before the age of eighteen every year. There are numerous organizations and institutions advocating to eliminate the practice of child marriage. This research aims to identify factors that lead to the variation in the prevalence of child marriage across the international system by analyzing the effect of inconsistency and low age requirements in national marriage and sexual consent laws. The research also includes other potential causal factors in the study, such as poverty, religion, and the marriage market. The study includes 125 countries and their most-recent measures of child marriage prevalence. Findings suggest that low and
inconsistent national marriage age requirements impact the prevalence of child marriage and marriage laws interact with one another, suggesting that their significance may lie in collective workings in addition to individual. **RATIONALE:** States included in the study experience high levels of poverty and lack adequate resources and opportunities for girls. Uneducated, unemployed, and unmarried girls – due to scarcity and sociocultural norms – are viewed as financial and social burdens on the family. Therefore, when the three laws that directly relate to marriage are not consistently established at the age of eighteen, they provide families and legal guardians of girls with more opportunities to marry them off as children. **METHODS:** Data Source: UNICEF, Demographic Health Surveys (DHS), Multiple Indicator Cluster Surveys (MICS), World Bank Indicators, UN Data, the Joshua Project, World Population Review

**DEPENDENT VARIABLE:** Prevalence of child marriage around the world

**VARIABLES OF INTEREST:** Inconsistency between three national marriage laws: general marriage age, parental consent age, and sexual consent age; lowest age of the three laws

**CONTROLLED VARIABLES:** Poverty, Religion, Marriage Market

**METHODS:** OLS regression, interactive effects on regression

**RESULTS:** My variables of interest, inconsistency and lowest age, are statistically significant, demonstrating that laws impact the prevalence of child marriage. My finding demonstrates that general marriage age and parental consent age interact with one another: when general marriage age is at least eighteen years and parental consent age increases by one year, the prevalence of child marriage decreases.

**CONCLUSIONS:** Results demonstrate that low and inconsistent marriage laws affect the prevalence of child marriage; therefore, consistent laws at 18 years of age would act as barriers against child marriage. My finding of interaction between general marriage age and parental consent age suggests that laws may have a more significant impact on the prevalence of child marriage collectively. Therefore, parental consent age requires special attention with regard to future policies, which would spillover to issues of parental rights, children’s rights, and autonomy. Further research should investigate state capacity with regard to the enforcement of laws and contexts of different societies within each country and the efficacy of laws within them.

**ACKNOWLEDGEMENT:** Dr. Terry Clark, Dr. Jim Martin, Dr. Richard Witmer

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**70. DEVELOPMENT AND EVALUATION OF TERNARY AMORPHOUS SOLID DISPERSION OF POLYPHENOLIC COMPOUNDS**

Sagar Kumar Paul, Shambhavi Borde, Harsh Chauhan

**PURPOSE:** The purpose of this study is to design a soluble and stable ternary amorphous solid dispersions (TASD) containing poorly soluble compounds curcumin (CUR) and resveratrol (RES). These polyphenols have synergistic antioxidant, chemopreventive, chondroprotective, and anticancer activity.
METHODS: Ternary amorphous solid dispersions were designed using Eudragit® EPO as a hydrophilic polymer due to its interaction potential with phenolic hydroxyl functional groups of both CUR and RES. TASDs were prepared by solvent evaporation method using a rotary evaporator. Dried CUR-RES-EPO complex of 40:40:20, 25:25:50, and 10:10:80 (w/w/w) ratios were obtained as the final product. Pure CUR, RES, their physical mixtures (PM), and complexes were characterized by XRD, DSC, and IR. Molecular modeling studies are carried out to understand the molecular interaction between CUR/ RES and Eudragit® EPO. Dissolution studies over 12 hours were done using USP apparatus II. The stability of TASDs were evaluated over 1 month at 25oC. RESULTS: PM of CUR, RES with Eudragit® EPO, and TASD containing high CUR/RES load i.e. 40:40:20 were found to be crystalline. However, XRD confirmed TASD containing low CUR/RES loads (25:25:50 and 10:10:80) were converted into amorphous form. Several peak shifts were observed in the IR data of the TASD when compared to their respective PMs confirming the presence of interaction between CUR, RES, and Eudragit® EPO. Molecular modeling confirmed non-covalent bonding between the CUR/RES and Eudragit® EPO. Dissolution study showed more than 10 times increase in the release profile of CUR and RES compared to their PMs. Stability study using XRD and IR showed TASD remains amorphous after 1 month. CONCLUSION: Successful formulation of soluble and stable TASD of CUR and RES combination. DSC, Raman, and NMR studies will be carried out to further understand the role of molecular interaction in designing soluble and stable TASD.

71. THE PERCEPTIONS OF MATERNAL PHYSICAL ACTIVITY DURING THE PERINATAL PERIOD: A LONGITUDINAL INVESTIGATION
Angie Pereira, Kailey Snyder, Kim Masuda, Creighton University

BACKGROUND: There are numerous mental and physical benefits related to physical activity during the perinatal period. These include but are not limited to increased focus and alertness and decreased risk of Gestational Diabetes. There is limited research designed to understand mothers’ perceptions of engaging in physical activity during the perinatal period.

PURPOSE: The purpose of this study was to explore maternal perceptions of physical activity during the perinatal period.

METHODS: This qualitative study consisted of interviewing mothers (n=8) at two time points. Once during their 2nd trimester of pregnancy and again when their child was ~3 months old. Demographic information was also acquired via survey at both time points. Interview data were analyzed through a process of immersion and crystallization to compare the two time points. RESULTS: Prenatal: During the prenatal period, only 2 of the women appeared to be achieving the ACSM recommendations of 150 minutes of moderate activity or 75 minutes of vigorous activity each week. Only 1 woman was given specific recommendations from her physician on types of beneficial physical activities. Postnatal: The results indicated that during the postnatal period, 7 of the 8 women appeared to decrease in their structured activity and only 1 woman appeared to
meet ACSM’s recommendations. 2 women indicated that they were not given any advice on physical activity from their physicians.

**CONCLUSION:** Despite the benefits of physical activity, women are still not meeting the thresholds of ACSM’s recommendations. Women received little information and support from physicians and it likely led to sedentary behaviors however more research is needed. Lack of proper education on physical activity could have led to cautious behaviors and limiting activity. More research is needed to understand how physical activity levels would be impacted by more physicians providing education and resources for activity during the perinatal period.

**72. THE VARIATION IN STATE SPENDING FOR HIGHER EDUCATION**

**David Petesich**

**RATIONALE:** Public higher education is part of state budgets that is set aside for individual states to invest in their own human capital. However, different states spend vastly different amounts of money on this service. States often set aside funds to help support their public universities however, there is currently concern of how much should be provided for higher education as many states have failed to raise university funding to pre-2008 levels, or even pace funding increases with tuition increases. This study considers factors that influence state spending for public universities from 2008 to 2018. Explanatory factors include GDP per capita, population of 18-24 year-olds, total population, and citizen ideology as potentially significant factors that affect state spending for public universities.

**METHOD:** Using a panel corrected standard errors regression

**RESULTS:** my findings indicate states with larger populations have no statistical spending difference per FTE student on public university spending then less populated states. Additionally, the study found citizen ideology has a small decrease in state appropriations.

**CONCLUSION:** This study concludes that a state’s total population is not an important factor when determining state appropriations for public universities

**73. ASSESSMENT OF A NOVEL VEHICLE FOR TRANS BLOOD BRAIN BARRIER ANTIRETROVIRAL DRUG DELIVERY**

**Matthew Pon¹, Anne Marie Backer¹, Andrew Kochvar¹, Subhra Mandal², Christopher Destache², Annemarie Shibata¹, ¹Department of Biology, ²School of Pharmacy and Health Professions, Creighton University**

It is well established that combination antiretroviral therapies (cART) are highly effective in both reducing HIV infections and AIDS-related deaths. Despite this, HIV continues to be one of the most prevalent worldwide viral infections. This is in-part due to known challenges associated with chronic cART. HIV-associated neurocognitive disorder (HAND) continues to be a significant clinical outcome for HIV-infected individuals due to low-levels of viral replication within the CNS. Studies have also shown that up to 6% of
patients experience peripheral neuropathies from chronic exposure to the popular cART drug, dolutegravir (DTG). DTG is an effective integrase inhibitor with markedly low viral mutation rates among patients, though a significant number are eventually forced to discontinue DTG use due drug-induced neuropathies. We are investigating the potential for modified poly(lactic-co-glycolic acid) (PLGA) nanoparticles to be utilized as a trans-blood-brain barrier vehicle for efficient and less cytotoxic DTG delivery. We propose human holo-transferrin-conjugated (hhTf) PLGA-DTG-NP may reduce drug cytotoxicity and have observed NP entry into various CNS cell lines. Cell viability was shown to be increased using NP treatments across multiple cell-lines when compared to DTG solution at the same concentrations. Cell viability in hhTf-DTG-NP treated SHSY5Y neurons was >20% higher than in DTG solution treatments at 24hr and 48hr (p<0.0001) but not at 96hr (p>0.05) between 10, 1, 0.1, 0.01 ug/mL. Between DTG solution and DTG nanoparticle treatments, BV2 microglia showed >50% higher viability at 24hr and 48hr (p<0.0001) at all tested concentrations and by 20% at 96hr below 1ug/ml (p>0.0001). Preliminary ELISA assays showed no significant release of inflammatory cytokines IL-6 and TNF-alpha between DTG conditions in SHSY5Y cells. RTPCR analysis for inflammatory cytokine production in DTG solution and DTG NP treatments are on-going.

**ACKNOWLEDGEMENT:** Funding for this work was provided by a CURAS Faculty Research Fund through Creighton University.

### 74. DEVELOPMENT AND CHARACTERIZATION OF NANOPARTICULATE DELIVERY SYSTEM FOR THE TREATMENT OF CUTANEOUS MELANOMA

**Saina Prabhu, Alekha Dash, Department of Pharmacy Sciences Creighton University School of Pharmacy and Health Professions**

**RATIONALE:** Malignant melanoma is the most aggressive type of skin cancer with limited treatment options once the tumor has metastasized. Nanoparticles serve as an attractive platform for co-administration of drugs as they can protect encapsulated drugs from degradation, enhance their pharmacokinetic profile and therapeutic efficacy, improve cellular uptake and biodistribution to tumor cells, minimize systemic toxicity and enhance accumulation at target site. The premise of this study is to design and characterize an injectable nanoparticulate delivery system for targeted delivery of dacarbazine (DTIC) and resveratrol (RES) for the treatment of cutaneous malignant melanoma.

**METHODS:** A rapid reverse-phase HPLC technique was developed and validated for the simultaneous quantitation of both drugs. An emulsion-solvent evaporation method was used to formulate both drugs (DTIC+RES) into a lipid-based nano-emulsion. The nano-emulsion was further lyophilized to form nanostructured lipid carriers (NLCs). The entrapment efficiency of the formulation was calculated. The formulations were characterized for their thermal and physical stability. *In-vitro* drug release studies were performed using 12-14kDa molecular weight cut-off dialysis membranes. *In-vitro* cell culture-based toxicity studies were carried out for all formulations on B16F10 melanoma and HEKa cells.
**RESULTS:** The (DTIC+RES) NLCs reported an average particle size of 162 ± 3 nm, polydispersity of 0.234 and zeta potential of -33.6 ± 2.2 mV. The % entrapment efficiency of DTIC and RES in the NLCs was 41.610 ± 0.195 and 95.195 ± 0.127 respectively. *In-vitro* drug release studies showed an initial burst release for DTIC and slow release of RES over a period of 16 hours.

**CONCLUSIONS:** The validity of the developed HPLC method was within the USP guidelines. The prepared nanostructured lipid carriers allowed co-delivery of both drugs encapsulated in the lipid matrix. Future studies involve *in-vitro* testing of the formulations for their cellular uptake in metastatic melanoma cells.

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**75. THE EFFECT OF SYNCHRONOUS AND ASYNCHRONOUS MUSIC ON TREADMILL RUNNING PERFORMANCE OF RECREATIONAL ATHLETES**

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**BACKGROUND:** Running with synchronous music tempo is associated with positive physiological and psychological effects that improve running performance as expressed by time to exhaustion. Changes in the music tempo may increase physiological efficiency (slow tempo) or improve motivation and mood (fast tempo), but there is no conclusive evidence whether asynchronous music tempo can influence distance covered or time to exhaustion.

**Purpose:** To investigate the effect of different music tempi on running performance, force and cadence profiles of recreational athletes.

**METHODS:** Six college students (age = 21.2± 3yr; weight = 75.4± 12kg; height = 179.5± 10cm) participated in the study. The participants were tested five times over a period of three weeks. During the first visit, lactate threshold speed (LTS) was assessed via blood samples. During the second visit participants run at 5% above their LTS (3.5±0.4m/s) with no auditory stimuli until exhaustion. During the last three visits participants were randomly assigned to run on an instrumented treadmill in three different tempo conditions until exhaustion: slow, matched and fast. Time to exhaustion, vertical ground reaction forces (vGRF) and cadence were calculated through Matlab.

**RESULTS:** A one-way repeated ANOVA (4 conditions) showed that there was a main effect of music, with the no music condition resulting in a decrease in time to exhaustion by 18-21% when compared to all the music conditions, but no significant differences among the 3 music conditions. The vGRF during running at slow tempo (2.58 BW) were significantly lower when compared to fast tempo (2.62 BW), whereas there was an increase in cadence between slow (167 steps/min) and fast (170 steps/min) tempo conditions.

**CONCLUSION:** The findings indicate that music – in general – has a positive effect on running performance, while asynchronous tempi can only cause significant but subtle changes (less than 2%) in the force and cadence profiles.
76. **Exploration of the Interplay Among Temporal Polyethism, Vitellogenin, and Juvenile Hormone Expression in Apis Mellifera**

Raeef Rahman, Ryan Sabotin, Tammy Tran, Carol Fassbinder-Orth

**Rationale:** Within the last decade, honeybee populations have undergone massive decreases due to Colony collapse disorder (CCD). Though *Varroa destructor* and pesticides have been linked to CCD, the impact of hormonal changes on longevity remains unassessed. Given the previously established roles of vitellogenin (Vg) and juvenile hormone (JH) on behavior and development, the aim of the present study is to assess their age-related changes in honeybees.

**Methods:**
1. Honey Bee Collection- Honey bees from six distinct age classes: larvae, pupae, hatchling, nurse, guard, and forager were collected from Dr. Fassbinder’s farm in Glenwood, Iowa.
2. RNA extraction- RNA was extracted and purified using the Qiagen RNeasy kit.
3. RT-qPCR- Juvenile hormone, vitellogenin, and beta-actin were selected for analysis by RT-qPCR.
4. Data Analysis- Data from RT-qPCR was used to determine average relative expression of JH and Vg and identify differences among age classes.

**Results:** RT-qPCR prime probe variations for vitellogenin, beta actin, and CrPV were successfully standardized in multiplex. Further primer probe variations of juvenile hormone concentration are needed to establish its standard curve in multiplex.

**Conclusion:** The present study explores the influence of viral infection on honeybee longevity and compares it to the age-related variation of juvenile hormone (JH) and vitellogenin (Vg) seen in healthy colonies. Further work should be done to complete the measurement of relative JH and Vg levels in all six age classes, as well as assess expression in CrPV infected bees. Understanding the link between JH and Vg is needed to determine if hormonal changes contribute to CCD.

**Acknowledgement:** Thank you to Bountiful Blossoms Bee Company for the use of their colonies. Further, thanks to Dr. and Mrs. Ferlic for funding this study through the 2019 Summer Undergraduate Research Fellowship.

77. **Crystallization and Structural Studies of PCNA-Cac1 Fusion Complexes**

Rebekah Rapoza, Lynne Dieckman, & Gloria Borgstahl

**Rationale:** Replication-coupled nucleosome assembly is a biochemical pathway that mediates DNA synthesis and storage. The interaction between proliferating cell nuclear antigen (PCNA) and chromatin assembly factor 1 (CAF-1) is crucial to this pathway and mediates normal gene silencing and cell viability. Disruption of this interaction compromises genetic stability and genomic integrity. The only recognized interaction between PCNA and CAF-1 occurs via a PCNA interacting peptide (PIP) motif. Two distinctive PIP motifs have been identified in the human homolog of CAF-1, but only one in yeast CAF-1. My project utilizes X-ray crystallography to solve the three-dimensional
structure of PCNA-Cac1 fusion complexes and determine if yeast CAF-1 interacts with PCNA via two non-redundant PIPs. This will improve our understanding of the connection between DNA replication and gene expression.

**METHODS:** Fusion constructs were designed with a truncated CAF-1 segment containing a single putative PIP fused to the C-terminus of full-length, wildtype PCNA. Following purification by Ni2+, anion exchange, and SEC column chromatography, low polydispersity (<20%) dynamic light scattering (DLS) samples were used to set up crystal trays. Crystallization conditions were optimized, and preliminary X-ray crystallography data collected.

**RESULTS:** Both PCNA-CAF-1 fusion constructs purified well and were monodisperse; however, the conditions, concentrations, and geometric morphologies of crystals varied. Following optimization, crystal formation improved to greater than 75% in some trays. Preliminary diffraction data for the PIP2 construct was collected ~ 8Å.

Conclusion: Further optimization studies and complete X-ray diffraction data collection (≤3Å) is necessary to generate enough quality data for refinement and structure determination. Solving and publishing the three-dimensional structure of the fusion constructs will improve our understanding of the protein-protein interactions and how they function in replication-coupled nucleosome assembly.

**ACKNOWLEDGEMENTS:** This project was supported by the NE-INBRE program and Creighton CURAS. Special thanks to Dr. Lynne Dieckman and Dr. Gloria Borgstahl.

78. **Low Regularity Non-L^2(R^n) Local Solutions to the gMHD-alpha System**

   Lorenzo Riva, Nathan Pennington

**Rationale:** The Magneto-Hydrodynamic (MHD) system of equations governs viscous fluids subject to a magnetic field and is derived via a coupling of the Navier-Stokes equations and Maxwell's equations. It has recently become common to study generalizations of fluids-based differential equations. Here we consider the generalized Magneto-Hydrodynamic alpha (gMHD-α) system, which differs from the original MHD system by the presence of additional non-linear terms (indexed by the choice of α) and replacing the Laplace operators in the equations by more general Fourier multipliers with almost polynomial symbols.

**Methods:** In a paper by Pennington, the author considered the problem with initial data in Sobolev spaces of the form $H^{s,2}(R^n)$ with $n \geq 3$.

**Results (and Conclusion):** Here we consider the problem with initial data in $H^{s,p}(R^n)$ with $n \geq 3$ and $p \geq 2$, with the goal of minimizing the regularity required to obtain unique existence results.
79. Effects of Ambient Temperature on Black Swallowtail Territoriality
Abby Robinson, Biology Department, Creighton University

RATIONALE: Black Swallowtail butterflies (*Papilio polyxenes*) are a prairie habitat specialist species common in Nebraska. Males of this species are well known for exhibiting "hill-topping" territoriality, in which males compete to hold territories in high elevation locations within prairies, to which females move when seeking mates. Previous studies have shown that such mate locating behaviors can be altered by changes in temperature and environmental conditions, which can significantly impact mating success.

METHODS: In the summer of 2019, I observed the hill-topping behavior of male Black Swallowtails at several locations at Glacier Creek Preserve, a restored prairie in Bennington, Nebraska, owned and managed by the University of Nebraska at Omaha. I recorded the number of interactions as well as the durations of male-male interactions and of male perching behavior on the hilltops. Using weather records from weather stations at G. C. P., I looked for effects of temperature, wind speed & direction, and relative humidity on the territorial behavior.

RESULTS: I found significant effects of temperature on number of interactions between males in the territories, with no differences between hilltops. Perching duration between fights was variable; there were no significant effects of temperature, but a non-significant trend for different durations between the different hilltops. Overall, I was able to learn more about average perching and fighting durations in black swallowtails.

CONCLUSIONS: With ongoing climate warming, temperature-dependent effects on behavior may have consequences for habitat specialists such as the Black Swallowtail.

ACKNOWLEDGEMENTS: I would like to thank Dr. Thomas Bragg and The University of Nebraska–Omaha for permission to use Glacier Creek Preserve to conduct this research. I would also like to acknowledge Creighton University’s Departments of Biology and Environmental Science as well as the CURAS Summer Undergraduate Research Fellowship program and the Clare Boothe Luce Scholarship for their support.

80. Flower Isoforms Regulate Keratinocyte Differentiation During Cutaneous Squamous Cell Carcinoma Development
Justin C. Rudd, Rachel Johnson, Kelsey Novak, Matti Holmes, Laura A. Hansen
Creighton University School of Medicine, Department of Biomedical Sciences

RATIONALE: Cutaneous squamous cell carcinoma (cSCC) is the second most common cancer worldwide and there is a need for targeted therapeutic options. In epithelia, cancer cells expressing high levels of cell surface proteins called Flower-Win can eliminate normal neighbors. Here we aim to describe (1) how keratinocyte expression of Flower-Win changes during cSCC progression (2) and the mechanisms by which Flower-win expression confer a competitive advantage to epidermal keratinocytes.
HYPOTHESIS: Transformed keratinocytes increase expression of Flower-win to promote differentiation resistance during the progression to malignancy.

METHODS: **UV Carcinogenesis.** SKH-1 mice (n=4) were UV-irradiated (5x/week for 15-30 weeks) or sham irradiated. Resulting skin lesions were subject to Basescope™ in-situ hybridization using probes specific for mFwe splice variants. One-way ANOVA with post-hoc Tukey’s test was used for statistical analysis of quantified data. **Flower knockdown.** The human cSCC cell line, SCC13, was transfected with DsiRNA targeting Flower-win, Flower-lose transcripts, or scrambled control. RNA and protein were collected 24 or 48h after transfection for RT-qPCR and immunoblotting against differentiation markers. Independent Student’s t-test was used for statistical analysis. **SCC13 Xenograft.** 1x10^6 DsiRNA treated SCC13 cells (described above) were grafted subcutaneously onto immunocompromised mice (n=4). Tumors were measured in-vivo and independent Student’s t-test was used for statistical analysis.

RESULTS: Both Flower-Win expression and the ratio of Flower-win:Flower-lose expression increased significantly during keratinocyte progression to malignancy (p<0.0001 and p<0.0001, respectively). Transient knockdown of Flower-win in SCC13 cells resulted in increased Filaggrin protein as detected by western blot. Additionally, a 1.5-fold increase (p=0.011) in Keratin-10 transcript level was observed by RT-qPCR. Lastly, knockdown of Flower-win in SCC13 prior to xenografting led a significant decrease in tumor volume at days 10 and 12 (p=0.0048, p=0.0014).

CONCLUSIONS: Transformed keratinocytes increase Flower-Win expression during cSCC progression and loss of Flower-Win expression may facilitate terminal differentiation in these cells.

81. SYNTHESIS AND ANALYSIS OF CLOFAZIMINE SALT FORMS FOR ORAL TREATMENT OF MYCOBACTERIUM TUBERCULOSIS
Katherine L. Sandquist, Kinnari S. Arte, Dr. Justin A. Tolman

RATIONALE: Tuberculosis (TB) continues to be one of the world’s deadliest infectious diseases, and there is a growing need for new drug therapy as multidrug-resistant TB strains emerge. Clofazimine (CFZ) has become a drug of interest in the expansion of anti-TB drugs, however, it is highly hydrophobic and poorly water soluble. Additionally, poor pharmacokinetic properties and severe adverse effects limits its clinical utility. Prior research projects focused on the utility of CFZ salt forms as inhalation formulations but, the particle size of the formulations deterred CFZ salt use via inhalation. However, the CFZ salts had increased solubility compared to bulk CFZ, indicating the need for exploration for improved oral formulations. This project focuses on the study of CFZ salt forms for oral use.

METHODS: Eight salts were synthesized and characterized to determine CFZ content, solubility, and permeability. The synthesis techniques mimicked prior studies and utilized a rotor evaporator, and Ultra-Performance Liquid Chromatography (UPLC) was used to determine the drug content and solubility. A parallel artificial membrane permeability assay (PAMPA) was used to study CFZ salt permeability through a synthetic
membrane. The goal is to use the PAMPA data to study CFZ salts on alveolar macrophages to better understand their permeability.

**RESULTS:** CFZ salt forms have improved solubility in comparison to bulk CFZ. This graded increase in the solubility of CFZ should allow us to address the problems associated with the hydrophobic nature of the drug, ultimately widening the scope of its clinical utility. Furthermore, permeability properties of the CFZ salts are expected to be improved, as well.

**CONCLUSION:** CFZ salt forms have demonstrated improved pharmacokinetic properties compared to bulk CFZ. Further exploration of CFZ salt permeability is necessary to fully understand their potential for oral formulation.

### 82. TOPICAL PAPAIN TRANSFEROSOMES FOR THE TREATMENT OF HYPERTROPHIC SCARS

Rachana Sapkota and Alekha K. Dash, Department of pharmacy Sciences, School of Pharmacy and Health Professions, Creighton University

Hypertrophic scars are firm, raised, pathogenic scars that are unappealing and often hinder the movement by interfering with flexion and extension across joints. It is characterized by the abundance deposition of collagen in the dermal layer of the skin. Proteolytic enzymes like papain has been utilized in the treatment of hypertrophic scars. Papain is extracted from Carica Papaya and has a high molecular weight of 23.5 kDa with 212 amino acid residues. This high molecular weight restricts the passage of the molecule through stratum corneum when applied topically. *We hypothesize that transferosomes can effectively encapsulate and deliver papain across the skin overcoming the stratum corneum barrier when applied topically.* Transferosomes were prepared using the thin-film hydration method. The particle size of these vesicles was further controlled using two independent methods that include an Avanti Polar- Lipid extruder and freeze-thawing followed by freeze drying. The freeze-dried particles were characterized for their particle size and zeta potential using Brookhaven particle size analyzer, and Zetameter, respectively. The extruded papain loaded transferosomes had a particle size of 154.43±3.24 nm with a polydispersity of 0.152 and zeta potential of -52.17±9 mv. Freeze thawed transferosomes had a particle size of 313±15.5 nm with a polydispersity of 0.32 and zeta potential of -50.17±5.1 mv. Transferosomes prepared by both methods had particle sizes in nano ranges with negative surface charge. Permeability of these transferosomes through skin will be further evaluated.

### 83. IDENTIFICATION OF BARRIERS FOR TYPE 1 DIABETES MANAGEMENT IN A RURAL SETTING

Sadie Schultes, Vanessa Jewell, PHD, OTR/L; Amy A. Abbot, PHD, RN; Emily Knezevich, PHARMD, CDE

**RATIONALE:** In rural and medically underserved communities, children with type 1 diabetes and their families can struggle to get care matching current diabetes practice guidelines potentially resulting in an increased risk for health complications. Due to a dearth of pediatric endocrinologists in rural Nebraska and Iowa families are forced to travel extensively to receive care increasing the financial impact for
families. Although these factors contribute to challenges for rural families, it is not clear if families living in rural Nebraska and Iowa experience similar or additional challenges in the quality and accessibility of health care, in daily management of the disease, and successful return to families’ previous daily routines. Therefore, the aims of this qualitative study were to identify the specific, unique needs of rural families affected by type 1 diabetes.

**METHODS:** A team comprised of healthcare providers, researchers, and community partners conducted four focus groups (n=23) across Iowa and Nebraska. Informants were aged 8-80, were diagnosed or had a close connection to type 1 diabetes, and lived a minimum of a one-hour commute from a pediatric endocrinologist. Thematic analysis guided the coding process and trustworthiness was established through member checking, researcher triangulation, reflexivity, and an audit trail.

**RESULTS:** Four themes emerged: dramatic family and lifestyle changes after diagnosis, lack of access to specialized care resulted in complications, isolation improves resourcefulness in health management, and technology improves health management and flexibility.

**CONCLUSION:** Findings suggested a need to increase accessibility and training of healthcare providers in remote settings or creative strategies to improve access to care. Stakeholders across Nebraska and Iowa are resourceful and committed to utilizing technology to improve quality of life and health. Finally, improved support after diagnosis may improve the transition to managing a chronic disease.

**ACKNOWLEDGEMENTS:** Benjamin Feiten, Shelby Hoffmann, Elise Boyle, Kameran Ulferts, Laura Eberly, Kim Randez, & Vicki Brown

84. **An Examination of Physical Illness and Health Service Use in Homeless Veterans with PTSD, Major Depressive Disorder, Anxiety Disorder, and/or Bipolar Disorder in Nebraska**

Haley Schuster, Sarah Norbeck, David Driscoll, Sriram Ramaswamy

This study examined physical health problems and health service use among homeless veterans with a reported mental health diagnosis. The current sample included a total of 156 homeless male veterans living in Nebraska. Each participant completed a single structured interview with questions pertaining to sociodemographics, clinical characteristics, and use of health services. The results showed that veterans with mental health diagnoses endorsed several physical health problems not endorsed by veterans without such a diagnosis. Participants with a mental health diagnosis were also more likely to report the use of several health services for treatment of medical, mental health, and substance abuse problems. These findings highlight the association of mental illness with physical health problems among homeless veterans and suggest that further work may be needed to address the unique health care needs of this population.
85. INHIBITOR CHARACTERIZATION FOR A NOVEL LIGASE (FadD32) ESSENTIAL FOR MYCOBACTERIAL CELL WALL BIOSYNTHESIS

Robyn Scott, Lynne Dieckman, PhD, and E. Jeffrey North, PhD

RATIONALE: *Mycobacterium tuberculosis* (M. tb) is the causative agent of tuberculosis (TB), a pulmonary bacterial infection that remains a leading cause of death globally, despite the existence of effective treatments. Though global incidence of TB has steadily declined, the incidence of both multi- and extensively-drug resistant TB is rising, creating an urgent need for the development of new anti-TB antibiotics with novel mechanisms of action. The mycolic acid biosynthetic pathway, responsible for the synthesis of the mycolic acids unique to mycobacteria and essential to mycobacterial pathogenesis and virulence, is a validated target for anti-mycobacterial drugs and provides a wealth of possible protein targets. FadD32 is an essential fatty acyl ligase in the mycolic acid biosynthesis pathway. Its activity and the activity of identified inhibitors remains poorly understood, in part due to its dual ligase and synthetase activity. By isolating each of these activities, the enzyme and inhibitors can be better understood, aiding in the identification and development of novel inhibitors.

METHODS: *M. tb* FadD32 was overexpressed in *E. coli* and purified through affinity and size exclusion chromatography. FadD32’s enzymatic activities will be studied separately using two kinetics assays. For ligase activity, the production of pyrophosphate (PPI) is tracked colorimetrically by hydrolysis of PPI to inorganic phosphate and subsequent chelation with the dye malachite green. For synthetase activity, the production of AMP is quantified through conversion to ATP and detection using a luciferin/luciferase reaction.

RESULTS: *M. tb* FadD32 has been overexpressed and purified from *E. coli* and its ligase activity has been shown to be functional, with kinetic characterization similar to that found in literature.

CONCLUSION: A kinetics assay to screen for and characterize inhibitors of FadD32’s ligase activity has been optimized. Future efforts will focus on screening for inhibitors of the ligase activity and optimizing an assay to isolate the synthetase activity.

86. DISCOVERY OF NOVEL FADD32 INHIBITOR OF MYCOBACTERIUM TUBERCULOSIS WITH IMPROVED DRUG PROPERTIES

Jigar P. Sethiya, E. Jeffrey North Creighton University, Department of Pharmacy Sciences, School of Pharmacy and Health Professions

BACKGROUND: Tuberculosis (TB) is an infectious disease caused by *Mycobacterium tuberculosis*. In 2018, the World Health Organization (WHO) reported 1.5 million deaths worldwide from the TB epidemic. The current short-course treatment includes a 6-month treatment with a multi-drug regimen. In addition, the increasing rates of multidrug-resistant (MDR) and extensively drug-resistant (XDR) strains remains a major public threat. Mycolic acids, an outer layer of the mycobacterial cell wall, are the long chain fatty acids which are responsible for cell wall integrity, permeability, and virulence. FadD32 is
an essential fatty acyl-AMP ligase involved in the mycolic acid biosynthesis and a new and interesting target for drug discovery efforts.

**RATIONALE:** FadD32 activates and transfers the meromycolyl chain to Pks13, a condensing enzyme. Inhibition of FadD32 will halt the mycolic acid biosynthesis, thereby, cell growth is inhibited. Recently identified coumarin derivatives are potent FadD32 inhibitors. However, they show a poor metabolic profile, with a half-life of ~8.63 minutes. Here, we have optimized the coumarin derivatives using the medicinal chemistry principles to increase the metabolic stability.

**METHODS:** Synthesis of the coumarin derivatives involves a four-step reaction sequence including a Steglich esterification, Sonogashira, and Suzuki-Miyaura coupling.

**RESULTS:** Products were isolated in good yields. All the compounds were characterized by the $^1$H NMR, $^{13}$C NMR, and mass spectroscopy. Purity was assessed by melting point determination.

**CONCLUSION:** We have successfully synthesized the compound with putative antimycobacterial activity. Our future studies include compound evaluation to determine whole cell *M. tb* growth inhibition, metabolic stability in the presence of human S9 fraction and further pharmacokinetic/physicochemical parameters.

87. EVALUATION OF FUNCTIONAL OUTCOMES IN CHILDREN TREATED FOR IDIOPATHIC CLUBFOOT AND COMPARISON TO TYPICALLY DEVELOPING CHILDREN USING PEDOBAROGRAPHY.

Kiarash Shams

Idiopathic clubfoot (ICF) is the most common birth defect of the lower extremity, affecting approximately 1 to 4 of every 1,000 live births. ICF is characterized by midfoot cavus, forefoot adductus, and hindfoot equinovarus. The current gold standard for treatment of ICF is the Ponseti method, a non-surgical treatment that employs a series of casts (typically 4-6) that guide the growth of the foot and correct clubfoot deformity over time. Ponseti casting has yielded very good results to date, but the outcomes are dependent on the clinician’s technique and skill level. The goal of this project is to evaluate the functional outcomes of children who received the Ponseti treatment at Phoenix Children’s Hospital (PCH) between 2008 and 2018. Our study examined 8 ICF subjects who received the Ponseti treatment and satisfied the following inclusion criteria: (1) between 3-18 years of age, (2) a minimum of 3 casts used in treatment, and (3) treatment received at PCH facilities. Exclusion criteria included subjects with neurogenic or genetic abnormalities associated with clubfoot (e.g. arthrogryposis, 22q11 deletion syndrome, constriction ring syndrome, etc). 12 Typically Developing (TD) subjects between 3-18 years of age were recruited for comparison to the ICF subject pool. All subjects were required to walk on a pedobarograph in the Motion Analysis Lab (MAL) at PCH.

The pedobarograph model used was the Tekscan Standard Resolution (SRSWS) Strideway system. We investigated two parameters: Maximum Force Differential (MFD, in Newtons) and Maximum Peak Pressure Differential (MPPD, in kPa) profiles generated from foot-to-ground contact. Our study found no statistical significance of the MFD generated between ICF and TD subjects ($2.2 \pm 6.7$ N, $p = 0.248$). Furthermore, the
MPPD generated from foot to ground contact was not statistically significant (-20.9 kPa ± 41.0 kPa, p = 0.0797); however, the MPPD distribution generated for ICF subjects was markedly different from TD subjects. This suggests that patients with ICF treated with the Ponseti method are capable of producing a ground reaction force (i.e., propulsive force) similar to the TD group, but possibly with less force distribution in a given area of contact (i.e., abnormal pressure profile, particularly at the lateral aspect of the plantar region). Furthermore, the altered MPPD distribution also raises the possibility that a significant difference might be observed with a larger subject pool. Future research should explore detailed areas of the foot (e.g. 7 segmental foot model) to provide a more detailed picture of the foot pressure profile differences between ICF and TD subjects. Furthermore, this study was able to demonstrate the utility of the pedobarograph as a potential 

**ACKNOWLEDGEMENTS:** Summer Research Program 2019, Phoenix Children’s Hospital, Orthopedic Surgery, Investigators - Dr. Mohan Belthur, Dr. Hadi Salehi, Dr. Emily Andrisevic, Kaye Sjoholm

**88. IMPROVING ACCESS, REDUCING NO SHOW FOLLOW UP RATES, AND IMPROVING OUTCOMES FOR PATIENTS ACCESSING EMERGENCY AND HOSPITAL CARE AT A UNIVERSITY CAMPUS FAMILY MEDICINE CLINIC.**

Strawmier, Thomas

**PROBLEM:** Patients without a primary care provider have poor health outcomes. Unattended follow up appointments after an emergency room visit or hospitalization have multiple effects on provider metrics, clinic productivity, access to care, and patient health.

**METHODS:** Patients receiving care in an academic health care emergency room or hospital, without a primary care provider (PCP) were given information for follow up: “the card” with provider picture, and office location. Providers partnered with inpatient nursing staff, RN supervisors, and social work to encourage follow up. Patients were offered the ability to be seen “on demand” in the clinic setting with PCP.

**Results:** Prior to intervention 64 patients were assigned 27 did not attend resulting in 42% rate. Data was collected over three months from November 2018 - January 2019. Post intervention 108 patients were assigned 55 did not attend resulting in 50.9% no show rate. Data was collected November 2019 - January 2020.

**DISCUSSION:** Results from this evaluation are less then desirable but the lessons learned are of value. First, the complexity of current health system presents many challenges for patients without a primary care provider. Current system factors affecting this project included: providers leaving practice, academic resident schedules limiting follow up with PCP, unexpected responsibilities for all student health services for a major university, and ever changing demands on primary care from the Center for Medicare and Medicaid services (CMMS) requirements for follow up for a Primary Care Medical Home (PCMH). Patient challenges included: transportation, financial constraints, and prioritization of follow up. Continued focus on providing care for this group of patients
without PCP care is needed to improve access, provide primary care, reduce the no show rate, and improve outcomes for patients. Further strategies need to be explored including; communication plan between inpatient/emergency room services with outpatient care team, removing barriers at clinic site for patients, and building relationships between patients and providers.

**Key Words:** Primary care provider, Follow-up, no show rates

89. **CCR5 Targeted Tenofovir Alafenamide and Dolutegravir Loaded Nanoparticle: Dual Protection for Human Immunodeficiency Virus (HIV) Functional Cure**

Shawnalyn Sunagawa, Subhra Mandal, PhD, Pavan Prathipati, PhD, Chris Destache, PharmD

**Rationale:** The project’s purpose is to design and evaluate *in vitro*, a novel targeted nano-formulation combining a HIV-prone cell targeting antibody (CCR5) and antiretroviral (ARV) drugs to prolong protection. The rational is to introduce a dual-protection strategy that promotes “functional cure” probability in HIV+ patients.

**Methods:** CCR5 targeted tenofovir alafenamide and dolutegravir (TAF+DTG) loaded nanoparticles (NPs) were synthesized. The encapsulation efficiency (%EE) of the TAF+DTG NP was evaluated by HPLC analysis. The comparative specific binding affinity of XFCCR5-TAF+DTG NP to CCR5+ CD4+ TZM-bl cell line was evaluated by flow cytometry. The HIV protection group were treated and infected with M5 tropic HIV viruses to determine IC50 results. Immunophenotype study was analyzed by flow cytometry. All experiments were performed on three independent donors at three different time and analyzed by GraphPad Prism 8 software.

**Results:** XFCCR5-TAF+DTG NPs obtained were uniformly sized with XFCCR5 mAb bound to TAF+DTG NP. The % entrapment efficiency of DTG and TAF was 35.3 ± 2.9% and 41.7 ± 2.5%, respectively. The specific binding affinity (Km) of XFCCR5-TAF+DTG NP with TZM-bl cells were estimated to be ~100 times higher compared to wild-type anti-CCR5 mAb. Intracellular DTG concentration maximum (Cmax) with NP averaged 100 times higher concentrations compared to naïve solution. DTG elimination t1/2 was 86.16 h with NP and 17.95 h with solution. The 4-day HIV protection results demonstrated significantly lower IC50 (XFCCR5-TAF+DTG NP 0.0352 ± 0.0086 nM and XFCCR5 NP 0.547 ± 0.01 nM) compared to 18.53 ± 2.85 nM for XFCCR5 mAb (p<0.05). XFCCR5 treatment follows reported immunophenotype trend for PrEP and treatment patients.

**Conclusion:** The results support treatment of HIV at *in vitro* level with dual ARV NPs linked to a mAb. Presumably, this novel technique could be a supportive immune-alternative to achieve ‘functional-cure’ against HIV-infection.

**Acknowledgement:** This project was funded by LB692 grant.
90. ACL RECONSTRUCTED INDIVIDUALS ARE NOT REACHING NORMATIVE BENCHMARKS FOR RETURN TO ACTIVITY

Paige Swanson, Brooke E. Farmer, & Terry L. Grindstaff

PURPOSE: Following anterior cruciate ligament reconstruction (ACL-R) decisions regarding rehabilitation progression and return to sport are informed by objective tests and measures including strength, jumping, and self-reported outcome measures. There is a wide range of variation within physical therapy practice and patient outcomes are influenced by rehabilitation approaches. The purpose of this study was to determine if individuals following ACL-R, from a single outpatient physical therapy clinic, were reaching normative benchmarks throughout the rehabilitation process.

METHODS: Forty individuals (female=23, male=17, age=20.6±7.0 years, mass=71.8±13.0 kg, height=172.3±8.0 cm, preinjury Tegner=8.2±1.2, graft type: hamstring=27, quadriceps=8, other=5) participated in this cross-sectional study. Outcome measures included quadriceps strength, jumping tasks (unilateral countermovement [CMJ], single leg forward hop [SLFH]), and patient-reported outcome measures (IKDC, KOOS, ACL-RSI). Averages, standard deviations, LSI (LSI=uninvolved/involved), and frequency counts were calculated for descriptive purposes. Existing clinical practice guidelines and treatment protocols provided benchmarks. Early (2-4 months), mid (5-6 months), and late (7+) time points were chosen for analysis. Early expected benchmarks include quadriceps peak torque >80%, hop tests >85%, and KOOS Sport >70%. After 5 months, >90% should be achieved across all measures.

RESULTS: Average scores at 2-4 months: KOOS Sports=68.2% (60.9% reported >70%), peak torque=74.8% (39.1% achieved >80%), CMJ=85.2% (66.7% achieved >85%), and SLFH=96.8% (100% achieved >85%). At 5-6 months post-op: KOOS Sports=84.8% (45.5% reported >90%), peak torque=81.5% (27.3% achieved >90%), UCMJ=91.4% (50% achieved >90%), and SLFH=92.6% (66.7% achieved >90%). At 7+ months post-op: KOOS Sports=91.8% (76.7% reported >90%), peak torque=85.9% (43.3% achieved >90%), UCMJ=92.4% (53.3% achieved >90%), and SLFH=96.7% (86.7% achieved >90%).

CONCLUSION: Participants who meet quadriceps peak torque, hop tests, and KOOS Sport benchmarks have a lower risk for reinjury than those who do not. The participants in this clinic are not reaching normative benchmarks which places them at greater risk for reinjury and prolonged dysfunction.

91. 1,2,3-TRIAZOLE-CONTAINING PHENANTHRIDINES: SYNTHESIS AND ANTIMICROBIAL EVALUATION

Lindsey R. Theut and James T. Fletcher, Department of Chemistry, Creighton University

RATIONALE: 1,3,4-Trisubstituted-1,2,3-triazolium salts have been shown to possess antibacterial and antifungal properties, though these properties vary depending on the substituents utilized. This project’s aim was to investigate whether ring-fused analogs of 1,2,3-triazolium salts representing the 1,2,3-triazole-containing phenanthridine ring system also display such biological activity. This included a comparison of fused and non-fused analogs as well a brief survey of substituent effects.
METHODS: 1,5-Disubstituted-1,2,3-triazoles were prepared from a base-catalyzed click reaction between terminal alkyne and aryl azide reactants. The ring-fused 1,2,3-triazole-containing phenanthridine analogs were prepared by an intramolecular Pd-catalyzed cross-coupling “fusion” reaction of 2-bromoaryl-substituted triazole precursors. Triazolium salts were prepared by N3 benzylation of each analog, resulting in a total of 16 different compounds in this study. Analysis of antimicrobial properties was conducted via minimum inhibitory concentration (MIC) assays. This analysis included both Gram-positive and Gram-negative bacteria as well as yeast in order to complete a thorough investigation of the antibacterial potential.

RESULTS: Within this series of 16 triazolium salts, the MIC activity indicated a maximum potency of 0.4 micromolar for Gram-positive bacteria, 16 micromolar for Gram-negative bacteria, and 31 micromolar for yeast. Fused-ring phenanthridine analogs generally showed increased MIC potency relative to their non-fused triazolium salt counterparts.

CONCLUSION: When comparing substituent effects, 4-tert-butylbenzyl substituents at the N3 position displayed the highest potency, as did the incorporation of chlorine groups on the arene subunits.

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92. LIMB PREFERENCE DOES NOT INFLUENCE LOADING BEHAVIORS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION
Benjamin Thompson, Brooke Farmer, Dimitrios Katsavelis, Kimberly A. Turman, Terry L. Grindstaff

PURPOSE: Injury to the non-preferred jumping limb is known to negatively impact strength and hop test outcomes following anterior cruciate ligament (ACL) reconstruction, but the influence of limb preference on joint loading is not known. The purpose of this study was to determine the influence of limb preference on jump landing loading behaviors in late-stage ACL rehabilitation.

METHODS: Thirty-three individuals (age= 18.7 ± 5.0 years, mass= 69.8 ± 11.0 kg, height= 172.5 ± 7.5 cm, time since surgery= 8.4 ± 2.5 months, IKDC= 85.9 ± 9.0%) participated in this study. Participants performed a drop jump landing to quantify lower extremity loading behaviors for each limb. Participants were placed into one of two groups based on if their preferred jumping limb was their injured limb (14 injured preferred jumping limb, 19 injured non-preferred). Peak vertical ground reaction forces (N/kg) were calculated for each limb and a limb symmetry index (LSI=involved/uninvolved) was calculated to quantify the magnitude of asymmetry between limbs. An independent samples T-test was used to determine differences between groups.

RESULTS: Peak vertical ground reaction force LSI values for both groups were above 90% (Non-dominant force LSI = 91.8%, Dominant Force LSI = 92.1%) and there were no significant differences between the groups (p=0.98).
**CONCLUSION:** Limb preference had no significant influence on loading behaviors following ACL reconstruction. A limitation of this study was that we only examined total forces across the lower extremity. Future studies should determine if joint specific loading (e.g. hip, knee, and ankle) after ACL reconstruction is influenced by limb preference.

**CLINICAL RELEVANCE:** All patients, regardless of injured limb, should continue to develop symmetrical jumping and landing strategies to optimize joint health and minimize future injury risk.

**93. MANNA FROM HEAVEN: INVESTIGATING THE GIFT OF RESOURCES FROM BUSINESS ANGELS**  
Dawn Marie Tolonen

**RATIONALE:** Entrepreneurs and small businesses drive the United States economy and capital investors drive the growth and success of these ventures by providing valuable financial and non-financial resources. The body of research on business angels provides evidence of the importance of their financial contributions and non-financial contributions in connection with monetary investments; however, no research exists on business angels’ propensity to provide non-financial resources absent the financial investment.

**METHODS:** I develop a moderated mediation model grounded in signaling theory and social exchange theory to investigate this potentially unrecognized entrepreneurial ecosystem benefit. Additional consideration is given to gender homophily in the investment process as female entrepreneurs and female business angels are steadily increasing and affecting the U.S. business landscape. Research on business angels has been more qualitative than quantitative, and scholars have noted the paucity of experimental methods in entrepreneurship research. Heeding the call for more experimental research in entrepreneurship, my study utilizes a 2x2 factorial design experiment to evaluate the propensity of angels to provide non-financial resources absent the initial financial investment.

**RESULTS:** The study is still in progress with completion anticipated in the summer of 2020.

Keywords: business angels, female entrepreneurs, non-financial resources, entrepreneur passion; entrepreneur coachability, activist choice homophily.

**ACKNOWLEDGEMENT:** I would like to acknowledge Dr. Zachary Russell (Xavier University) and Dr. Regina Taylor (Creighton University) for their invaluable assistance and wisdom.
94. A NEW METHOD TO ASSESS EFFECTIVENESS OF HIPPOTERAPY IN CHILDREN WITH AUTISM SPECTRUM DISORDER

Emma Travis¹, Claire Merriman², Martyna Adamiec¹, Connor Frerichs², Cindy Menk², Tess Hofstra³, Kirk Peck², Edye Godden³, Katherine Smith³, Dimitrios Katsavelis¹, Anastasia Kyvelidou² ¹Creighton University, Department of Exercise Science and Pre-Health Professions, ²Creighton University, Department of Physical Therapy, ³Heartland Equine Therapeutic Riding Academy

INTRODUCTION: The incidence of autism spectrum disorders (ASD) has increased dramatically in the last decade. One treatment option for children with ASD is hippotherapy (HPOT), which is speech, occupational or physical therapy while being on a horse. Even though there are multiple studies showing positive effect of HPOT in children with ASD, there is limited evidence on the underlying mechanisms of why HPOT is successful for children with ASD. This pilot project aims to propose a new way to assess effectiveness of HPOT through the coupling of physiological responses between horse and rider.

METHODS: Two female typically developing participants, 5 and 9 years old, participated in the study. To assess movement coupling between the horse and rider, four tri-axial inertial sensors were placed at the rider’s pelvis and sternum, as well as the back and head of the horse. We used Cross Approximate Entropy (CAE) to calculate the synchronization of movement between the rider and the horse. CAE quantifies the regularity of patterns in a pair of related time series and is indicative of the dimensionality of control of the two signals. Larger CAE values indicate greater joint signal asynchrony, while lower CAE values indicate greater joint signal synchrony.

RESULTS: The younger participant demonstrated greater movement synchrony with the horse’s movement when compared to the older. Overall, the movement of the younger participant’s lumbar and sternum was more synchronized than the older child’s (0.89 vs 0.928).

CONCLUSIONS: The younger participant was more rigid in her movements as observed visually, possibly indicating a freezing of degrees of freedom and thus moving body segments in synchrony. In contrast, the older participant was more relaxed, possibly leading to greater values of CAE. This pilot data demonstrates the feasibility of this protocol and its potential to assess effectiveness of HPOT.

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95. DACARBABINE POLYPHENOL POLYMERIC NANOCARRIERS FOR TRANSDERMAL DELIVERY IN MELANOMA

Namratha Turuvekere Vittala Murthy, Gayathri Heenatigala Palliyage, Harsh Chauhan

PURPOSE: Dacarbazine (DAC) is a first-line agent for melanoma chemotherapy. Polyphenols like quercetin (Qct), resveratrol (Res) and curcumin (Cur) have been reported to exhibit anti-melanoma activity. The purpose of this study is to determine synergistic potential of DAC with polyphenols and design nanoparticle formulation for their effective delivery.
**METHODS:** Cell confluence studies of pure DAC and in combination with the selected polyphenols were carried out to evaluate the synergistic potential to reduce the dose of Dacarbazine. PLGA based nanoparticles (NP’s) loaded with Dacarbazine and polyphenols were prepared using double emulsion solvent evaporation method Polyvinyl alcohol (PVA) as a stabilizing polymer. Particle size and zeta potential of prepared NP’s are carried out before and after lyophilization. Physical characterization of lyophilized NP’s are carried out using XRD and TGA analysis.

![Cell confluence study](image)

Figure 1: Cell confluence study at 90h. The combinations of Dacarbazine with polyphenols showed significant difference from the vehicle (p<0.001). Dacarbazine only treatment was also found to have significant difference from the vehicle (p<0.01)

**RESULTS AND DISCUSSION:** Cell confluence studies using SKEML-28 cell line for DAC monotherapy showed an IC50 value of 430.54 µg/mL and in combination with quercetin, resveratrol and curcumin the IC50 value decreased to 14.0 µg/mL, 10.40 µg/mL and 37.83 µg/mL respectively indicating the enhanced anti-melanoma effect of DAC when in combination with polyphenols, confirming the effectiveness of combination. Dac+Qct, Dac+Res and Dac+Cur NP’s were of the sizes 288.7±3.4nm, 222.0±3.3nm and 233.9±11.7nm with negative zeta potential values. TGA results of lyophilized NP’s showed rapid degradation of DAC and absence of sharp diffraction peaks in XRD confirmed the presence of DAC and polyphenols in an amorphous form.

**CONCLUSION:** Combination of DAC with polyphenols was found to be effective against SKEML-28 cell line. and prepared NP’s using biodegradable PLGA based system have significant potential for the prevention and treatment of melanoma.
96. **Isolating Fluorescent Carbon Dots from Concentrated Glucose Solutions**

Harsh Uppala, Eric Marsh, Max Markuson-DiPrince, John Vosicky, Joel Destino Ph.D, Andrew Baruth Ph.D, and David Sidebottom, Ph.D

**Rationale:** Carbon nanodots are a class of zero-dimensional carbon-based nanoparticles that have been used increasingly in the fields of bioimaging, drug delivery, and opttronics. Despite their popularity, carbon nanodots remain difficult to isolate when synthesized by a bottom-up approach, especially through the thermal treatment of carbohydrate solutions due to the presence of many molecular by-products as a result of the Maillard reaction. We aim to develop a methodology to further isolate carbon dots and build upon existing processes.

**Methods:** We investigated multiple possible methods of purification of heated glucose solutions to isolate carbon dots. Glucose solutions were heated at 120 °C for a period of 48 hours to produce carbon nanodots, dialyzed in 500 Da dialysis tubing, and isolated using an octadecyl-functionalized solid phase extraction column.

**Results:** CNMR and HNMR data showed the elimination of several spectral lines after solid phase extraction, indicating the removal of multiple carbon and hydrogen species, while absorption and fluorescence spectroscopy showed the elimination of some fluorescence peaks. Meanwhile, size characterization through photon correlation spectroscopy indicated the growth of the carbon particles from 48 nm to 230 nm, likely due to aggregation while in the column, a matter that requires further research to explain fully.

**Conclusion:** We found that dialysis combined with solid phase extraction preserved the photoluminescent properties of dissolved carbon nanodots, while eliminating measurable traces of other chemical byproducts. This is promising as another step in the purification of carbon dots.

**Acknowledgement:** This work was supported through the Dr. and Mrs. Randolph Ferlic Summer Undergraduate Research Fellowship and the Center for Undergraduate Research and Scholarship.

97. **Sensory Integration and Postural Control in Childhood**

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**Introduction:** The Clinical Test of Sensory Interaction for Balance (CTSIB) is a simple and effective test in adults to identify and assess deficiencies in sensory integration. The test challenges each primary sensory system (somatosensory, visual, and vestibular) to identify which sensory inputs the body relies on to maintain balance. Currently, there is limited information regarding how the CTSIB in combination with force platform technology can help us identify how sensory motor integration develops in children. The
purpose of this study was to capture sensory organization age differences in typically developing children between 4 and 16 years of age.

METHODS: Three groups of children with typical development participated in the study. Six children in the 4-6-year-old group, 5 children in the 7-10-year-old group and 4 children in the 11-16-year-old group participated in the study. We collected center of pressure (COP) data while children stood on the force platform and performed six different sensory conditions. The conditions involved closing their eyes, standing on a foam pad and wear a visual dome that restricted their vision. Dependent variables were range and root mean square (RMS) in the anteroposterior (AP) and mediolateral (ML) directions as well as sway path, median frequency and sample entropy (SampEn) in the AP and ML directions.

RESULTS: Overall, the values of the linear measures of COP revealed a decreasing trend from the youngest to oldest children. In contrast SampEn was the highest in the group of 7-10 years old, while the other two groups showed lower and similar values of SampEn.

DISCUSSION: Sensory organization differences are evident among children of different ages and should be taken into consideration for better learning outcomes. In the future we would like to investigate whether the experimental protocol presented here is able to capture sensory organization differences between typically developing children and children diagnosed with autism spectrum disorder.

98. INTERPLAY BETWEEN CHROMOSOMAL SHV-1 AND PLASMID-ENCODED β-LACTAMASES IN CETTOLOZANE/TAZOBACTAM RESISTANT KLEBSIELLA PNEUMONIAE
Alyssa K. Whitney and Nancy D. Hanson
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RATIONALE: Studies of resistance to ceftolozane/tazobactam (C/T) in extended spectrum β-lactamase (ESBL) producing clinical isolates of E. coli and K. pneumoniae have shown increased incidence of resistance among K. pneumoniae isolates, despite similar ESBL carriage. K. pneumoniae also carries the broad spectrum β-lactamase SHV-1 on the chromosome. Combined overproduction of SHV-1 and high-level expression of a plasmid-encoded β-lactamase (pβlase) may be sufficient to confer resistance in K. pneumoniae. The purpose of this study was to determine the level of expression of both pβlases and SHV-1 in K. pneumoniae, related to C/T susceptibility.

METHODS: 13 clinical isolates were assessed for the pβlases DHA, CMY-2, CTX-M-14, and CTX-M-15 genes using the Streck ARM-D® ampC ID and ARM-D® β-lactamase ID kits. C/T MICs were determined by agar MIC and E-test, according to CLSI guidelines. mRNA expression of the chromosomal SHV-1 and pβlases was determined by qRT-PCR. Susceptible isolates producing the same enzymes were used as comparators.

RESULTS: Isolates fell into 4 categories. 2 isolates produced no pβlase but had a 5-25 – fold increase in SHV-1 expression and were susceptible to C/T. 5 susceptible isolates produced pβlase with increased levels from 1-10 – fold and decreased SHV-1 expression
8-2 – fold. 1 isolate was intermediate to C/T with no change in SHV-1 expression and 16 – fold increased CTX-M-14 expression. The remaining 5 resistant isolates produced pβlase increased from 2-95 – fold and SHV-1 elevated 2-21 – fold.

**Conclusions:** Resistance to C/T was only detected in isolates with both elevated SHV-1 and pβlase, regardless of the type of pβlase. Overexpression of SHV-1 without the presence of pβlase or increased expression of pβlase without SHV-1 elevation were not sufficient to generate C/T resistance. Therefore, this study highlights the importance of both plasmid-encoded and chromosomal β-lactamases in C/T resistance.

**Acknowledgments:** Thanks to Merck, Inc. for funding this project.

99. Reproductive Ecology of Water-Pollinated *Stuckenia Pectinata*

Adam D. Wilson, Monroe Pruett, Neha Lamsal, Mackenzie L. Taylor

**Rationale:** *Stuckenia pectinata* is a submerged aquatic monocot and one of relatively few species to exhibit hydrophily, or water pollination. In hydrophilous plants, pollen is released from anthers and transported to receptive stigmas, either at the water surface or underwater. Water pollination is associated with certain pollen and flower traits and has consequences for reproductive ecology and development. However, little is known about these characteristics in *S. pectinata*. The goal of this study was to characterize the process of pollen reception and stigma receptivity in *S. pectinata*.

**Methods:** *S. pectinata* inflorescences were collected and categorized into developmental stages based on inflorescence morphology. Carpels were stained with aniline blue and observed with light microscopy. The number of pollen grains at each stage was determined in order to characterize the timing of pollen reception and stigma receptivity, as well as pollen load. Pollen to ovule ratio was also determined.

**Results:** Stigmas are first receptive in developmental stage 3, but pollen loads were small. Pollen loads peaked in stage five inflorescences, with an average of 10.7 pollen grains per carpel. Pollen germination was highest in stage 5, with an average of 91.2% of pollen grains germinated per carpel.

**Conclusion:** Results from *S. pectinata* will be compared with those from other water-pollinated species in order to better understand the reproductive ecology of water-pollinated plants. Further research into other hydrophilous plants will be conducted.

**Acknowledgement:** Funding for this project was provided by the Biology Department, CURAS, Randolph M. and Theresa Kolars Ferlic, and the Clare Boothe Luce Program for Women in Science. We also thank Jim Portis and Robert Kaul. We would also like to thank Emma Baker, Sabrina DuMond, Luke Klahs, and Karis Choy for their assistance with this project.
100. **The Characterization of Carnitine Palmitoyltransferase II Deficiency in Development of Zebrafish**

Delaney Wilton¹, Andrew Kochvar, Aaron Marta, Carly Baker, Rochelle Wickramasekara², Holly Stessman², and Annemarie Shibata¹, ¹Department of Biology, ²Department of Pharmacology and Neuroscience, Creighton University

**Rationale:** Carnitine palmitoyltransferase 2 (CPT2) protein is involved in the process of beta oxidation of long chain fatty acids. Research suggests that astrocytes, the glial cells of the brain, rely on beta oxidation to support neural growth during development and for synaptic function in adulthood. Deficiencies in CPT2 protein expression is associated with a plethora of severe medical symptoms such as respiratory and liver failure, seizures, hypoglycemia, and potentially schizophrenia. The relationship between CPT2 dysfunction and neurodevelopmental and neurological disorders establishes a clear need to better understand the role of CPT2 and lipid metabolism in the brain. Our central hypothesis is that transesterification of palmitoylcarnitine to palmitoyl-CoA by CPT2 is necessary for proper neural developmental and synaptic function and that disruption of CPT2 function leads to abnormal nervous system cell differentiation, migration, synapse formation and synaptic function.

**Methods:** In collaboration with clinicians we are studying the genotypic and phenotypic profile of a male proband with confirmed CPT2 deficiency as compared to his heterozygous parents and unaffected fraternal twin. In our research, we are also developing a zebrafish model system to investigate the mechanisms by which CPT2 mutation affects overall brain development and synaptic communication. Using a splice blocking morpholino construct, we have confirmed Cpt2 gene knockdown using PCR, and are currently in the process of confirming knockdown using Western Blotting for a translation blocking morpholino construct. Results: We have characterized the phenotype of CPT2 deficient zebrafish. Significant differences in body length, tail length, tail curve, head shape, pigmentation, cartilage formation, blood vasculature, and swim bladder morphology are present in mutant fish compared to control morpholino and wild type fish. Oil red immunohistochemistry and lipid analyses using LC-MS/MS demonstrate significant differences in total acylcarnitine levels in mutant fish compared to control and wild type fish. Future aims are to perform morpholino CPT2 rescue experiments and to assess brain development both globally and regionally. Functional analyses will include electrophysiological and behavioral assessment of mutant and control zebrafish. Conclusion: Structural and functional abnormalities may contribute to the development of seizure and neural network deficiencies potentially underlying attention deficit disorders and schizophrenia. Results from these experiments will provide insight into how genetic deficiency in CPT2 and long chain fatty acid metabolic signaling influences brain development and function.

**Acknowledgments:** Funding was internally provided by the Health Science Strategic Investment Fund of Creighton University. Thank you to all authors that have contributed to this work. Thank you especially to Annemarie Shibata who has
contributed so much to my development over the past few years – my college experience would not have been the same without her.

101. Community Survey of Anolis and Phelsuma Populations on Oahu

Kyle Wong and Amber Wright

**Rationale:** Since the introduction of the Green Anole (Anolis carolinensis) in the 1950’s, along with the Brown Anole (Anolis sagrei) and Day-Gecko (Phelsuma laticauda) that were introduced to the Windward side of O'ahu in the 1980’s, there have been no formal island wide studies conducted on these introduced lizard populations.

**Methods:** Conducted a 2km transect in each residential zip code on the island and recorded the species type, sex, distance from transect, perch type, and height above ground for each lizard observed.

**Results and Conclusions:** Through these transects, we found that Brown Anoles were the most abundant and widely distributed specie found across O'ahu. We also found that Green Anoles are primarily isolated to the western and northern sides of the island, the areas where these three species have spent the least amount of time as they were originally introduced on the windward.

**Acknowledgement:** Amber Wright
1. **DEPRESSION, ANXIETY, AND MORAL INJURY IN BISEXUAL AND HETEROSEXUAL WOMEN**

Amy S. Badura-Brack¹ Lauren Merfeld¹², Mackenzie S. Mills¹, Abigail B. Brack³, Jill Brown¹, Creighton University Department of Psychological Science¹, Loyola University Chicago Department of Psychology², Skutt Catholic High School³

**RATIONALE:** Empirical evidence suggests more psychological symptoms among people who identify as bisexual compared heterosexual; however, the topic is understudied. We hypothesized that we would find higher levels of depression, anxiety and moral injury in bisexual as compared to heterosexual women.

**METHODS:** 195 heterosexual and 35 bisexual women completed online questionnaires via Qualtrics. Participants completed a demographic questionnaire, the Patient Health Questionnaire-9 to measure depression, the Overall Anxiety Severity & Impairment Scale to measure anxiety, and the Moral Injury Symptom Scale-Civilian Version to assess betrayal, guilt, shame, loss of religious faith/hope, loss of trust, and loss of meaning.

**RESULTS:** We conducted a MANCOVA with depression, anxiety, and moral injury as dependent variables, age as a covariate, and sexual orientation (heterosexual/bisexual) as the independent variable. Age was a significant covariate (Wilks’ Lambda=.82, $F_{3,225}=16.03, p<.001$). Sexual orientation had a significant main effect (Wilk’s Lambda=.88, $F_{3,225}=10.63, p<.001$). Between-subjects effects were significant for depression ($F_{1,227}=16.35, p<.001$), moral injury ($F_{1,227}=11.35, p=.001$), and marginally significant for anxiety ($F_{1,227}=3.49, p=.06$) with higher scores for bisexual women. Another MANCOVA with the moral injury subscales as dependent variables found significant between-subjects with higher scores for bisexual than heterosexual women for betrayal, shame, and self-condemnation. Finally, a step-wise regression revealed that depression was best predicted by anxiety, sexual orientation, loss of faith/hope, betrayal, age, and loss of trust ($R^2=.65, p<.001$).

**CONCLUSION:** Bisexual women report higher levels of depression, moral injury and somewhat higher levels of anxiety than their heterosexual peers. Higher moral injury scores for betrayal, shame, and self-condemnation are consistent with struggles in both other and self-acceptance faced by bisexual women. Results call for social and psychological action because bisexual women are at risk for depression resultant from self and other alienation and betrayal.

**ACKNOWLEDGEMENT:** Funding from CURAS and At Ease USA

2. **INTERDISCIPLINARY LEADERSHIP OBSERVED: A HEALTH AND CARE LEADERSHIP DYAD STORY**

Candace Bloomquist & Ellie Heitzig

**RATIONALE:** As health inequities continue to rise globally, the collaboration between organizations providing health and care services needs to be interdisciplinary and aligned with a commitment to implement leadership practices that bridge the divide and balance power between previously separate functions. The need to reduce
inequities, increase prevention activities, foster public participation, strengthen community health services, and coordinate healthy public policy have propelled health and care organizations to begin using novel leadership practices, such as interdisciplinary leadership.

**METHOD:** With a focus on the dynamic between a health and care leadership dyad, this qualitative ethnomethodological study focused on the details of the dyads’ practices that make up this unique leadership practice. Individual interviews with the medical health officer and health promotion administrator, respectively, as well as one group interview were used as aids to understand the descriptions of the practices as well as the observation of these practices.

**FINDINGS:** We show the unnoticed features of ordinary actions used by this interdisciplinary health care dyad that create the conditions that allow intersectoral partners to find direction, alignment, and commitment to guide population health promotion work. We show a pattern of working together that was focused on listening, learning, collaboration, and cultural humility that distinguishes this leadership approach from other approaches to leadership.

**CONCLUSION:** Drawing on the descriptions of the practices and set of instructions used by this interdisciplinary health and care dyad we were able to refine a conceptualization of interdisciplinary leadership as a unique leadership approach that could be used by leadership practitioners attempting to address complex, wicked problems.

**ACKNOWLEDGEMENT:** This project was funded through a Creighton University CURAS Faculty Research Award.

### 3. PRAIRIE BUTTERFLY FLOWER VISITS: PROPORTIONAL OR PREFERENTIAL?

Theodore Burk¹², Abby Robinson¹². ¹Biology Department, Creighton University; ²Environmental Science Program, Creighton University

**RATIONALE:** To Characterize Patterns of Nectar Plant Use by Prairie Butterflies

**METHODS:** Data were collected on butterfly nectar plant visits at four eastern Nebraska tallgrass prairie sites from early June through mid October each year from 2002 to 2017. Over 17,000 flower visits by over 50 species of butterflies to over 80 species of flowers were recorded. Nectar plant visits by butterfly species were highly non-random. Information is presented on the most frequent flower-visiting butterflies and the most-frequently visited flower species, with particular emphasis on two butterflies of special conservation concern, the Monarch (*Danaus plexippus*) and the Regal Fritillary (*Speyeria idalia*). To determine whether butterflies visited flower species simply in proportion to their abundance, or showed preferences in flower species visited, flower abundance surveys were conducted in 2016 & 2017 at Glacier Creek Preserve and correlations between flower abundance and butterfly visits were calculated.

**RESULTS:** Our findings indicated that while butterfly visits by the butterfly community as a whole are correlated significantly with flower species abundance, individual butterfly species exhibited preferential patterns of flower visits.

**CONCLUSION:** Different butterfly species show different patterns of visitation to prairie flower nectar sources. This suggests that different species have different food niches.
This information is important both for general knowledge of the ecology of prairie butterflies and for use by managers of natural areas.

**ACKNOWLEDGEMENTS:** We thank the University of Nebraska-Omaha, in particular Dr. Thomas Bragg, for permission to work at Glacier Creek Preserve. Abby Robinson was supported by a Clare Boothe Luce Undergraduate Fellowship.

4. **SYNTHESSES OF HOMOALLYLIC AND BIS-HOMOALLYLIC ALCOHOLS BY DOUBLE AND TRIPLE HYDRIDE REDUCTION**

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Homoallylic alcohols are common in organic chemistry: They appear as natural products such as sterols (cholesterol, campesterol, ergosterol), xanthophylls (lutein, zeaxanthin, cryptoxanthin) and marine metabolites with anticancer potential (calyculin). It has been determined that sequential double hydride addition of hydridoaluminates to 3-alkynyl-2-cycloalkenones provides highly stereoselective access to allene-containing homoallylic alcohols, and that this reaction can be extended to the preparation of other nonallene-containing homoallylic alcohols. The extension of this addition strategy to sequential double hydride additions to 2,4-diynols and 2,4-diynones as well as triple hydride additions to cross-conjugated ketones was investigated: 2,4-Diynols and 2,4-diynones provide allene-containing homoallylic alcohols; various cross-conjugated ketones have been synthesized for continuing investigations into preparations of bis-homoallylic alcohols.

5. **ADDRESSING THE OPIOID USE EPIDEMIC: STRATEGIES FOR INTERPROFESSIONAL HEALTH EDUCATION**

   Jessen, Jennifer

**BACKGROUND:** There is a need for an interprofessional approach to the health care crisis related to opioid use and abuse. In order to assist health professional students understanding of the complexities of the epidemic, and to experience the value of an interprofessional approach, an on-line program was developed and implemented in the Fall of 2019.

**PURPOSE:** The purpose of this qualitative study was to explore health professions students’ perception of patients experiencing opioid use disorder and the challenges of interprofessional care.

**THEORETICAL FRAMEWORK AND RATIONALE:** The Community of Inquiry Model for on-line learning environment was used as the framework for this study. The model emphasizes social, cognitive, and teaching presence as essential components of the learning community.

**METHODS AND SAMPLE:** This study was a retrospective qualitative analysis of discussion board data from an interprofessional activity which was offered during Fall 2019 with 217 participants. Students from multiple health professions participated in the 1-week online course. Students were required to listen to four pre-recorded lectures by professionals in family medicine, pain management, mental health, and emergency
medical services. The recordings focused on contributing factors to the crisis, management of individuals with acute opioid overdose, and strategies for providing a comprehensive and holistic approach in the treatment of individuals with opioid use disorders. Students were introduced to two central patients in unfolding case studies including a young female athlete who became addicted to opioids after a sports injury and a 40-year-old business man with severe chronic back pain. Thematic analysis was applied to the case study.

**RESULTS:** Six themes emerged from the discussion board responses: 1) Opioid Use Disorder can happen to anyone 2) Mismanaged Health Care 3) Overwhelming life stressors; 4) Seeking relief from chronic pain 5) Compassion and empathy 6) Interprofessional collaboration improves outcomes.

**CONCLUSION:** An interprofessional on-line teaching approach to increase student knowledge of the opioid epidemic and the implications for professional health care practice was effective in enhancing student knowledge of the opioid epidemic.

6. **INTERPROFESSIONAL COMPETENCE DEVELOPMENT THROUGH ONLINE PALLIATIVE CARE EDUCATION AND VIRTUAL INTERPROFESSIONAL SIMULATION (VISION)**

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**BACKGROUND:** Interprofessional (IP) collaboration and quality palliative care (PC) are global priorities, requiring baseline competence of generalist health care professionals (HCPs). PC requires a collaborative team approach, thus is an exemplary model for teaching IP roles and teamwork. Many HCP training programs are now online, offering flexibility and self-paced instruction but leaving students craving personal connections. Simulations with varied IP student backgrounds assist in fostering these connections while promoting collaboration and team-based competency development.

**PURPOSE:** An elective IP PC course for prelicensure HCP students was developed to increase IP competence and meet the growing need for quality PC. Virtual IP simulations (VI$S$ion) were included in the course for synchronous experiential learning. The following student outcomes were measured:

1. IP self-competence,
2. PC self-efficacy,
3. IP team performance, &
4. student perceptions of course impact.

**METHODS:** The 15-week online course included eight modules with two embedded VI$S$ion activities involving palliative and hospice phases of care. A pretest/posttest mixed method design was used to evaluate IP and PC outcomes of 24 IP students using validated and reliable instruments (Interprofessional Palliative Care [IPPC] Self-Efficacy Tool©, Interprofessional Collaborative Competency Attainment Scale [ICCAS], and Creighton Interprofessional Competency Instrument© [C-ICE]). Three open-ended
questions were included to evaluate student perceptions. Descriptive statistics and qualitative descriptive analysis were used to summarize results.

**RESULTS/OUTCOMES:** Student reported self-efficacy increased on all items of the IPPC and ICCAS instruments. Qualitative themes (confidence in quality PC delivery, team collaboration, and IP role knowledge) showed largest mean increases. Additionally, faculty rated students as competent on all items of the C-ICE.

**CONCLUSIONS:** The IP PC course benefitted students in self-efficacy and knowledge development. VI$S$ion was an effective method for evaluating students’ team performance and promoting self-awareness. Despite the online format and sensitive content, students felt supported and connected to other students and the school.

**ACKNOWLEDGEMENT:** This work was supported by the Josiah Macy Jr. Foundation, Creighton University Graduate School, and Creighton University College of Nursing. Authors would also like to acknowledge Alex Hall for his assistance with statistical analysis.

7. **FACTORS INFLUENCING THE SELF-REPORTED PALLIATIVE CARE PRACTICES OF ACUTE CARE NURSES**

Kotula, Keshia

**RATIONALE:** Approximately 40 million people are currently in need of PC, and this number is predicted to increase due to the aging population and increasing longevity. Providing PC in the acute care setting leads to better quality and clinical outcomes, reduced inpatient costs, and improved efficiency. However, timely referrals and provision of PC in the acute care setting are lacking in part due to the complex interplay of factors that nurses must navigate. A paucity of research exists that reflects a comprehensive approach, integrating the complexities of the clinical setting and encompassing the multidimensional factors. The purpose of this study is to examine the factors that influence the nature and frequency of self-reported palliative care (PC) practices of nurses in the acute care setting by using a comprehensive approach.

**METHODS:** A descriptive, cross-sectional design will be used to examine the effects of PC knowledge, education, and self-efficacy; attitudes; patient/family barriers; and institutional factors on nurses’ PC practices in acute care. Registered nurses in Nevada will be emailed a link to a survey which will contain items from a demographic questionnaire, the Undergraduate Nursing Palliative Care Knowledge Survey, the Frommelt Attitude Toward Care of the Dying Scale, Competencies and Recommendations for Educating Undergraduate Nursing Students – Perceived Competence Scale, the Patient/family Barriers Subscale, the Institutional/Unit Factors Subscale, as well as the Palliative Care Self-Reported Practices scale. Hierarchical multiple regression analysis will be used in this study to evaluate the degree to which each of the independent variables explain the variance in self-reported frequency of PC practices of acute care nurses while controlling for the others.

**CONCLUSION:** Nurses are on the front lines of patient care, spending more time at the bedside caring for patients with serious illness than any other profession and are therefore critical to the increase in PC utilization in the acute care setting.
8. RECOLLECTIONS OF OPERA: NARRATING MUSIC, SELF, AND THOUGHT IN ELIZABETH BOWEN
Matthew L. Reznicek, Ph.D.

In a 1950 interview, Elizabeth Bowen notes that “my being a hybrid—Anglo-Irish—has had a certain effect on my writing—whether good or bad I can never say.”¹ This hybridity has resulted in “contrasting reductionist pitfalls [that] have risked distorting Bowen’s reception,” especially in Irish literary criticism.² Rather than a problem to be solved, or an opportunity for the risky distortions, Bowen’s hybridity provides an unique opportunity to complicate the conception of Irish identity by extending it outward, destabilizing the protracted insularity against “alien influences.”³ Bowen’s hybridity “unsettles” these fixities through a persistent recourse to the alien influences of European opera.⁴ This destabilization is a form of transnationalism, not simply because it borrows from a European tradition of music but because it reveals the porous nature of a tradition that was defined by its “cultural protectionism.”⁵ As Paul Gilroy notes, the recognition of hybridity “necessitates constructing an account of the borrowings made by these English initiatives from wider, modern, European traditions of thinking about culture […] beyond these national and nationalistic perspectives.”⁶ If political, economic, and cultural structures are no longer co-extensive with national borders, as though they ever were or could be, then a writer’s position ought to be understood as “a double one, twice defined,” “inextricably national and international.”⁷ That is to say, Bowen’s own writings, as she explained in terms of her own self-identity, ought to be identified by its “being a hybrid.”

Such hybridity, as Jahan Ramazani has demonstrated, can “evoke noncoercive and nonatavistic forms of transnational imaginative belonging.”⁸ Instead of replicating the exclusivity of Benedict Anderson’s imagined communities, reading Bowen in a transnational model, attuned to the cross-cultural references, offers a “different model of ‘citizenship’” that recognizes multiple aesthetic attachments to a variety of traditions, forms, and locales.⁹ This new literary citizenship begins with her “being a hybrid” between England and Ireland, but that interstitial and hybrid status extends across the map and across aesthetic models, recognizing that citizenship, like aesthetic forms, is mobile and multifaceted. Such aesthetic citizenship allows for literary output that is “formed by both unwilled imaginative inheritances and elective identifications across national borders.”¹⁰ Indeed, allowing Bowen’s personal hybridity to shape my reading of her aesthetic hybridity enables a recognition of the destabilizing role that European opera plays in her works. The intermingling of opera and modernist literature offers a counter-narrative to the reductive attempts that fix Bowen within a national or monocultural tradition, ignoring her European aesthetic context.

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⁴ Homi Bhabha, The Location of Culture, 1994, Routledge, 2006, p. 159.
⁵ Brown, Ireland, p. 58.
⁹ Ramazani, A Transnational Poetics, p. 31.
¹⁰ Ramazani, A Transnational Poetics, p. 48.
9. The Lived Experience of Potentially Traumatic Experiences Associated with the Practice of Vocation of Nursing
Nicole Schroeder MS, RN, Instructor, Creighton University College of Nursing

Rationale: Nursing is a profession in which many who practice nursing feel called to the vocation of nursing. Nurses are routinely exposed to potentially traumatic experiences and these exposures put nurses at risk for experiencing psychological trauma. The nursing profession is struggling with high rates of burnout, compassion fatigue, and post-traumatic stress disorder.

Methods: This qualitative study used semi-structured interviews to seek understanding of the lived experiences of four nurses and how they coped with potentially traumatic experiences associated with their nursing practice.

Results: The study participants all had significant exposure to potentially traumatic experiences during the practice of their nursing vocation, such as witnessing human suffering, being physically and verbally assaulted, and indirectly experiencing serious and unexpected threats to life. Many of the study participants identified that having too much work to do and a lack of resources to cope with their workload and patients that were unreceptive to the help nurses were trying to give as particularly traumatic experiences. The results of this study found that nurses coped with potentially traumatic experiences associated with their nursing practice through engaging in meaningful relationships, practicing self-care, remaining open to the call of vocation, being compassionate, and seeking meaning and transformation from potentially traumatic events.

Conclusion: Further research is needed towards supporting nurses’ coping with potentially traumatic experiences that are inherent to the nursing profession. The goal of this research needs to be preventing psychological trauma and compassion fatigue so that the vocation of nursing can flourish.

10. The Use of a Scholarship Salon to Encourage Faculty Research Collaboration
Misty Schwartz, PhD, RN; Amy A. Abbott, PhD, RN; Ronnie Sheridan EdD, RN; Cindy Hadenfeldt, EdD, RN; Kandis L. McCafferty PhD, RN; Becky Davis, DNP, RN; Joan Lappe, PhD, RN; & Jan Boller, PhD, RN

Rationale: Evidence exists that people begin to make their greatest discoveries in their 20s and are most productive in their mid-30s. These indications have implications for Colleges of Nursing (CON) of integrating new faculty into knowledge generation and dissemination while being mentored by experienced faculty. One challenge is cultivating scholarship in environments that place greater emphasis on the role and activities of teaching and less on Boyer’s methods of scholarship, discovery, integration, and application. Shakespeare followed a tradition of a “Salon” setting where intellectuals gathered to discuss works of art with creators in order to gain a deeper understanding. This tradition continues today with “Shakespearian Salons” in theaters to promote intellectual growth through community. Wenger’s Community of Practice Model
combined with the Social Ecology Theory of Bronfenbrenner guided this project. **METHODS:** “Night at the Scholarship Salon” was offered by the Dean and the CON Research Committee. The evening event was piloted on one campus so faculty could gather, have dinner, and socialize in a “salon-type” environment while discussing current scholarship endeavors. One faculty presented the background and goal of the evening and five areas of current faculty research were highlighted. A “speed dating” process was implemented where these researchers facilitated discussions at individual tables and faculty rotated among them. **RESULTS:** Twenty-five faculty were in attendance and began a process of collaboration with others who shared similar scholarly interests. The Salon was incorporated into the fall retreat where faculty (N= 62) from three campuses gathered for the new academic year. Another Scholarship Salon is planned for the Spring Annual Research Day so that students can engage in this process to encourage future research. Efforts are in progress to evaluate changes in productivity and funding submissions. **CONCLUSION:** Scholarship Salon gatherings can be beneficial in increasing CON networking and collaborative scholarship projects. **ACKNOWLEDGEMENTS:** Dr. Jan Boller, who brought this idea to Creighton University CON. Dr. Ellen Darowszewski, founding DNP Director at Western University of Health Sciences, College of Graduate Nursing who first introduced the format at WesternU.

11. **CINEMATIC SIMULATION: AN INNOVATIVE STRATEGY FOR PSYCHIATRIC MENTAL HEALTH UNDERGRADUATE STUDENTS**
Ronnie Sheridan, Assistant Professor

**PURPOSE:** The purpose of this pilot study was to explore the impact of an innovative simulation strategy, Cinematic Simulation, on student learning and anxiety prior to going into a psychiatric mental health (PMH) clinical experience.

**BACKGROUND:** Nursing schools report continued shortages of clinical placements. This shortfall has led faculty to search for acceptable alternatives that are comparable. Simulation is an acceptable alternative (Hayden et al., 2014); however, research is limited related to PMH (Felton & Wright, 2017). Although a variety of simulation methods exist (Brown, 2015), they are not always feasible due to available resources.

**SAMPLE/SETTING:** A convenience sample of 82 students enrolled in a Care Management PMH practicum course at one university across two states in the southwest and the Midwest.

**METHODS:** To evaluate the potential of Cinematic Simulation among undergraduate BSN students in a PMH course, a Cinematic Simulation was developed. Students participated in a Cinematic Simulation. Students were given the option of completing a pretest/posttest when participating in this activity as their pre-clinical experience.

**RESULTS:** Students exposed to Cinematic simulation reported a 24% increase in confidence of their skills and abilities before going into their PMH rotation. 8% reported a decrease in their anxiety. When considering knowledge of the care management process, 35% reported an increase in their knowledge of completing a plan of care for
their patient in a PMH setting. In basic knowledge of PMH disorders, students demonstrated an increase in 5% when it came to understand a specific disorder demonstrated in the experience. Statistical significance results pending.

CONCLUSION: Cinematic Simulation is in the beginning of its inception; this data informs nurse educators on the potential impact of this new simulation method. Based on the data, students demonstrated a decrease in anxiety and increased knowledge of the care management process, suggesting that future studies are warranted.

12. DANGEROUS BALLAST: ZEBRA MUSSELS AND THE ECOLOGICAL CRITIQUE OF GLOBALIZATION IN THE ANTHROPOCENE
Adam Sundberg, PhD. Department of History, Patrick Driscoll, EVS Major

RATIONALE: This project explores the scientific and policy responses to the spread of Zebra Mussels (Dreissena polymorpha) since their introduction into the Great Lakes. Cargo ships transported the Zebra Mussel in ballast water from Europe in the late 1980s and they quickly expanded in number and range. By 1990, Zebra Mussels were widely considered an ecological and economic disaster that required intervention and regulation. Public outcry culminated in the congressional passage of the Nonindigenous Aquatic Nuisance Prevention and Control Act of 1990. Subsequent decades saw increasing public interest in species introductions, expanded regulation limiting pathways of introduction, and new research into “invasion biology.” Today, Zebra Mussels are an archetypal exotic, representing the economic and environmental costs of twentieth-century globalization and international commerce.

RESULTS/CONCLUSIONS: This summer research explored how scientists and policy makers transformed the Zebra Mussel from a localized economic nuisance into a critique of globalization, beginning in the 1980s. It found that policy responses emerged quickly following the first evidence of Zebra Mussels in 1987. Early efforts worked through existing transnational networks of state and private actors. By 1988, an informal network of state-sponsored researchers, policy institutions, and university scientists identified the causal origin of the invasion and proposed ballast management as a policy solution. Legislation in 1990 and 1996 formalized this network, its prescriptions, and expanded its scope to a national context. The Zebra Mussel invasion catalyzed the first global policy discussions on marine and aquatic bioinvasions. Scientists participated largely on regional and national scales. This early work lay the foundation for marine and aquatic bioinvasion science and established its relevance on a global stage. As the ecosystem approach expanded to global environmental issues in the 1970s and 1980s, policymakers continued to frame bioinvasions as a problem of vector management - rather than a product of integrated natural-human systems.

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