



St. Albert's Day
Student Research Forum

April 1, 2014

9:30 a.m.—3:30 p.m.

Ahmanson Ballroom

Harper Center

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. Awards will be presented for the 'best poster' in three categories, as well as for the 'best presentation.'

St. Albert the Great 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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Whitmore, Brittany	11:15 AM	Room 3028B

SUMMER FACULTY FELLOWSHIP PARTICIPANTS

Aizenberg, Suan
Averett, Erin Walcek
Baruth, Andrew
Roedlach, Alexander

HADDIX RESEARCH SCHOLAR PARTICIPANTS

Fassbinder-Orth, Carol A.
Givens, Deborah
Stanton Chapple, Helen
Soto, Patricia
Wee, Alvin
Wrubel, Jonathan

COLLEGE OF ARTS AND SCIENCES DEAN'S SUMMER RESEARCH PARTICIPANTS

Bonini, Rachel
McDermott, Tim
Paradise, Kelsey
Rogers, Jason
Smith, Andrew
Swisher, Amanda

HONOR'S PROGRAM SUMMER RESEARCH PARTICIPANTS

Fredericks, Nina
Ruchensky, Jared

STUDENT POSTER ABSTRACTS

1. ANTICOAGULATION RISK EVALUATION AND GUIDELINE ADHERENCE IN PATIENTS WITH NONVALVULAR

Katie Chase Abigail Vieyra, Sandra Byers, College of Nursing, Creighton University, Omaha, NE

Nonvalvular Atrial Fibrillation (NVAF) is the most common sustained cardiac arrhythmia in the United States. NVAF is also a common cause of embolisms that can lead to transient ischemic attacks and strokes. The risk of developing an embolism while in NVAF is predicted by the CHADS-2 scoring system. The CHADS-2 scores a patient based on the comorbidities of recent cardiac failure, hypertension, age greater than 75 years, diabetes, and previous stroke or transient ischemic attack. Guidelines from the American Cardiology Council, the American Heart Association and the European Society of Cardiology, have been established in the treatment of NVAF based upon the CHADS-2 score. This study aims to assess if healthcare providers are accurately assessing and treating NVAF patients based on their CHADS-2 score. All patients diagnosed with NVAF from 2013 from a Midwestern Healthcare System between the ages of 50-74 will be selected using retrospective chart review. This study will look for evidence of an association between CHADS-2 score categories and guideline adherence. Patients who receive medical treatment according to guidelines based on CHAD-2 scores will be compared to those who were not treated according to the CHAD-2 scores and outcomes will be compared. A confidence level will be stated that following guidelines according to CHADS-2 scores will reduce your risk of associations between CHADS-2 score based treatment and patient stroke outcomes.

2. EVALUATION OF AN EVIDENCE-BASED POST-OPERATIVE ATRIAL FIBRILLATION (POAF) TREATMENT ALGORITHM

Natalie Cora and Amy A. Abbott, College of Nursing, Creighton University, Omaha, NE

Background: Practice guidelines exist for treatment of post-operative atrial fibrillation (PAOF); however, no accepted algorithm exists to guide treatment.

Purpose: To determine if patients treated according to the American College of Cardiology (ACC)/American Heart Association (AHA)/European Society of Cardiology (ESC) compiled practice algorithm have better outcomes when compared to patients whose treatment does not follow this algorithm.

Methods: A retrospective, descriptive study was conducted on a convenient sample of 75 cardiac surgery patients who experienced POAF at an urban, Midwestern medical center. Administered treatment was compared to treatment recommended by the investigator-compiled algorithm. Outcomes were analyzed comparing subjects treated according to the algorithm versus those who were not.

Results: Twenty-six (34.67%) of 75 subjects (N = 75) who met inclusion criteria were treated according to the investigator-compiled algorithm. The majority of subjects were Caucasian males who underwent aortic valve replacement. Patients who were treated according to the algorithm were estimated to have a 3.08 times greater odds of conversion into normal sinus rhythm, than those whose treatment deterred from the algorithm (p = 0.1979). A significant difference was detected in time spent in the ICU between groups (p = 0.0451). No other significant differences in outcomes were detected.

Conclusion: Few patients were treated according to the algorithm, suggesting that extensive education is needed in order to translate ACC/AHA/ESC guidelines into practice. This algorithm has the potential to facilitate treatment which is in agreement with evidence-based best practices. This may reduce ICU costs while improving conversion rates.

3. REDUCING PEDIATRIC EMERGENCY DEPARTMENT LENGTH OF STAY AND LEFT WITHOUT BEING SEEN RATES: AN INNOVATIVE APPROACH

Amanda Hinkel and Catherine O'Keefe, College of Nursing, Creighton University, Omaha, NE

Purposes: (1) implement the QuickView Provider (QVP) split flow process in a Midwestern tertiary pediatric emergency department; and (2) evaluate the influence of this process on LOS and LWBS rates.

Research Questions: (1) Will the QVP process decrease the average LOS for triage code 4 and 5 patients during the hours of 1600-2200? (2) Will the QVP process decrease the LWBS rate for all patients during all hours of operation?

Design: Upon arrival at the pediatric emergency department the QuickView Nurse (QVN) obtains demographics, chief complaint, significant past medical history, and performs a brief visual assessment using the Pediatric Assessment Triangle. If the patient meets the QVP criteria (triage code 4 or 5) they are then seen by the QVP (MD, NP, or PA)/nurse team allowing for a more streamlined process. QVP runs during a high volume time, 1600-2200.

Findings: The average LOS for all QVP patients from November 2013-January 2014 was compared to the average LOS for triage code 4 and 5 patients from 1600-2200 in November 2012-January 2013. Statistical analyses revealed the Post (QVP) mean LOS was significantly shorter than the Pre LOS. LWBS rates also decreased after QVP initiation when comparing the two time periods.

Clinical Implications: A split flow process allows for a more streamlined process; can decrease LOS for lower acuity patients, overall LWBS rates, and allows for sufficient resources to be available for higher acuity patients. Providers can quickly, efficiently, and safely provide care in both settings.

4. **A HEALTH COACH WORKPLACE SMOKING CESSATION PROGRAM FOR INDIVIDUALS**

Elisabeth Barlow and Cindy Costanzo, College of Nursing, Creighton University, Omaha, NE

The purpose of this evidence based program was to determine the effectiveness of an individual health coach model employing behavioral counseling strategies for smoking cessation with an adult population within an urban, industrial work site setting. Smoking prevalence in adults in the United States and in Nebraska exceeds 12%, the goal established by Healthy People 2020. Low smoking rate benefits for an industrial work force include increased productivity, less absenteeism, fewer health insurance claims, and increased employee retention. Regarding workplace cessation programs, the culture and needs of the employees must be taken into consideration. Different styles of counseling are effective with aiding smokers in quitting. Counseling messages can be delivered by a wide variety of health care providers. This quality improvement program enrolled seven patients. The company clinic had planned to implement a smoking cessation program for employees and dependents. Patients had four high intensity counseling meetings with the clinician. A survey was completed during the first meeting. They were counseled and given the option of starting cessation medications. In addition, there were two follow up phone calls, eight and 12 weeks after the first meeting to assess the patient's smoking status, their need for additional support, and obtain feedback on the program. Two of the seven patients successfully quit smoking during the program and stayed quit through both follow up phone calls. Another four patients cut back on the number of cigarettes smoked daily. Three other patients had at least one quit attempt of 24 hours or longer during the program. All patients said they would recommend this to others. Several recommended that a group program be offered also. The program was critically evaluated with the assistance of clinic staff to ensure sustainability.

5. **SHARED GOVERNANCE IN THE CLINIC SYSTEM**

Michelle Meyers and Cindy Costanzo, College of Nursing, Creighton University, Omaha, NE

Purpose/Rationale: The purpose of this quality improvement project was to implement and evaluate a shared governance structure in a clinic system. Shared governance in healthcare empowers nurses to share in the decision making process, which results in decentralized management and collective accountability. Share governance practices have been present in hospitals since the late 1970's; however, shared governance in ambulatory care clinics has not been well established.

Methods: The subjects of this project included staff and administrative nurses in a clinic system. The Stakeholder Committee consisted of equal staff and administrative nurses. The Stakeholder Committee chose what model of shared governance to implement and educated clinic staff. The Index of Professional Nursing Governance (IPNG)

measured a shared governance score pre and post implementation of the Clinic Nursing Council (CNC). The CNC included thirteen representatives from the different types of clinics, two nurse supervisors, and the Chief Nurse Executive. The CNC met bimonthly for three months during this project to discuss issues and make decisions related to nursing staff.

Results: The IPNG scores indicated traditional governance pre and post implementation of the CNC. Response rate was significantly lower for the post survey. Nurses felt the Stakeholder Committee was beneficial, the CNC had a strong administrative presence, and topics discussed pertained to staff's work. About half of nurses felt they were empowered, and the CNC facilitated nurses' voice in decision making.

Conclusion: The clinic system developed a nursing council to share decision making responsibilities among staff and administration. Baseline IPNG scores indicated traditional governance and provided direction for the clinic to move towards shared governance. Recommendations for future clinic implementation of shared governance structures include starting with a stakeholder committee, limiting the demographic data in the IPNG, and have direct care nurses in formal leadership on the CNC.

6. **MANAGEMENT OF SKIN AND SOFT TISSUE INFECTIONS IN A COUNTY CORRECTIONAL CENTER: A QUALITY IMPROVEMENT PROJECT**

Lisa Mullen and Catherine O'Keefe, College of Nursing, Creighton University, Omaha, NE

The number of antibiotic resistant infections continues to increase. In 2005, there were nearly 11,406 deaths from methicillin-resistant *Staphylococcus aureus* (MRSA) infection in the United States. Since 1980, the United States has seen a 300% increase in the rate of incarceration. This is noteworthy because individuals who enter correctional facilities have an increased risk for MRSA skin and soft tissue infections (SSTIs) and the risk of colonization proportional to the length of stay. Correctional institutions have a vested interest in improving the screening and treatment of MRSA SSTIs, as it is a costly and potentially preventable problem. This article will describe the process of implementing an MRSA screening and treatment policy in a county correctional center.

7. **REDUCING CATHETER-ASSOCIATED URINARY TRACT INFECTIONS IN THE PEDIATRIC INTENSIVE CARE UNIT**

Renee Ervin Katie O'Keefe, College of Nursing, Creighton University, Omaha, NE

Indwelling urinary catheters, used to continuously drain the bladder, remain commonly used in the acute hospital setting (Bernard, Hunter, and Moore, 2012). Although urinary catheters may be beneficial, there are several adverse events associated with their use including urinary tract infections (Gokula, Smith, and Hinckner, 2007). Catheter-associated urinary tract infections (CAUTIs) remain the most common of hospital-acquired infections (HAIs) (Saint et al., 2008). Implementation of evidence-based practices for the use and maintenance of urinary catheters is essential in order to reduce urinary tract infections related to urinary catheters. Most of the current research on CAUTIs is limited to the adult population; however, pediatrics patients are also negatively affected by UTIs. The PICU in a Midwest, Children's Hospital has reported estimated annual CAUTI rates of 12.2 and 11.67 per 1000 device days in 2012 and 2011, respectively (Children's Hospital and Medical Center Scorecard, 2013). The specific goals of the proposed quality improvement project were to develop an effective surveillance system to monitor the number of urinary catheter days and reduce the rate of CAUTIs in a pediatric intensive care unit at a Midwest regional Children's Hospital. Based on current research, an Evidence Based Pediatric Bladder Bundle (EBPBB) was developed and implemented in the PICU at Children's Hospital & Medical Center in Omaha, Nebraska. Results of this implementation and surveillance will be presented. The evaluation of these new protocols will ensure best practices to prevent CAUTIs and other complications related to indwelling urinary catheters, therefore improving patients' health outcomes and decreasing medical costs.

8. **SUSTAINABLE CONSULTING: A DEVELOPING SECTOR**

Jacob Yager Department of Energy Technology, Creighton University, Omaha, NE

Sustainable consulting is evolving into the world of engineering and architecture and Verdis Group is on the leading edge of this evolution.

9. **OPERATIONAL REVIEW OF NEW DUAL-POLARIZATION RADAR PRODUCTS**

Kyle Wright and Daniel Nietfeld, Department of Atmospheric Science, Creighton University, Omaha, NE

Beginning in March 2011, the National Weather Service, Department of Defense, and Federal Aviation Administration's Weather Surveillance Radars (WSR-88Ds) have undergone upgrades that allow the radars to transmit and receive both horizontal and vertically polarized radiation pulses. Prior to the upgrades, the radars could only send and receive a singularly polarized, horizontal pulse, which provided limited qualitative descriptions of scatterers. The addition of the second polarized pulse has enabled the development of algorithms to determine precipitation types, precipitation density, airborne tornado debris, and even blowing dust and sand. Though there was extensive research prior to the upgrade deployment, operational meteorologists are still examining the new products in an effort to exploit the full capability of the new technology available to them.

This research will examine two new dual-polarization radar products for three different storm system types to find relationships that will allow meteorologists to better identify areas of heavy precipitation. More specifically, specific differential phase (KDP) and differential reflectivity (ZDR) will be scrutinized when looking at tropical storm systems, severe thunderstorms, and non-severe thunderstorm systems that resulted in high precipitation rates observed by Automated Surface Observations Systems (ASOS). These two products enable forecasters to infer raindrop concentration and raindrop size and shape distribution, respectively, within the storm system. Vertical distribution, over a specified period of time, of these two products will be studied to identify a potential patterns associated with heavy rainfall. Additionally, base reflectivity values will be compared to values of KDP and ZDR over a small area, to again identify potential relationships and or patterns.

10. **STRATIFORM CLOUD DECKS AND THEIR RELATION TO THE NOCTURNAL LOW-LEVEL JET**

Hallie Dusselier and Jon Schrage, Department of Atmospheric Science, Creighton University, Omaha, NE

Current research on the formation of nocturnal stratiform cloud deck in tropical West Africa suggests that their formation is directly related to the existence of a known low-level nocturnal jet. Cloud decks exhibiting similar characteristics to those in West Africa have also been observed in the south central and gulf regions of the United States. This is an area in which the known low-level jet is common. The purpose of this research is to compare the conditions within the two aforementioned regions in order to find data that supports the hypothesized relationship between the formation of these cloud decks and the low-level jet. In addition, this research contains comparisons between the annual cycle and frequency of the formation of the cloud decks. Using data gathered from hourly surface weather observations, wind profiler networks, and the Tropical Rainfall Measuring Mission satellite, algorithms sorted dates by conditions that have been pre-defined. Using the strictest condition ensures that these clouds form under similar conditions to the cloud decks in West Africa, and are not caused by other weather events, such as precipitation or synoptic forcing. Findings will be presented and then compared to the annual cycle of cloud deck formation in West Africa. Results suggest that although processes and conditions under which these clouds decks form are similar, the annual cycle of their formation appear to be very different from the clouds of West Africa. Additionally, studying the formation of these stratiform cloud decks in the United States is imperative because of the significant impact that they have on the radiation budget. A better understanding of these clouds decks and their annual cycle will allow for better detection by models and a more accurate forecast for both locations experiencing these low level clouds, and greater potential for improved forecasting across the world.

11. **USING THREE DECADES OF LANDSAT TM DATA TO EXAMINE GEORGIA COASTAL SALT MARSH VEGETATION**

John O'Donnell¹ and John Schalles², ²Department of Biology, ¹Department of Atmospheric Science, Creighton University, Omaha, NE

The goal of this project is to see whether long-term plot-based plant biomass observations of Marsh Cordgrass, *Spartina alterniflora*, the dominate vascular plant in Southeast Atlantic salt marshes can be effectively scaled to larger spatial (tidal watersheds to regional) and temporal scales (decadal) via satellite data. We are developing a standardized workflow for batch processing 28 years of NASA Landsat 5 TM images to produce vegetation indices and above ground plant biomass maps for Georgia coastal wetlands. This analysis requires solutions to several challenging problems: tidal marsh inundation, atmospheric conditions, spectral mixtures in 30 m pixels, and geo-registration across scenes. Concomitantly, we are investigating linkages between coastal ecosystem drivers (river discharge, precipitation, El Nino and La Nina cycles, Atlantic Multidecadal Oscillation) and variability among annual and intra-annual plant productivity observations within our time series of biomass estimates and mapping products.

12. **AN EXAMINATION OF CONVECTION-ALLOWING MODEL FORECASTS OF THE 4 OCTOBER 2013 NEBRASKA/IOWA TORNADO EVENT**

Robert Hepper and Timothy Wagner, Department of Atmospheric Science, Creighton University, Omaha, NE

High resolution convection-allowing forecast models operate on spatial scales which allow them to directly simulate convection and its associated processes, as opposed to coarser resolution models which must parameterize convection. Output from high resolution models can then be integrated into a forecasted radar reflectivity product. The accuracy of these forecasts regarding the timing, location, and impacts of thunderstorms is of critical importance to meteorologists. A case study is presented examining the accuracy of high resolution model forecasts of an outbreak of supercell thunderstorms on 4 October 2013 over northeast Nebraska and northwest Iowa. This outbreak produced several significant tornadoes that caused significant damage. The strongest of these tornadoes struck near Wayne, Nebraska, causing 14 injuries; rated as an EF4 tornado on the enhanced Fujita scale, its wind speeds were estimated at up to 200 mph. The storms formed along a northward moving outflow boundary which had been produced by thunderstorms the previous night over southeast Nebraska.

Radar reflectivity forecasts from the National Severe Storms Laboratory (NSSL) Experimental 4-km Weather Research and Forecasting (WRF) Model, National Centers for Environmental Prediction (NCEP) experimental 4-km WRF-Nonhydrostatic Mesoscale Model (NMM), NCEP operational 4-km WRF-NMM, and NCEP operational 4-km WRF-Advanced Research WRF (ARW) are compared to observed radar reflectivity in order to assess the accuracy of these forecasts. Results show that model forecasts displayed southward errors in the location of thunderstorm development due to their inability to return the outflow boundary northward. Implications for severe weather forecasting will be discussed, as well as future research plans.

13. **INTERCOMPARISON OF AIRBORNE AND GROUND-BASED OBSERVATIONS OF CUMULUS CLOUDS**

Christopher Begalke and Timothy Wagner, Department of Atmospheric Science, Creighton University, Omaha, NE

Two ways to observe clouds are through ground and airborne observations, and certain variables can be measured by both types of observations allowing for direct comparisons. Airborne observations are less prone to error, but one key downside is that they are much more expensive to retrieve than ground-based observations. The Routine ARM (Atmospheric Radiation Measurement) Aerial Facility (AAF) Clouds with Low Optical Water Depths (CLOWD) Optical Radiative Observations (RACORO) program flew an instrumented airplane over a ground-based observation site multiple times a week throughout the spring and early summer of 2009. One day, May 26th 2009, is analyzed here. Because the ground observations are stationary and the flight of the observing airplane is constantly changing, the data will be converted into Probability Density Functions (PDF's) so that the variability can be compared. Data analysis shows that the ground-based observations overestimate the effective radius of the cloud droplets, which has important implications for climate research and forecasting.

14. **A CLIMATOLOGICAL RESPONSE OF SURFACE WEATHER OBSERVATIONS DURING DROUGHT PHASE TRANSITION**

Matt Salerno, Jon Schrage, and Timothy Wagner, Department of Atmospheric Science, Creighton University, Omaha, NE

Droughts, or periods of below normal precipitation and above normal temperatures for prolonged periods of time, have significant negative impacts on the agricultural industry, especially in Nebraska. An open area of research is how specific meteorological variables at surface stations across Nebraska respond to periods of drought breaks, or periods when the Palmer Drought Severity Index or Palmer Z index transitions from a negative anomaly (dry period) to a positive anomaly (wet period) over one week. A fifteen-year dataset consisting of weekly maximum and minimum temperatures, precipitation, soil moisture content, and evapotranspiration will be compared with the weekly change in Palmer Drought Index and Palmer Z Index in various regions across the state. A multiple linear regression analysis will be conducted to comprehend how each variable corresponds to changes in Palmer Drought Index. Results from the regression analysis will provide a determination of whether or not predictability of Palmer Index values is possible and if drought breaks occur more or less frequently during growing season.

15. **EXAMINING TRANSPORTATION OF NATURAL GAS EXPLORATION EMISSIONS IN THE HIGH PLAINS REGION**

Smantha Strong-Henninger, Timothy Wagner, and David Stokowski, Department of Atmospheric Science, Creighton University, Omaha, NE

Surface ozone production relies on chemical reactions between nitrogen oxides (NO_x) and volatile organic compounds (VOCs). Natural gas production is responsible for the production of both of these chemicals: heavy machinery in extracting processes generates nitrogen oxides and equipment leaks allow VOCs to vent into the atmosphere. Omaha, NE and Tulsa, OK are two cities with comparable size, populations, and topography. In contrast with one another, Tulsa has many natural gas drilling sites nearby, whereas Omaha lies above the Forest City Basin, which is an area with natural gas extraction potential. These two cities' surface ozone emissions are contrasted with one another using the Weather Research and Forecasting-Chemistry (WRF-Chem) model and observations from Environmental Protection Agency (EPA)-regulated ground-level ultraviolet spectrophotometry instruments. Air quality is simulated in both cities' regions and focuses on advection from urban sources and natural gas drilling sites to rural regions downwind of these sources in order to determine the magnitude of ozone production forced by natural gas production as opposed to other urban processes.

16. **CLOUD-TOP COOLING METHODS USED TO FORECAST SEVERE CONVECTIVE EVENTS IN THE GREAT PLAINS**

Brian H. Decicco, Department of Atmospheric Science, Creighton University, Omaha, NE

Forecasting the initiation, intensity, and duration of severe convective events remains a significant challenge for operational weather forecasters. Even with continual increases in operational forecast model spatial resolution, numerical models remain unable to accurately simulate mesoscale phenomena with the needed degree of accuracy. Satellite remote sensing, however, has experienced major technological advancements over the last decade, however, and the enhanced resolution has enabled observations of small-scale features and bolstered a forecaster's ability to nowcast severe thunderstorm lifecycles. The University of Wisconsin recently developed a cloud-top cooling algorithm, which has preliminarily demonstrated to provide forecast lead times of up to 1 hour on severe convection. 15 major events will be analyzed and evaluated during the Spring 2014 season over the Great Plains states. Application and utility in operational forecasting for Department of Defense activities should be considered, based on the findings of this study.

17. **IMPACTS OF WIND FARMS ON CUMULUS CLOUD DEVELOPMENT**

Laren Mahoney and Timothy Wagner, Department of Atmospheric Science, Creighton University, Omaha, NE

Cumulus clouds form due to buoyant ascent of warm, moist plumes of air at the surface; as they ascend, they cool to the point of condensation, forming a convective cloud. With wind power being America's fastest-growing energy source, locations in Iowa and Nebraska using Geostationary Operational Environmental Satellite (GOES) visible

satellite imagery will be compared to investigate if wind farms affect cumulus development due to turbulent destruction of the moist plumes. Regulatory issues force Iowa and Nebraska, despite their prime location for wind resources and similar latitude, to vary vastly in their wind power offerings. In 2012, Iowa ranked 3rd in the nation for total megawatts installed (3,216 turbines), and is the top state in the nation for the percentage of its electrical load generated by wind energy (24 percent). In contrast, Nebraska ranks 23rd in the nation for total megawatts installed (313 turbines), and 4.8 percent of the state's electrical load is wind-generated. This variance in wind power in close proximity makes Iowa and Nebraska a prime area for initial research.

18. **TOTAL LIGHTNING IMAGING DURING MESOSCALE BANDED SNOW EVENTS**

April A. Ellis, Department of Atmospheric Science, Creighton University, Omaha, NE

Lightning morphology during the lifespan of thundersnow storms are not fully understood due to the uniqueness of the atmospheric dynamics and lack of total lightning imagery. Lightning initiation, by definition, characterizes a thunderstorm, however the dynamics of thundersnow storms and thunderstorms differ greatly. Thundersnow dynamics are based on frontogenetical forcing, equivalent potential vorticity, saturation, and weak moist symmetric stability, elements typically observed during mesoscale banded snow events. Lightning is currently under detected using the existing ground based lightning detection system, which only senses cloud-to-ground strikes, with the exception of a few experimental Lightning Mapping Array systems. Previous studies revealed that cloud-to-ground lightning is rarely the first type of lightning observed, highlighting the importance of total lightning detection. The Lightning Mapping Array system employs very high frequency (VHF) and Global Positioning System Time-of-Arrival (GPS-TOA) signals to determine latitude, longitude, altitude, and time of a lightning strike. With the total lightning imagery, the type of strike can be differentiated as cloud-to-ground, cloud-to-cloud, cloud-to-air, or in-cloud lightning. The purpose of this study is to validate the usefulness of total lightning imagery during thundersnow events by utilizing the Oklahoma City and Washington DC area Lightning Mapping Array systems and to gain an understanding of how lightning progresses through time during these events. With the upcoming launch of Geostationary Operational Environmental Satellite-R Series (GOES-R), total lightning detection will be available for thunderstorm activity across the United States and surrounding waters through similar technology. Enhanced knowledge of thundersnow lightning activity would contribute to an increase in lightning warning lead times attributing to improved aviation and general public safety.

19. **PARAMETERIZATION OF FOREST CANOPIES WITH THE PROSPECT/SAIL COMBINED SPECTRAL MODEL**

Michael Austerberry, Susan Ustin, and E. Shane Grigsby, Department of Atmospheric Science, Creighton University, Omaha, NE

Particularly in forested environments, Leaf Area Index (LAI) and Leaf Inclination Angle have a large impact on the reflected spectral characteristics. Airborne instruments like MASTER or AVIRIS are used to identify the reflectivity spectra of different forest canopies in Southern California. Using the PROSPECT/SAIL combined model, estimated reflectivity spectra could be computed. Part of the combined model input was Leaf Area Index and Inclination Angle, and varying these parameters gave an estimate of each of three specific tree's characteristics. These trees' values of LAI were also computed using different methods to provide a verification for the model output.

20. **SEXY ENVIRONMENTALISM**

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The purpose of this study was to look at whether or not sexualized ads could be an effective form of environmental communication. As the push for green technology occurs, more effective forms of environmental communication are needed. For this I conducted a literature review and historical review of environmental communication techniques, contrasted them with the efficacy of PETA's campaign. The paper looks at three PETA ads, and demonstrates their use of an advocacy campaign to create a male inclusive message while utilizing feminist themes. Through the ad's use of shock value and women as a stand in for animal suffering the ads create a wider audience, which can effectively spread the overall environmental message for animal rights and conservation.

21. **QUANTIFYING SPATIAL VARIABILITY OF MICROBENTHIC ALGAE USING OPTICAL REFLECTANCE MEASUREMENTS**

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Tidal mudflats are inhabited by communities of microbenthic algae that contribute to the productivity and biogeochemistry of coastal wetlands and estuaries. These algae migrate vertically, surfacing at low tide, and a fraction of the algae slough off the mud surfaces and drain into tidal streams, providing trophic support for grazing both invertebrates and filter feeders. Variation in microbenthic algal pigment features were evident in 2006 AISA Eagle aerial imagery acquired at Sapelo Island, Georgia. In the summers of 2012 and 2013, close-range hyperspectral scans were taken over different areas of Georgia coastal mudflats. Chlorophyll a signals were clearly discernable. Surficial sediment samples were collected and analyzed for pigment concentrations. We found substantial spatial variability in algal densities within and between sites. We have produced provisional predictive algorithms for estimating the microbenthic algal densities on exposed mudflats and are working to parameterize these algorithms for use with high spatial and spectral resolution airborne spectroscopy.

22. **glmS RIBOZYME MECHANISM AND DEVELOPMENT AND DELIVERY OF ARTIFICIAL AGONISTS AS CANDIDATE ANTIBIOTICS**

Lauren Hintz, Alex Stock, Tommy Holmes, Xian Fei, and Juliane K. Soukup, Department of Biochemistry, Creighton University, Omaha, NE

The continual threat of antibiotic resistance has required that new approaches and new targets be investigated in order to effectively fight a host of medically relevant bacterial infections. The antibiotics of the past need to be replaced with novel, rigorous treatments in order to combat the evolved and antibiotic resistant bacterium of today. One way to destroy bacteria is to target their most essential, metabolic pathways. Riboswitches are RNA structural elements that bind cellular metabolites and control expression of essential metabolic genes providing a unique and distinct set of targets for development of artificial agonists to fight bacterial infections. Many riboswitches, once liganded, repress expression of associated or adjacent genes involved in the synthesis of the metabolite, providing an efficient feedback mechanism of genetic control. One particular riboswitch (the glmS riboswitch/ribozyme) binds to glucosamine-6-phosphate (GlcN6P), a building block of the cell wall in Gram-positive bacteria, and undergoes self-cleavage resulting in inactivation of the mRNA.

The efficacy of artificial analogs in eliciting this same glmS RNA self-cleavage response has been studied. Through kinetic assays and the study of the binding affinity with an isothermal titration calorimeter (ITC), the following can be determined for each analog: the time and the optimal concentration at which analogs support self-cleavage and the affinity of each analog for the glmS ribozyme. Delivery of GlcN6P and similar synthetic analogs into Gram-positive bacteria has also been investigated. Future work will continue to focus on this area in order to determine whether glmS gene expression is reduced and whether these analogs could ultimately inhibit bacterial cell wall synthesis.

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23. **EXPRESSION OF MATRIX METALLOPROTEASES DURING THE DIFFERENTIATION OF PORCINE ADIPOSE-DERIVED MESENCHYMAL STEM CELLS TO END. CELLS**

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Rationale: Adipose-derived mesenchymal stem cells (ADMSCs) are multipotent cells that have the potential to differentiate into different cell lineages, and represent promising tools in various clinical applications. However, the molecular mechanisms that control the ability of ADMSCs to remodel 3-dimensional extracellular matrix (ECM) barriers during differentiation are not clearly understood. Herein, we studied the expression of matrix metalloproteinases (MMPs) during the differentiation of ADMSCs to endothelial cells (ECs) *in vitro*.

Methods: MSCs were isolated from porcine abdominal adipose tissue, and characterized by positive staining for MSC markers, CD44, CD73, CD90, and negative staining for CD11b, CD34 and CD45. The plasticity of MSCs was detected by bi-lineage differentiation to osteocytes, and adipocytes. The mRNA transcripts for different MMPs and TIMPs and protein expression of EC markers were analyzed by RT-PCR and immunostaining. The enzyme activity and protein expression were also analyzed by gelatin zymography, ELISA, and Western blot.

Results: The differentiation of ADMSCs to ECs was confirmed by the positive staining and mRNA expression of the endothelial markers. The mRNA transcripts for MMP-2 and membrane type 1 MMP (MT1-MMP) was significantly increased by 2.5 and 2.0 fold, respectively, during the differentiation of MSCs into ECs. Western blot and ELISA showed an elevated MT1-MMP and MMP-2 expression. The enzyme activity of MMP-2 was also observed by gelatin zymography.

Conclusion: We demonstrated that porcine ADMSCs have the ability to differentiate into ECs, and this process involves the upregulation of MMP-2 and MT1-MMP. The increase in the expression of MMP-2 and MT1-MMP may, at least partially, facilitate the change in morphology of MSCs by degrading the ECM barriers. These findings may provide a potential mechanism for the role of MMP2 and MT1-MMP in the differentiation of ADMSCs into ECs.

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24. **IN VITRO DIFFERENTIATION OF PLURIPOTENT STEM CELL WITH COEXPRESSION OF miRNAs & TRANSCRIPTION FACTORS FOR PROMOTING HAIR CELL FATE**

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Purpose: The mammalian inner ear lacks the capacity to regenerate hair cells (HCs). Strategies for guiding pluripotent stem cells (PSCs) differentiation into HCs represent a promising approach in regenerative research. An emerging paradigm in cell reprogramming is utilization of a combination of crucial factors regulating gene expression including transcription factors (TFs) and microRNAs (miRNAs). miRNA-183 family members (miR-183, miR-96, and miR-182) are required for HC differentiation and maintenance. In addition, the TF *Atoh1* is necessary and contextually sufficient for HC development. Other TFs including *Pou4f3* and *Gfi1* are also necessary for HC differentiation and survival. Our goal is to guide PSCs toward a HC fate by co-expression of HC specific microRNAs and TFs.

Methods: We have developed a series of plasmid vectors (pVs) for co-expressing various combinations of miR-183 family members, TFs (*Atoh1*, *Pou4f3*, or *Gfi1*), and red fluorescent protein (RFP) from a single open reading frame by ribosome-mediated cleavage of intervening viral 2A peptide elements. This series of pVs was converted to adenoviral vectors (AdVs) that can be used to efficiently transduce cells. HEK293 cells were used to validate protein expression by western blot (WB) analysis, RFP expression by fluorescence microscopy and flow cytometry, and miRNA expression by quantitative reverse transcription and PCR (qRT-PCR). Induced pluripotent stem cells (iPSCs) were transfected with pVs, and cellular morphology was assessed by fluorescence microscopy. Mouse embryonic stem cells (mESCs) were used to generate embryoid bodies (Ebs) in suspension culture as a model that better recapitulates the embryonic microenvironment. EBs were transduced with AdVs to assess transduction efficiency by fluorescence microscopy, and to examine effects on cell morphology and differentiation.

Results: In HEK293 cells, vectors largely functioned as expected by yielding RFP expression and increased miRNA detection. Vectors encoding more factors yielded less RFP expression than simpler vectors, suggesting that protein expression is not equal among all vectors. However, WB analysis showed that *Atoh1*, *Pou4f3*, and *Gfi1* are produced, although one viral 2A peptide element appeared to work inefficiently and may require redesign. Cytomorphological analysis of iPSCs transfected with pVs showed that miR-183 family in combination with *Atoh1* uniquely produced some morphologically HC-like cells. EBs generated from mESCs were efficiently transduced with AdVs, and further analyses are pending.

Conclusion: Preliminary results suggest that combining HC-specific miRNAs and TFs may provide a more efficient means for differentiating HC in therapeutic strategies for HC repair.

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25. IDENTIFICATION AND CLONING OF ACTIVE CLC3 PROMOTER

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Rationale: We have earlier reported the involvement of CLC3 in TGF- β or eotaxin-induced migration and activation eosinophil. Here, we identified CLC3 promoter and the regulatory elements present on CLC3 gene to identify target in manipulating the gene response in allergic asthma.

Methods: Bioinformatics tools were used to identify promoter region and transcriptional sites present on CLC3 gene. Using UCSC genome browser the promoter region of CLC3 was identified and confirmed with EPD Bioinformatics software. The PAP, PASTAA, and DECODE (SABiosciences) softwares were used to identify the transcription-factor binding sites and translational frame was checked by Expsy software. Promoter bashing and AP-1 site-directed mutagenesis sequences were cloned to pGL4.17-promoterless vector (luc2). Along with pGL4.73-SV40 (hRluc) vector, the system was utilized for dual luciferase assay. The vectors were co-transfected to HEK293 cells with FuGENE-HD and incubated with TGF- β , eotaxin, and IL-5 to monitor CLC3 promoter activity.

Results: Promoter region of CLC3 was identified and successfully cloned from human genomic DNA into a promoterless pGL4.17 vector. Several transcription factor-binding sites, including AP-1, were identified on CLC3 promoter. Dual-luciferase assay on co-transfected HEK293 cells showed CLC3 promoter activity that was similar for both, long and short promoter clones. However, the activity was reduced to half with the respective AP-1 site-directed mutagenesis clones confirming the involvement of AP-1 in the regulation of CLC3.

Conclusions: We report the identification and cloning of an active region of CLC3 promoter that is regulated by AP-1 transcription factor. However, modulation of CLC3 promoter activity did not correlate with the RNA expression profiles in eosinophils with TGF- β , eotaxin and IL-5, suggesting other regulatory regions might be involved in controlling the expression of CLC3.

Our results will likely provide a foundation to study CLC3 and its role in the migration and activation of eosinophils in allergic asthma, and may help in finding novel therapeutic interventions.

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26. DIFFERENTIAL SMALL RNA EXPRESSION IN HAIR CELLS OF DGCR8 AND DICER1 CONDITIONAL KNOCKOUT MICE

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Purpose: Deafness has a global impact and is primarily due to inner ear hair cell loss. An understanding towards the molecular mechanisms involved in hair cell differentiation can be invaluable for attempts to restore hearing. Small RNAs including endogenous small interfering RNAs (siRNAs) and canonical microRNAs (miRNAs) transcriptionally and post-transcriptionally regulate gene expression, respectively. Canonical miRNA processing requires ribonucleases encoded by both Dgcr8 and Dicer1, whereas siRNA processing requires only Dicer1. Conditional knockout (CKO) of Dgcr8 versus Dicer1 has different effects on hair cell development and maintenance, Depletion of miRNAs appears to be more detrimental to hair cells than depletion of both siRNAs and miRNAs. Examination of small RNA content can begin to explain an imbalance between miRNAs and siRNAs which may lead to the demise of hair cells in the Dgcr8 CKO mouse.

Methods: Hair cell-specific Dgcr8 CKO and Dicer1 CKO mice were generated using Atoh1-Cre to examine small RNA content in the inner ear by high-throughput sequencing. Total RNA was isolated from inner ear of two biological replicates from each of three groups including Dgcr8 CKO, Dicer1 CKO, and control (lacking Atoh1-

Cre). Illumina small RNA sequencing was performed to identify mappable reads that differ in abundance between groups.

Results: Atoh1-Cre mediated Dicer1 CKO results in little or no hair cell loss or stereocilia aberrations in mouse cochlea up to two weeks old. However, Dgcr8 CKO hair cells show disorganized stereocilia and some hair cell loss in the base of the cochlea from one to two weeks old. To address how miRNA depletion affects siRNAs in Dgcr8 CKO mouse inner ear compared to Dicer1 CKO inner ear, small RNA sequencing was performed at two weeks of age. Results from this analysis are pending.

Conclusion: Depletion of miRNAs with Dgcr8 CKO versus depletion of both siRNAs and miRNAs with Dicer1 CKO leads to earlier hair cell defects and death. This observation suggests that perturbing the balance of small RNA function in hair cells can have devastating effects, and it highlights a possible caveat to the use of small RNAs as therapeutic agents. Examining the small RNA content of these models is expected to lead to a better understanding of small RNAs, target genes, and target processes that are involved in hair cell development and maintenance.

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27. **STUDIES TOWARDS THE SYNTHESIS OF FMOC-N-METHYL- β -(TERT-BUTYLDIMETHYLSILOXY)-L-VALINE USING THE SCHÖLLKOPF CHIRAL AUXILIARY**

Connor Griggs, Martin Hulce, and D. David Smith, Department of Biomedical Sciences, Creighton University, Omaha, NE

Methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus faecalis/faecium* (VRE) are Gram-positive bacteria that continue to be problematic pathogens in hospital acquired infections. Pargamicin A is a recently isolated cyclic hexapeptide natural product possessing potent bactericidal activities against MRSA and VRE. Currently, Pargamicin A is available in limited quantities as a purified fermentation product restricting comprehensive evaluation of this antimicrobial peptide as a therapeutic agent for the treatment of drug-resistant bacteria. As part of ongoing studies on the total synthesis of Pargamicin A, efforts towards the Schöllkopf chiral auxiliary-mediated asymmetric synthesis of Fmoc-N-methyl- β -(tert-butyldimethylsilyloxy)-L-valine, a protected form of one of the unusual amino acids constituting Pargamicin A, will be presented.

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28. **INCREASED CYTOPLASMIC CDC25A PHOSPHATASE IN CUTANEOUS SQUAMOUS CELL CARCINOMA LEADS TO 14-3-3 ϵ RELOCALIZATION AND SUPPRESSION OF APOPTOSIS**

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Non-melanoma skin cancer, the most common cancer in the United States, frequently results from chronic exposure to ultraviolet (UV) irradiation. UV-induced DNA damage activates cell cycle arrest checkpoints through degradation of the cyclin-dependent kinase activators, the Cell Division Cycle 25 (CDC25) phosphatases, which are over-expressed and, thus, deregulate cell cycle control in many human cancers. To investigate a role for CDC25 in skin cancer, CDC25 levels were examined in both UV-induced mouse tumors and human skin cancer. CDC25A and CDC25C protein and transcripts were increased in benign and malignant skin tumors from UV-exposed *v-ras*^{Ha} transgenic Tg.AC mice. CDC25B protein but not transcripts was increased in mouse skin tumors compared to normal skin. Similarly, CDC25A and CDC25C but not CDC25B were elevated in human squamous cell carcinoma (SCC) and in the premalignant precursors actinic keratosis and Bowen's disease when compared to skin. While CDC25A was localized primarily to nuclei in normal epidermis, both the premalignant precursors and SCC exhibited strong cytoplasmic CDC25A localization. To determine whether increased CDC25A stimulates

proliferation in skin SCC, CDC25A levels were modulated by siRNA-targeting or forced expression in cultured SCC cells, but no difference in proliferation resulted. Because cytoplasmic CDC25A can bind to the apoptotic regulator 14-3-3, we hypothesized that the increase in cytoplasmic CDC25A may suppress apoptosis. Forced over-expression of CDC25A in SCC cells suppressed cell death, whereas CDC25A silencing increased apoptotic cell death. Phosphorylation of CDC25A at serine178, a docking site for 14-3-3 proteins, was elevated in the cytoplasmic compartment of SCCs, and cytoplasmic 14-3-3 ϵ was increased in cutaneous SCC. Mutation of the nuclear export sequence on CDC25A relocalized both CDC25A and 14-3-3 ϵ to the nucleus, while mutation of 14-3-3 binding sites on CDC25A led to a decrease in 14-3-3 ϵ levels. Furthermore, silencing of 14-3-3 ϵ increased cell death by 60%. Taken together, these data suggest that increased cytoplasmic CDC25A in cutaneous SCC may suppress apoptotic cell death through its interaction with 14-3-3 ϵ .

29. **DIFFERENTIAL GENE EXPRESSION IN THE AMYGDALA OF A CONGENIC-LIKE FEARFUL DXH RECOMBINANT INBRED STRAIN COMPARED TO INBRED DBA/2J**

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Purpose: Twenty percent of the US population suffers from anxiety- and stress-related disorders. Here, we studied the impact of genetic disposition to increased fear learning and stress responses on gene expression in the amygdala, a region critical in regulating emotional responses.

Methods: Gene expression was compared between a congenic-like D x H recombinant inbred strain (C3H-like recombinant inbred strain, C3HLRI) showing exaggerated fear and stress responses and the background strain DBA/2J. Non-stressful cognitive learning was studied in the novel object recognition (NOR) paradigm to analyze specificity of learning deficit. Expression levels were studied using microarrays. Quantitative real-time polymerase chain reaction (qPCR) was used to confirm differential gene expression shown in microarrays (n=8-11 per group).

Results: In the NOR test, both mouse strains learned the cognitive task equally well, suggesting that differential gene expression did not affect learning per se, but was specifically related to changes in fear/stress responses. The qPCR analyses showed that, among the NAD(P)H dehydrogenase, quinone 2 (Nqo2), E2F transcription factor 3 (E2f3), glucagon-like peptide 1 receptor (GLP1R), Oxytocin (Oxt), calcium-binding protein hippocalcin (HPCA), gamma-aminobutyric acid (GABA) A receptor, beta 2 (GABRB2), family with sequence similarity 213, member A (FAM213A, a redox-regulatory protein), and Rgcc (regulator of cell cycle) genes differentially expressed in the microarrays, Nqo2, GABRB2 and HPCA were significantly down regulated and Rgcc was up regulated in C3HLRI mice compared to control DBA/2J mice.

Conclusion: Amygdalar down regulation of the Nqo2 and GABRB2 genes has been associated with increased anxiety- and fear-related behaviors. Thus, we found differential expression of genes that are specifically up or down regulated in the amygdala of the fearful and stress-prone C3HLRI mice that may play a role in the exaggerated emotional responsiveness in this strain.

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30. **PREPARATION OF $N\alpha,N\tau$ -BIS(T-BUTOXYCARBONYL)-4(5)-BENZYL-L-HISTIDINE METHYL ESTER**

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$N\alpha,N\tau$ -bis(t-butoxycarbonyl)-4(5)-benzyl-L-histidine methyl ester (Boc-BnHis(Boc)OMe, 1) is an intermediate in the synthesis of $N\alpha$ -t-butoxycarbonyl- $N\tau$ -benzyloxymethyl-4(5)-benzyl-L-histidine (Boc-BnHis(BOM)OH), a fully protected histidine derivative that is suitable for solid phase peptide synthesis. While 1 is readily prepared from the reaction of 4(5)-benzyl-L-histidine methyl ester with excess di-t-butylidicarbonate under basic conditions, a second di-Boc derivative also is isolated after flash column chromatography of the crude reaction product. 1H-NMR

suggests this derivative to be the positional isomer $N\alpha,N\pi$ -bis(*t*-butoxycarbonyl)-4(5)-benzyl-L-histidine methyl ester (2). Our efforts to obtain the desired intermediate 1 free of isomeric 2 using medium pressure liquid chromatography employing a glass column packed with normal phase silica will be presented.

31. INVESTIGATIONS OF THE BIOCHEMISTRY BEHIND IMMUNITY IN ANASA TRISTIS

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In our lab, we aim to elucidate the role of eicosanoids in the cellular immunity in the squash bug, *Anasa tristis*. Squash bugs are common pest insects found in the Midwest region of America and are harmful to major crops in the area. Currently we are working to investigate its immune response to a bacterial pathogen *Serratia marcescens*. Assays were also performed on the spined soldier bug, *Podisus maculiventris*, during periods when squash bugs were unavailable due to diapause. In the past we did this by analyzing an infected bug's hemocyte proliferation, microaggregate formation, and nodulation in comparison to control insects. Eleven of 31 challenged squash bugs (35.5%) showed nodulation. The average count per challenged bug was 190 hemocytes and 2.56 microaggregates. This compared to 1 out of the 11 insects with nodulation (9.09%), and an average count of 145 hemocytes and 0.33 microaggregates in the control squash bugs. Of 14 challenged spined soldier bugs, 1 showed nodulation (7.14%) whereas two of 17 control insects showed nodules (11.8%). The hemocyte count was 2820 for challenged spined soldier bugs compared to 1210 in controls. The bacteria, *S. marcescens*, induced an immune response in both types of insects. In our recent studies, we focused primarily on nodulation and made changes to certain parameters in our experiment. We aimed to improve our results by using adult squash bugs, decreasing our volume of injected bacteria, and increased incubation time to extend the vitality of the squash bugs. Unfortunately, this was disadvantageous because we observed significantly lower levels of nodulation. Recently, our collaborators have found that more nodulation is observed using higher levels of magnification, heat killed bacteria, and late stage nymphs.

32. EVALUATION OF CERAMIC FILTER ELEMENTS FOR USE IN PERSONAL WATER FILTERS

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Rationale: Safe drinking water is a major health concern for those living in developing countries. Ceramic filter elements provide an effective means for purifying contaminated water. The Institute for Latin American Concern has made personal water filters available to rural Dominican families since 1997. Currently in use are ceramic, candle filters (long) that remove more than 99% of pathogens in contaminated drinking water. In this research project we attempted to determine if the current long filter is comparable to a short, mound-shaped ceramic filter, which is cheaper, sturdier, and faster at filtration than the long filters. If the short filter gives similar or better results for limiting passage of bacteria, then it will be a better choice in providing a safe source of drinking water for rural Dominican families.

Methods: To compare the ability of the two types of ceramic filters to purify water, 5 gallons solutions of non-pathogenic *E. coli* strain, ATCC25922, were prepared ($\sim 1 \times 10^8$ colony forming units/100 mL). A solution was divided equally between a standard long filter and a test filter. Three long filters and four short filters were tested. After 24 hours of filtration, 100 mL of purified water was sampled from each filter. Samples were diluted, if necessary, and sterile filtered to separate the bacteria from the water. The membrane was removed from the filter, placed in a petrie dish with m-ColiBlue24 media, and incubated at 35°C for 24 hours. Bacteria colonies were counted and ratios of bacteria allowed through the filters were calculated.

Results: Our results demonstrated long filters to have better bacteria rejection than short filters. On average, short filters passed 25 times more bacteria than the long filters. In addition, statistical analysis of our results showed that there was less variability in the data from the long filters.

Conclusion: From this study, it was concluded that the long filters were more reliable for producing safe drinking water than the short ones. This type of filter will be continued to be used by ILAC.

33. **AN EFFICIENT SYNTHESIS OF NIM-PROTECTED 4-L-PHENYLSPINACINE AND ITS METHYL ESTER**

Brendan Cokingtin and Martin Hulce, Department of Chemistry, Creighton University, Omaha, NE

An efficient synthesis of 4-L-phenylspinacine from L-histadine and benzaldehyde in the presence of sodium hydroxide was accomplished via a Pictet-Spangler reaction. The recrystallization process took place over one week's time in a refrigerator, and repeated recrystallization was carried out in order to maximize the yield. Characterization of the product using IR spectroscopy, NMR analysis, and mass spectrometry revealed the presence of the cis isomer of the product only. Subsequent esterification of the cis-4-L-phenylspinacine with methanol and thionyl chloride was performed at reflux for roughly 24 hours in order to achieve the formation of cis-L-4-phenylspinacine methyl ester. Acid-base extraction of the solid, crude product into chloroform gave pure methyl ester. N-selective tosylation of this ester will be discussed.

34. **METABOLIC PROFILING OF CULTURED MURINE COCHLEAE VIA FLUORESCENCE LIFETIME MICROSCOPY**

Lyandysha Zholudeva, Kristina Ward, Michael Nichols, and Heather Jensen Smith, Department of Chemistry, Creighton University, Omaha, NE

Purpose: Aminoglycoside antibiotics are implicated as culprits in hearing loss of more than 120,000 individuals annually. Research has shown that of the two cochlear cell types, sensory and supporting cells, sensory cells are readily damaged by such antibiotics. Furthermore, of the two types of sensory cells, inner and outer hair cells (IHCs, OHCs), OHCs in the high-frequency region of the cochlea exhibit the greatest sensitivity to antibiotic ototoxicity. Our purpose is to determine if variations in sensory and supporting cell mitochondrial metabolism account for the differences in ototoxic susceptibility.

Methods: To identify variations in mitochondrial metabolism, we employ two-photon fluorescence lifetime microscopy (FLIM) to measure changes in the metabolic reporter molecule NADH in sensory and supporting cells from explanted murine cochleae. Mitochondrial uncouplers, inhibitors and an ototoxic antibiotic, gentamicin (GM), were used to assess high- and low-frequency IHC, OHC and supporting cell (Pillar) mitochondrial metabolism.

Results: Chemically induced changes in metabolic state resulted in a reorganization of specific NADH lifetimes into altered subcellular fluorescence lifetime pools. Variations in NADH intensity and average NADH lifetime were greatest in high-frequency OHCs. Pretreatment with GM significantly increased NADH intensity in high-frequency sensory cells but not supporting cells. Treatment with GM significantly increased the average NADH fluorescence lifetime within IHCs but not OHCs. GM also caused a significant increase of NADH concentration in OHCs, not IHCs.

Conclusion and Significance: These results demonstrate that there are essential differences between sensory and supporting cell metabolism. Furthermore, GM causes differential changes to IHC and OHC metabolism, respectively. This study suggests a novel mechanism for antibiotic-induced ototoxicity which may lead to the development of alternative approaches to for the prevention and treatment of hearing loss.

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35. **AN EFFICIENT SYNTHESIS OF 4-L-STYRYLSPINACINE**

Kevin Cokingtin and Martin Hulce, Department of Chemistry, Creighton University, Omaha, NE

An efficient synthesis of 4-L-styrylspinacine from L-histidine and trans-cinnamaldehyde was developed. A Pictet-Spengler reaction between L-histidine and trans-cinnamaldehyde promoted by strong base potassium hydroxide was performed. This mixture was heated at reflux for one hour, after which the solvent was concentrated by rotary evaporation. The resulting mixture's pH was lowered with hydrochloric acid to produce a single stereoisomer of 4-L-styrylspinacine. Purification of the spinacine product by extraction using chloroform and aqueous acid or base was investigated. Results of purification and selective hydrogenolysis to provide 4(5)-[3-phenylpropyl]-L-histidine will be discussed.

36. **ON THE GAS PHASE DEUTERATION OF METHANE OVER PALLADIUM**

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We have studied the gas-phase deuteration of methane with deuterium gas over a palladium-coated alumina support. The reaction proceeds by two competing mechanisms: at lower temperatures a single D/H exchange takes during a single residence of methane on the palladium. This is believed to occur via a concerted transition state: Pd...D...CH₃...H...Pd. At higher temperatures, methane oxidatively adds to palladium and D/H exchange is extensive and nearly statistical prior to reductive elimination of methane-d_x, x = 0 – 4. Products and distributions of isotopologues are determined by mass spectroscopy and proton nmr.

37. **DEVELOPMENT AND OPTIMIZATION OF CARBON PASTE MICROELECTRODES FOR ELECTROGENERATED CHEMILUMINESCENCE DETECTION ON A MICROFLUIDIC**

Rachel M. Kuntz, John B. Wydallis, Meghan M. Mensack, Rachel Feeny, Charles S. Henry and Erin M. Gross, Department of Chemistry, Creighton University, Omaha, NE

Carbon paste microelectrodes can be used to electrochemically detect a variety of compounds accurately and quickly. They are inexpensive and easy to fabricate. In this study, carbon paste microelectrodes were used to electro-analytically detect an electro-generated chemiluminescent (ECL) signal produced by the reaction between tris-(2,2'-bipyridyl)ruthenium(II) (Ru(bipy)₃²⁺) and tripropylamine (TPrA). The microelectrodes studied were 500µm wide with 500µm spacing and a height of either 50µm or 25µm. Within these height groups different reference electrodes were tested: an Ag/AgCl reference and a quasi-carbon paste (qscp) reference. The microelectrodes were characterized using cyclic voltammetry with a 4mM Ru(bipy)₃²⁺ solution. From there, the ECL reaction between Ru(bipy)₃²⁺ and TPrA was used to optimize the response of the microelectrode. Using a microfluidic flow system, the potential applied was optimized for all of the different types of microelectrodes fabricated (25µm height with quasi-carbon paste reference, 50µm height with Ag/AgCl microelectrode). The ECL peak intensity of the different microelectrodes was compared. The 25µm height microelectrode with the qscp reference had peak ECL intensity at 0.9V of 5301 counts. The 50µm height microelectrode with the Ag/AgCl reference showed a much lower ECL signal of 2400 counts at 1.3V. Work to obtain ECL signals for the 50µm height with the qscp reference is ongoing. From the data currently available, it has been shown that the 25µm height microelectrode with the qscp reference is reliable.

38. **STRUCTURAL CHARACTERIZATION OF A MAMMALIAN RIBOSWITCH IN THE SPERMINE BIOSYNTHETIC PATHWAY**

Brian Farrell, Zac Holmes, Katie DelVecchio, Garrett Soukup, and Juliane Soukup, Department of Chemistry, Creighton University, Omaha, NE

Riboswitches are found in the 5' untranslated region of mRNAs that bind cellular metabolites and induce a conformational change in the mRNA, subsequently modifying the expression of the coding region nearby. This coding region is involved in the synthesis of the same metabolite it binds, and this system provides an efficient feedback mechanism of genetic control. Various riboswitches have been described as effective controls of genetic expression in bacterial cells, but we propose here a potential mammalian riboswitch. We are investigating the structure and function of a potential mammalian riboswitch conserved over a wide variety of species and thought to control polyamine biosynthesis. Polyamines are essential for cellular proliferation and differentiation, and therefore they play a key role in cancer and tumor development. The goal of this project is to solve the crystal structure of this

putative riboswitch RNA bound to the polyamine spermine. Preliminary crystallization results have aided in optimizing the chemical conditions necessary for crystal growth. In addition we will study the thermodynamic properties of spermine binding to its riboswitch by utilizing Isothermal Titration Calorimetry (ITC). ITC directly measures the energy involved in the binding of ligand to the sample. Results will render a better understanding of the binding properties of the metabolite to the RNA and may aid in development of synthetic ligands/metabolites for use as cancer therapies.

39. **DEVELOPMENT OF ARTIFICIAL AGONISTS AS CANDIDATE ANTIBIOTICS FOR A BACTERIAL RIBOSWITCH**

Julianna Diddle, Tommy Holmes, Alex Stock, Lauren Hintz, Dan Delaney, Xiang Fei, David Berkowitz, and Juliane K. Soukup, Department of Chemistry, Creighton University, Omaha, NE

The bacterial glmS ribozyme is a mechanistically unique functional RNA among both riboswitches and RNA catalysts. Its self-cleavage activity is the basis of riboswitch regulation of glucosamine-6-phosphate (GlcN6P) production, and catalysis requires GlcN6P as a coenzyme. The glmS riboswitch binds to GlcN6P, a building block of the cell wall in Gram-positive bacteria, and undergoes self-cleavage resulting in inactivation of the RNA. As a result, modulation in gene expression occurs through an efficient feedback mechanism.

We are developing non-natural GlcN6P analogs that retain coenzyme function and work as artificial riboswitch agonists. The goal of this project is to determine whether artificial riboswitch agonists compare kinetically to the natural ligand. We measured second-order rate constants at subsaturating coenzyme concentrations, below 20% of K_m values, under so-called k_{cat}/K_m conditions. Two ligand analogs show promise as candidate antibiotics due to their catalytic efficiencies, namely those bearing a 6-phosphonomethyl group or a 6-O-malonyl ether. Kinetic profiles show a 22-fold and a 27-fold higher catalytic efficiency, respectively, for these two analogs than is observed with glucosamine. These ligand analogs may disrupt normal cell metabolism in a variety of bacterial pathogens that harbor the glmS ribozyme.

40. **BIOMOLECULAR MODELING OF SYNTHETIC ALZHEIMER'S A β PROTOFILAMENTS**

Brendy Aoki¹ and Patricia Soto², ¹Department of Chemistry and ²Department of Physics, Creighton University, Omaha, NE

Amyloid proteins are a class of proteins that exhibit distinct monomeric and oligomeric conformational states hallmark of the deleterious neurological disease, Alzheimer's disease. My goal is to examine the conformation of synthetic A β protofilaments that display polymorphism in two-fold and three-fold symmetry, to further assess the binding and/or insertion into a model lipid bilayer of the brain, which is hypothesized to have degenerative effects on brain cells. To do this, I used biomolecular modeling techniques. I will present the results of my free energy calculations to illustrate patterns in the binding energies of A β peptide stacking in the protofilaments and the interaction of the protofilaments with bilayers.

41. **EXTRACTION AND QUANTIFICATION OF NICOTINE FROM DOSED AVIAN EMBRYOS**

Joshua Cogell, David Dobberpuhl, and Mark Reedy, Department of Chemistry, Creighton University, Omaha, NE

Cigarette smoke can have significant health consequences, especially for a developing fetus. As such, pregnant women who smoke are recommended to consider alternatives such as nicotine patches or gum. However, nicotine is powerful drug with cholinergic activity. Previous work with avian embryos, which are used as analogs to human fetuses, has shown that nicotine slows growth, alters heart rate, and eventually results in neurological changes. This abnormal development suggests that nicotine in the albumen is absorbed by the embryo. Initial work reported here focused on identifying chromatographic strategies offering the most promise for the determination of nicotine. Gas chromatography with mass spectrometry (GC-MS) proved to be more promising than high performance liquid chromatography with UV absorbance detection (HPLC-UV). Avian eggs subsequently were dosed with nicotine tartrate at 24 hours of incubation with the total concentration of nicotine in the egg approximating plasma levels of women using the nicotine patch. Five-day-old embryos were then excised and homogenized. The resulting solutions

underwent further acid/base extraction culminating with head space capture solid-phase micro-extraction (SPME) and analysis by GC-MS. Standard curves are presented for both 1 μ L neat standards and SPME fibers. Several extraction strategies were investigated using various solvents and solid-phase techniques. Results indicate that nicotine extraction is challenging given the complex biological system. The ultimate goal is the development of an extraction strategy that isolates nicotine from the embryonic matrix and allows for accurate quantitation of nicotine.

42. **Mode Coupling Theory in Sodium Hexametaphosphate**

Jamison Duckworth , Department of Physics Creighton University, Omaha, NE

Mode Coupling Theory (MCT) has predicted the “freezing” out of the fast dynamics in glasses at below the glass transition point. Fast dynamics (β relaxation time) correspond to the free particle motion within the glass structure. According to MCT, as temperature falls the kinetic energy, or motion, of the particles will lessen and eventually stop. It is possible to understand the structure of the glass better by studying when these dynamics occur and when they “freeze” out. To track the freezing out of the fast dynamics one must measure the change in the non-ergodic level. This level is measured by dynamic light scattering on a translating glass sample to achieve ensemble averaging. In this study, we report attempts on ensemble-averaged light scattering on sodium hexametaphosphate glass at temperatures below the glass transition point.

43. **APPLYING ORGANIC LIFE CONCEPTS TO MECHATRONIC SYSTEMS**

Rustin Haase , Department of Physics, Creighton University, Omaha, NE

Since the beginning of the industrial revolution, people have been taking concepts found in nature and have applied them to the machines that they build, essentially doing a technology “transfer” from living nature to technology. This presentation is a categorization and summary of the most significant transfers known at present. It also elaborates on what makes them significant and how humanity has been affected by such scientific and engineering achievements. The presentation also lists and elaborates on likely future transfers along with their consequences. Modern machines are usually a combination of mechanical, electrical, and computational systems designed to be controlled by the user. These are called “mechatronic” systems and are excellent recipients of technology transfers from organic life processes. An effort has been made by the author to make a concise list of concepts that, when applied to mechatronics, can lead to a highly autonomous and useful industrial system with true metabolic qualities. Elaboration on the challenges, benefits and issues involved will also be presented. The presenter/author emphasizes the significance of this kind of achievement by calling it the beginning of a second industrial revolution.

44. **JET QUENCHING AND JET IDENTIFICATION OF BOTTOM JETS IN COLLISIONS AT ALICE**

Gleb Batalkin, Department of Physics, Creighton University, Omaha, NE

Purpose: A Large Ion Collider Experiment (ALICE) is one of six major experiments at the European Organization for Nuclear Research (CERN). Collisions at CERN produce countless subatomic particles. Some particles, like the B-meson, contain heavy quarks, which cause them to decay into a collection of particles moving in nearly the same direction. This collection of particles, which travels in a narrow cone outward from the collision, is defined as a jet. This work’s aim is to study an identification method as well as the interactions of heavy Bottom jets at ALICE.

Methods: The proposed method for identifying Bottom jets involves finding the fastest moving most common decay products of a B-meson and using them to estimate the momentum of the original B-meson. Then, by performing a Lorentz boost and by plotting the longitudinal momentum distribution of all particles in the event, it is possible to select out only those particles that decayed from the original B-meson. Such particles would have a nearly zero longitudinal momentum after the boost.

Results: Applying this method to simulations shows a significant enhancement in the fraction of Bottom jets in the selected sample compared with a random sample of jets.

Significance: This method of Bottom jet identification can be employed in real-world data to study heavy flavor jets in collisions at ALICE. These Bottom jets are especially important because Bottom quarks are less likely to be stopped in the dense nuclear matter produced in these collisions. Thus, Bottom jets can be used to probe the interior of the dense nuclear matter produced in collisions.

Acknowledgements: Creighton University Department of Physics, ALICE Collaboration at CERN, US Department of Energy

45. **CHANGE IN UV ABSORPTION OF THE ACTIVE GALACTIC NUCLEUS, MARKARIAN 279**

Zachary Monti, Department of Physics, Creighton University, Omaha, NE

We present an analysis of the mass outflow in the Active Galactic Nucleus (AGN), Markarian 279. The analysis focuses on the absorption variability of the mass outflow. All the data were collected from spectrographs aboard the Hubble Space Telescope (HST). We compare the absorption spectrum from the Cosmic Origins Spectrograph (COS) to that of the Space Telescope Imaging Spectrograph (STIS) and the Far Ultraviolet Spectroscopy Explorer (FUSE). We model the absorption to further constrain the physical conditions and geometry of the mass outflow.

46. **ACTIVE CANCELLATION OF MAGNETIC FIELDS USING HELMHOLTZ COILS**

Shouvik Bhattacharya, Department of Physics, Creighton University, Omaha, NE

Cancelling fluctuations due to exterior magnetic fields plays a key factor in the Bose-Einstein Condensation and ultra-cold atom experiments because the experimental setup requires a precise control of the magnetic field. To name a few sources that cause fluctuations within the magnetic fields are: power source, lab equipment, geomagnetic field, and the space weather. An active cancellation of the magnetic field is achieved by using three pairs of Helmholtz coils. This setup is expected to be able to screen magnetic field fluctuations up to 3 kHz. An array of six single-axis magnetic sensors is used to detect variation in the magnetic field, which controls the amount of current in Helmholtz coils through a proportional and differential (PID) controller in a feedback loop.

47. **THE HALL EFFECT'S USE IN CREIGHTON UNIVERSITY'S MATERIAL SCIENCE RESEARCH**

Jason W. Rogers, Department of Physics, Creighton University, Omaha, NE

The Hall Effect, a phenomenon discovered by Edwin Hall in 1879, uses the basic principles of Electricity and Magnetism to divert electrons in a vertical electric field into the horizontal direction. The helical motion of these electrons then provide a measurable parameter which can give further insight into the electrical properties of the material that is carrying the current. The Hall Effect, therefore, has great uses in the field of material science to determine properties of newly created materials under various environmental conditions. The Creighton University Physics Department is currently in the process of setting up and calibrating their own Hall apparatus.

48. **ION CYCLOTRON RESONANCE MASS SPECTROMETER**

William Collins, Department of Physics, Creighton University, Omaha, NE

The Ion Cyclotron Resonance Mass Spectrometer is a device used to determine the mass of a long chain molecule, usually a hydrocarbon. The molecule is first showered with electrons to split the molecule into smaller functional groups and contained with 6 orthogonal plates which form electric fields with an external magnetic field. These fragments are spin at a high angular velocity and the resonance signals produced are interpreted via a Fourier Transformation.

49. **ENDOGENOUS DIFFERENCES IN COCHLEAR SENSORY AND SUPPORTING CELL MITOCHONDRIAL METABOLISM BIAS FREE RADICAL PRODUCTION DURING OTOTOXIN EXPOSURE**

Danielle Desa, Christina Miller, Michael G. Nichols, Heather Jensen Smith , Department of Physics Creighton University, Omaha, NE

Purpose: Aminoglycosides, including gentamicin (GM), are the most frequently used antibiotics in the world despite irreversible cochlear damage and hearing loss associated with their use. Although there are numerous causes of deafness, reactive oxygen species (ROS) are key regulators of multiple pathologies including: ototoxicity, noise-induced and age-related hearing loss. Unfortunately, the source of these cell-damaging ROS remains controversial. Given that ROS are normal byproducts of ATP synthesis, intrinsic differences in cochlear sensory (inner and outer hair cell, I/OHC) and supporting (pillar) cell mitochondrial metabolism may explain why high-frequency OHCs are profoundly sensitive to a host of challenges.

Methods: Mitochondrial metabolism was compared in low-frequency and high-frequency IHCs, OHCs and pillar cells from acutely cultured cochlear explants. Intensity-based changes in the metabolic intermediate, nicotinamide adenine dinucleotide (NADH), were used to measure endogenous, mitochondrial toxin and GM-induced differences in sensory and supporting cell mitochondrial metabolism. In addition, DHR-123 was used to detect sensory and supporting cell ROS production during GM exposure.

Conclusion and Significance: Sensory cell mitochondrial metabolism was significantly enhanced relative to supporting cells. Despite similar amounts of mitochondria in IHCs and OHCs, endogenous levels of NADH were greatest in high-frequency OHCs. Metabolic profiling of NADH metabolism revealed basal turn, high-frequency OHCs to be metabolically responsive to a number of changes in their microenvironment including metabolic toxins and GM, while high-frequency IHCs, low-frequency I/OHCs and, pillar cells are substantially less sensitive. Within 30 minutes of GM application, ROS are dramatically and specifically increased in high-frequency sensory cells. GM-induced changes in mitochondrial metabolism and cell-damaging free radical production were greatest in high-frequency OHCs. This metabolic predisposition is a part of the base for understanding the underlying mechanism(s) of ROS production in cochlear cells and developing antibiotics that do not cause permanent hearing loss.

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50. **MOLECULAR MODELING OF THE INHIBITION DYNAMICS OF THE CELLULAR PRION PROTEIN**

Charles Nguyen, Ian Collin, Jason Bartz, and Patricia Soto, Department of Physics, Creighton University, Omaha, NE

Prions are infectious agents responsible for transmissible spongiform encephalopathies (TSEs), a type of fatal neurodegenerative disease in mammals. Prions propagate biological information by conversion of the non-pathological version of the prion protein to the infectious conformation, PrP^{Sc}. A wealth of knowledge has shed light on the nature and mechanism of prion protein conversion. In spite of the significance of this problem, we are far from fully understanding the conformational dynamics of the cellular isoform. To remedy this situation we employ multiple biomolecular modeling techniques such as docking and molecular dynamics simulations to map the free energy landscape and determine what specific regions of the prion protein are most conducive to binding. The overall goal is to characterize the conformational dynamics of the cell form of the prion protein, PrP^c, to gain insight into inhibition pathways against misfolding.

51. **STUDENT REFLECTIONS ON PROJECT-BASED PEDAGOGIES IN PHYSICS COURSES**

Kristina Ward and Gintaras K Duda, Department of Physics, College of Arts and Sciences, Creighton University, Omaha, NE

Project-Based Learning (PBL) is a form of teaching that helps students become active learners. It starts with the idea that all learning begins with a problem, and not all of the necessary information needed to solve the problem are provided to students in the real-world. The goal of PBL is to create students that are both active and reflective learners. This poster will present the results of student reflections from several PBL courses at Creighton, including an upper division quantum mechanics course and a freshmen level integrated calculus and physics course. Reflections were assigned periodically throughout the semester to give students an opportunity to monitor their progress toward course goals. The PBL courses will be described and common themes will be presented and discussed, such as motivation, changes in students' epistemologies, and teaming issues. Student suggestions for more successful implementations of PBL pedagogies will also be discussed.

52. **THE ROLE OF SOLVENT CONCENTRATION IN SOLVENT VAPOR ANNEALING OF PS-PLA**

Mark Akubo, Ryan Gnabasik, and Andrew Baruth, Department of Physics, Creighton University, Omaha, NE

Block polymers have garnered increased interest and importance/relevance in the arena of lithographic templating for nanofabrication. For example, it has been shown useful for integrated circuitry in microelectronics, ultrafiltration membranes, hardness coatings for scratch and wear resistance, as well as potential in magnetic storage. To prove efficacy of this method, a protocol to direct the ordering of these structures in a reliable way is paramount. Solvent vapor annealing (SVA) introduces a solvent vapor into this film, whereupon the film swells, in order to lower the glass transition temperature to promote mobility and has been shown effective in recent years.

Solvent concentration has been shown key throughout the stages of SVA of PS-PLA thin films (50 – 100 nm) to successfully direct the ordering; from polymer deposition, swelling during annealing and eventual solvent evaporation. Of importance, solvent concentration plays a huge role in the thermodynamic and dynamic interactions at the two interfaces (i.e., free surface and substrate). These thin polymer films are spin coated onto hydrophobically modified Si wafers. At this stage, critical parameters include thickness, roughness, and composition, which require measurement and monitoring. We use an optical technique known as spectral reflectance to measure the film thickness, which is shown to be a direct measure of solvent concentration. We show the various fitting parameters in spectral reflectance that are relevant to this study and show preliminary data for its use in controlled SVA.

53. **CONFIRMATION OF RIGIDITY THEORY IN ALUMINOPHOSPHATE GLASSES**

Adam Keller, David Sidebottom, and Tri Tran, Department of Physics, Creighton University, Omaha, NE

Glass is a network forming liquid. What gives glass its properties (fragility, strength, etc.) are the constituents of the network and how they form the network. In rigidity theory, it is believed that the number of bonds each constituent provides to the network is directly related to the strength of the glass. To test this, liquid glasses of varying composition are studied using dynamic light scattering to measure the dynamic structure factor. The dynamic structure factor can be analyzed to determine a composition's fragility and correlated with the number of contributing bonds in the network.

In Tri Tran's study of glass forming aluminophosphate mixtures, the dynamic structure factor was analyzed for the shaping parameter and fragility. His results will be compared to expected results for a similar mixture. Mixtures studied included (X) aluminophosphate (AlPO_4) + (1-X) sodium metaphosphate (NaPO_3); which yields a constant phosphate concentration and (X) Sodium Aluminate (NaAlO_2) + (1-X) sodium metaphosphate; which yields a constant sodium concentration.

54. **SIMULATING THE GALACTIC PULSAR POPULATION**

Damian Daszynski and Kyle Watters, Department of Physics, Creighton University, Omaha, NE

When a star's life comes to an end, its mass determines whether or not it explodes in a devastating supernova. Depending on the type of supernova, it is possible that the only remains of the star will be a small, ultradense core called a neutron star. These newborn neutron stars spin rapidly and pulse like a lighthouse beacon, giving them their name, pulsars, which originated from the phrase pulsating stars. Much is still unknown about pulsars and many of

our current hypotheses are based only on theory. Using theory, we are able to predict both the interior and exterior environments of the star. In this project, we focus on the exterior environment, also known as the magnetosphere, which is dominated by a powerful magnetic field with magnitudes upwards of one trillion gauss (compare that to Earth's magnetic field strength at 0.5 gauss). Our research consisted of developing and optimizing a galactic simulation code that effectively modeled the properties of pulsars throughout the Milky Way. By attempting to match our simulations to observed parameters, we could better predict the characteristics of Milky Way pulsars. We have determined a set of simulation parameters, including initial spin period and magnetic field strength, which successfully reproduce most properties of the observed galactic pulsar population.

55. **DESIGN, CONSTRUCTION, AND TESTING A PURPOSE-BUILT CLIMATE-CONTROLLED SOLVENT VAPOR ANNEALING CHAMBER FOR GUIDED SELF-ASSEMBLY OF**

Ryan Gnabaski and Andrew Baruth, Department of Physics, Creighton University, Omaha, NE

Purpose: Despite its efficacy to produce well-ordered, periodic nanostructures, the intricate role multiple parameters play in solvent vapor annealing has not been fully established. In solvent vapor annealing a thin polymer film is exposed to the vapors of a solvent(s) thus forming a swollen and mobile layer to direct the self-assembly process at the nanoscale. Recent developments in both theory and experiment have directly identified critical parameters, but controlling them in any systematic way has proven non-trivial. These identified parameters include vapor pressure, solvent concentration in the film, and, critically, the solvent evaporation rate.

Methods: To explore the role of these parameters on solvent vapor annealing, a purpose-built chamber was designed and constructed, paying special attention to solvent compatibility and computer-aided control over the annealing process. Atomic force microscopy was used to image the annealed films to investigate final morphology.

Results: The all-metal chamber has proven inert to solvent exposure and pneumatically actuated valves allow for controlled introduction and precision timing in the removal of solvent vapor (demonstrated to occur in less than 20 ms) from the film. Furthermore, the mass flow controlled inlet, chamber pressure gauges, in situ spectral reflectance-based thickness measurements, and high precision micrometer relief valve, give real-time monitoring and control during the annealing and evaporation phases. Of note, the controlled inlet and thickness monitoring is computer controlled. The successful solvent-induced directed ordering is demonstrated via atomic force microscopy of the annealed films.

Conclusions: The solvent vapor annealing chamber has been built and the design considerations discussed above appear effective. The anticipated perpendicular cylindrical morphology has been demonstrated via atomic force microscopy.

Acknowledgements: Funded by Creighton University Summer Faculty Fellowship Award.

56. **PROGRESS TOWARDS A ^{41}K SPINOR BOSE-EINSTEIN CONDENSATE**

Nathan Holman, Sruti Prathivadhi-Bhayankaram, Luke Slattery, Alex Tarter, and Jonathan Wrubel, Department of Physics, Creighton University, Omaha, NE

We report on the progress made in constructing an apparatus to create a potassium-41 Bose-Einstein condensate (BEC) at Creighton University, a primarily undergraduate institution. Several major components of the experiment have been completed including an external-cavity diode laser, laser characterization systems, and the saturated absorption system for laser wavelength locking. Our immediate goals are to complete construction of an atomic source and 2D magneto-optical trap by summer's end. We plan to use this system to study spinor physics in a ^{41}K BEC. Namely, we will utilize predicted radio-frequency Feshbach resonances to continuously alter the magnetic properties of the system from ferromagnetic to anti-ferromagnetic. Using the radio-frequency Feshbach resonance we aim to explore previously inaccessible magnetic phases and their dynamics.

57. **SIMULATIONS OF η_c PRODUCTION IN ULTRAPERIPHERAL LEAD-LEAD COLLISIONS AT 14 TEV IN ALICE**

Barak R. Gruberg Janet Seger, Department of Physics Creighton University, Omaha, NE

Purpose: ALICE (A Large Ion Collider Experiment) is one of the LHC's (Large Hadron Collider) main experiments at CERN, the world's largest particle accelerator. Its main purpose is to study matter under extreme conditions. Run1, the first run of data collection, ended at the end of 2012 and the LHC entered a two-year shutdown period to allow the experiments and accelerator to perform upgrades. Our study focuses on ultraperipheral collisions, an interaction between hadrons governed by the electromagnetic force and characterized by an impact parameter greater than the sum of the radii of the projectiles – in this case twice the radius of a lead nucleus. In preparation for Run2, at energies of 14 TeV, we explore the possibility of measuring the cross section of η_c , the charmed η meson, in two-photon production in ultraperipheral Pb-Pb collisions in ALICE. It has been suggested that the η_c cross section might show the effects of the Odderon, an exotic particle whose existence has not been experimentally confirmed. Photoproduction of the η_c would be a significant background to this process, so it is important to know the photoproduction cross section to high precision. We focus on the four channel decay of the η_c into $K^+ \pi^- K^- \pi^+$.

Methods: We perform Monte Carlo simulations with STARlight, in conjunction with Pythia8, to calculate the geometric acceptance and detector efficiency for this decay channel. We then calculate a preliminary η_c production rate at which this decay channel will be observed to determine whether this is a feasible analysis for Run2.

Conclusion: The preliminary production rate suggests that enough η_c particles will be observed in ALICE during Run2 in order to measure the photoproduction cross section of η_c .

Acknowledgment: This research was partly funded by the DOE.

58. CONFORMATIONAL DYNAMICS OF AMYLOID PROTEINS AT THE AQUEOUS INTERFACE

Matthew Armbruster, Nathan Horst, Brendy Aoki, William Marquardt, Saad Malik, and Patricia Soto, Department of Physics, Creighton University, Omaha, NE

Amyloid proteins is a class of proteins that exhibit distinct monomeric and oligomeric conformational states hallmark of deleterious neurological diseases for which there are not yet cures. Our goal is to examine the extent of which the aqueous/membrane interface modulates the folding energy landscape of amyloid proteins. To this end, we probe the dynamic conformational ensemble of amyloids (monomer prion protein and Alzheimer's Ab protofilaments) interacting with model bilayers. We will present the results of our coarse grain molecular modeling study in terms of the existence of preferential binding spots of the amyloid to the bilayer and the response of the bilayer to the interaction with the amyloid.

59. MOLECULAR MODELING OF THE CONFORMATIONAL DYNAMICS OF THE CELLULAR PRION PROTEIN

William Graft, Patricia Soto, William Graft, Ian Colling, Charles Nguyen, Shannon L. Bartelt-Hunt, and Jason Bartz, Department of Physics, Creighton University, Omaha, NE

Prions are infectious agents responsible for transmissible spongiform encephalopathies, a fatal neurodegenerative disease in mammals, including humans. Prions propagate biological information by conversion of the non-pathological version of the prion protein to the infectious conformation, PrP^{Sc}. A wealth of knowledge has shed light on the nature and mechanism of prion protein conversion. In spite of the significance of this problem, we are far from fully understanding the conformational dynamics of the cellular isoform. To fill this gap, we employ biomolecular modeling techniques to study i) binding modes of short peptide inhibitors to Syrian hamster prion protein, ii) conformational dynamics species barrier effect between ferret and mink prion protein, and iii) mechanisms of interaction between prion proteins and model surfaces.

60. SYNTHESIS OF COPPER MONOSULFIDE THIN FILMS BY EX-SITU SULFIDATION

Erin Cheese, Brianna Baca, Anton Yanchilin, and Andrew Baruth, Department of Physics, Creighton University, Omaha, NE

Copper Monosulfide (CuS) has received recent interest for its use as a p-type transparent conductor. CuS films of nominal thickness ~110 nm, prepared by ex situ sulfidation of thermally evaporated copper, exhibit a carrier density of $\sim 1 \times 10^{22}$ cm⁻³ holes/cm³ and a resistivity of ~ 200 $\mu\Omega$ cm at room temperature. In addition, the films have a ~60% (peak) optical transmission throughout the visible range with an indirect band-gap near 1.6 eV. The high carrier concentration leads to a strong suppression of transmission in the infrared. As a result, the properties of CuS may be useful in semi-transparent photovoltaic and architectural glazing applications. In this presentation we describe the synthesis method, where 50 nm films of copper are thermally evaporated onto a soda lime glass substrate and immediately vacuum sealed in a glass ampoule containing sulfur powder. After annealing for 8 hours at 400°C, phase-pure CuS was formed. The resultant films' surface morphology is examined using atomic force microscopy, as large single crystalline features are known to form on the surface at elevated sulfidation temperatures. Optical transmission and absorption are measured using UV-Vis and ATR-FTIR spectroscopy. Finally, temperature-dependent carrier concentration and mobility is investigated using the Hall Effect, while resistivity is measured in the van der Pauw configuration.

61. VALIDITY AND RELIABILITY OF SPECTRORADIOMETER USING A 45/0 MEASUREMENT GEOMETRY

Wendy Wu, Creighton University; David Marx, University of Nebraska Lincoln; Matthew Yuen, University of California-Davis; Alvin G. Wee, Creighton University School of Dentistry, Omaha, NE

Purpose: The purpose of this in vitro investigation was to evaluate the validity and repeatability of a PR670 spectroradiometer using a 45/0 measurement geometry on opaque color patches. The measurement was set up using the PR670 spectroradiometer (PhotoResearch Inc.) at normal to the color patch with two sets of illumination (A illumination) at 45° to normal. Spectral reflectance was obtained from 280 to 780nm with a 5nm interval. In random order, each of the 240 color patches (DC Color Checker, GretagMachbeth) were measured once and 10% (N=24) was measured 10 times. The reflectance measurement was converted to CIELAB values with D65 illumination and 2° observer. Validity was defined by the color difference between the 240 color patches measured and the certified CIELAB values provided. For re-test reliability, the mean, SD, and 95% confidence intervals (CI) for ΔL^* , Δa^* , and Δb^* values between the mean (N=10) measured color and the certified values of the 24 color patches were also calculated. The mean and SDs of the color differences were then calculated. ANOVA was used to evaluate the L^* , a^* , and b^* variability of the repeated values.

Results: For validity, the mean ΔE was 1.73 (SD=0.92). The CI for ΔL^* (-0.16 to 0.08), Δa^* (-0.16 to 0.44), and Δb^* (-0.05 to 0.42) contains zero. For re-test reliability, the replication covariance parameter estimate was statistically significantly for $L^*=0.1545$ ($p=0.0203$) and $b^*=0.08122$ ($p=0.0199$), but not for $a^*=0$. With regard to validity, ΔL^* , Δa^* , and Δb^* did not show significant bias. With regard to test-re-test reliability, although the variances for the CIELAB values were significant for L^* and b^* , the variance was very small.

Conclusion: With regard to validity, ΔL^* , Δa^* , and Δb^* did not show significant bias. With regard to test-re-test reliability, although the variances for the CIELAB values were significant for L^* and b^* , the variance was very small.

62. LABEL-FREE IMAGING OF REGENERATING HUMAN PERIODONTAL LIGAMENT AND GINGIVA BY SECOND HARMONIC GENERATION CONFOCAL MICROSCOPY

Andrew Jenzer, Roselyn Cerutis, Michael Nichols, Shakeel Khan, Timothy P. McVaney, Takanari Miyamoto, and Wayne B. Kahldahl, School of Dentistry, Creighton University, Omaha, NE

Rationale: Surgical treatment interventions for treating periodontal disease all disrupt the collagenous structures (gingiva and periodontal ligament) that form the soft-tissue supporting structures of teeth. We hypothesized that using the second harmonic generation (SHG) technique would enable detection of changes in the appearance, fibril

density, and fibril organizational structure of the human periodontal ligament and gingiva during the regenerative process taking place following periodontal surgery.

Methods: De-identified archival unstained, de-paraffinized histological sections (4 μ M) of teeth with surrounding hard and soft tissues (from normal or various stages of post-surgical regenerating periodontal structures) were used.

Results: It was found that SHG clearly showed the normal organization and the subsequent changes in the collagen fibrils in normal vs. regenerating periodontal soft tissues.

Conclusion: This interdisciplinary study shows that SHG can be effectively used to study the organization of collagen in the normal and regenerating periodontal ligament and surrounding gingival tissue. SHG could constitute a potentially useful technique for determining the efficacy of periodontal regenerative strategies, and for assessing / studying peri-implantitis using punch biopsies.

63. **EFFECT OF SMOKELESS TOBACCO ON CARIES AND MISSING TEETH FOR ADULT MALES IN RURAL APPALACHIA**

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Background: Previous studies are inconclusive on the effect of smokeless tobacco (ST) on teeth. This clinical study's purpose was to evaluate the effect of ST on caries prevalence and tooth loss.

Methods: A calibrated dental examiner recorded decayed, missing, or filled surfaces (DMFS) and noted the number of missing teeth in 264 ST users and 116 non-users who were recruited during one year in two of Ohio's rural Appalachian counties. Variables were evaluated if they were either confounders or effect modifiers.

Results: ST users over 45 had significantly more caries ($p=0.0167$); caries prevalence in users under 45 was not significantly different from non-users. ST users over 45 showed a higher average number of missing teeth compared to non-users ($p<0.001$). ST users under 45 experienced significant tooth loss to a lesser extent ($p=0.0301$).

Conclusion: Results of this study suggest that ST use has a significant effect on caries prevalence and is associated with more tooth loss in users over 45.

Clinical Implications: Physicians and dental professionals should caution their patients about the health risks of using tobacco, including ST. This puts them at risk for developing caries and tooth loss especially when patients are greater than or equal to 45 years of age.

64. **ENCAPSULATION OF CALCIUM AND PHOSPHATE IONS IN A TOOTHPASTE FORMULATION**

Elizabeth Mueller, Ryan L. Cooper, Stephen M. Gross, Mark A. Latta, William A. McHale, Department of Oral Biology, Creighton University School of Dentistry, Omaha, NE

Objectives: The objective of this study was to determine the capability of releasing biologically available calcium and phosphate ions from aqueous solutions contained in microcapsules formulated in toothpaste.

Methods: A heterogeneous polymerization technique was utilized to prepare microcapsules containing an aqueous solution of 4 M potassium phosphate dibasic and 6 M calcium nitrate. Five weight percent of microcapsules were formulated into a commercially available toothpaste formulation. Ion release was studied as a function of ion type. The amount of available fluoride was also measured. Phosphate ion detection was performed by the molybdenum blue method and reported as ppm of phosphate ion released per gram of formulation. Calcium and fluoride ion release measurements were performed using ion specific electrodes.

Results: One gram of toothpaste formulated with either phosphate or calcium containing microcapsules was placed in 12 mL of nanopure water and brushed for 2 minutes. An aliquot was removed after brushing and was analyzed for calcium, phosphate and fluoride ions.

Conclusions: Using mechanical agitation of a toothbrush, phosphate and calcium ions were released in significant concentrations from microcapsules formulated in toothpaste. The preparation of a toothpaste formulation with significant bioavailable levels of calcium, phosphate and fluoride ions should provide for enhanced remineralization.

Acknowledgment: The authors would like to acknowledge Premier Dental Products Incorporated and Creighton University for financial support of this work.

65. **A PILOT STUDY OF PRIMARY CULTURE OF ORAL EPITHELIUM USING THE DIRECT EXPLANT TECHNIQUE**

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Purpose: This investigation was a pilot study to determine the feasibility of using a direct explant technique to isolate mesenchymal stem cells from gingiva removed from extracted teeth. The long-term goal of this research is to identify an easily obtainable source of mesenchymal stem cells that could be used to develop a new and innovative therapy for bone loss due to periodontal disease.

Methods: Attached gingiva was excised from extracted teeth obtained from Creighton University's Oral Surgery Clinic. The tissue was cut into small fragments and placed into collagen-coated plates with media. The cultures were incubated at 37 °C with 5% CO₂ in air. Once significant numbers of cells had migrated from the explants, they were transferred into T25 flasks and expanded until adequate numbers were obtained for analysis.

Results: This study demonstrates that attached gingiva is a suitable source for both epithelial and fibroblast/mesenchymal cells. Fibroblasts and keratinocytes were successfully harvested for analysis. Characterization is in progress to determine if the fibroblastoid cells are mesenchymal stem cells or a more differentiated population of transit amplifying cells using flow cytometric analysis, stem cell assays, and immunofluorescence.

Conclusion/Significance: The direct explant technique is an acceptable method for obtaining cells from small tissue samples obtained from teeth that are typically discarded. If the presence of mesenchymal stem cells is confirmed, it will be possible to manipulate them to differentiate into osteoblasts, which are the cells responsible for bone development. The use of mesenchymal stem cells as a biological therapy has clinical applications for both dental and medical science.

66. **DETERMINING THE DIFFERENCE BETWEEN ACTIVE AND INACTIVE WHITE SPOT LESIONS USING SODIUM IODIDE**

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Introduction: Identifying the differences between active and inactive white spot lesions is presently a challenging task in clinical dentistry. Distinguishing between active and inactive white spot lesions is important because inactive lesions can be treated without restorative methods. Avoiding unnecessary repair will preserve the natural tooth structure and increase its longevity. In this study, 11 molar Sodium Iodide (NaI) was used as a radiographic contrast agent to suggest that more penetration will occur in an active lesion than an inactive white spot lesion.

Methods: Two teeth (one human maxillary 1st molar and one maxillary 3rd molar) with visible white spot lesions were collected. Photomicrography, radiography and Scanning Electron Microscopy (SEM) assessments were used to study these specimens.

Results: Radiographic data revealed a high penetration of NaI solution through the enamel of the 1st molar, which had an active white spot lesion, as confirmed by photomicrography and SEM analysis. Conversely, minimal to no NaI penetration was observed through the enamel of the 3rd molar, which was confirmed to have an inactive white spot lesion.

Conclusion: While preliminary, the development and application of new methods to identify active carious lesions has the potential to move the dental field forward by providing much needed tools allowing dentists to make educated decisions regards whether and when to treat a carious lesion.

67. CONTROLLED RELEASE OF REMINERALIZING AGENTS FROM ORTHODONTIC CEMENT

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Objectives: The objective of this study was to determine the effect of orthodontic cement continuous phase on the release of biologically available ions from microcapsules with ion permeable membranes.

Methods: Ion permeable microcapsules containing bioavailable fluoride, calcium, and phosphate aqueous salt solutions were integrated into both the primer and paste of the Dentsply® NeoBond© orthodontic adhesive system. Ion release profiles were studied as a function of ion type, microcapsule composition and loading for 3 months. Phosphate ion detection was performed by the molybdenum blue method and reported as ppm of phosphate ion released per gram of formulation. Calcium and fluoride ion release measurements were performed using ion specific electrodes and reported as ppm calcium ion released per gram of formulation.

Results: Ion release profiles were studied as a function time orthodontic cement formulations.

Conclusions: Ion release profiles were generated for both paste and primer continuous phases of orthodontic cement that contained microencapsulated aqueous solutions that contained biologically available phosphate and calcium ions useful in remineralization. The manufacture of an orthodontic cement with controlled release profiles appears promising.

Acknowledgement: The authors would like to acknowledge Premier Dental Products, NSF University-Industry Partnership Grant and Creighton University for support of this work.

68. VITAMIN D REGULATING TGF- β INDUCED EPITHELIAL-MESENCHYMAL TRANSITION

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Rationale: Subepithelial fibrosis is a hallmark characteristic of airway remodeling in asthma. An important regulator of fibrosis is transforming growth factor β (TGF- β). TGF- β can induce airway remodeling in epithelial cells through induction of epithelial-mesenchymal transition (EMT). This represents a novel therapeutic target in asthma. Vitamin D has immunomodulatory functions that could inhibit subepithelial fibrosis in asthma.

Methods: Human bronchial epithelial cells (BEAS-2B) were stimulated with the active form of Vitamin D, calcitriol (100 nM). After 24 hours, TGF- β 1 (10 ng/ml) or TGF- β 2 (10 ng/ml) was added to the cells for an additional 48 hours. Following stimulation, mRNA and protein was isolated and mRNA transcripts for E-cadherin, Snail, MMP2, MMP9 were analyzed by qPCR while E-cadherin and Snail were examined by Western blot. An invasion assay and scratch wound assay were performed to identify the migratory properties of the cells following stimulation.

Results: TGF- β 1 and TGF- β 2 decreased E-cadherin expression and increased the expression of Snail, MMP2, and MMP9 mRNA transcript levels. TGF- β also increased cell invasion. The effect of TGF- β on these markers and motility was impeded by the presence of calcitriol as ascertained at the mRNA, protein levels, and invasion assays.

Conclusions: These data suggest that both TGF- β 1 and TGF- β 2 can regulate EMT expression markers, which can be impeded by stimulation with calcitriol in human airway epithelial cells. Therefore, calcitriol could be a potential therapeutic agent in the prevention and management of subepithelial fibrosis.

Acknowledgement: Supported by an NIH grant RO1AI075315

69. **MACHINERY FOR VITAMIN D METABOLISM IN PORCINE ADIPOSE DERIVED MESENCHYMAL STEM CELLS**

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Background: There is increasing evidence that Vitamin D deficiency is an independent predictive factor for cardiovascular disease. Cell-based therapy using adipose derived mesenchymal stem cells (MSCs) is an attractive option for endothelial layer regeneration post angioplasty procedures. Vitamin D levels in circulating blood might regulate MSC based re-endothelialization of injured arteries. To our knowledge, the presence of Vitamin D machinery on porcine MSCs is not yet reported. In this study, we investigated whether or not MSCs possess vitamin D machinery and participate in vitamin D metabolism by analyzing the expression levels of vitamin D receptor (VDR), vitamin D metabolizing enzymes (CYP24A1 and CYP27B1) after in vitro stimulation with active Vitamin D, calcitriol.

Methods and Results: MSCs isolated from porcine adipose tissue were characterized by positive staining for MSC markers CD44, CD73, CD90, and negative staining for macrophage marker CD11b and hematopoietic stem cell markers CD34 and CD45; and by tri-lineage differentiation to osteocytes, chondrocytes, and adipocytes. No cytotoxicity was observed when MSCs were stimulated with 0.1 to 10nM calcitriol. The MSCs were analyzed for mRNA and protein expression of CYP24A1, CYP27B1 and VDR by immunostaining, qPCR and ELISA (n=6). A significant increase (p<0.01) in mRNA expression of CYP24A1, CYP27B1 and VDR was observed after stimulation of MSCs with calcitriol (10nM). The in vitro time dependent effect of calcitriol (10nM) on the vitamin D machinery on cultured MSCs was determined by qPCR after stimulation for 0, 3, 6, 12, 24 and 48h. The VDR and CYP27B1 expression peaked at 3h, and CYP24A1 at 24h, respectively. The in vitro biosynthesis of 1,25(OH)₂D₃ by ADMSCs was analyzed by ELISA and Western blot. The expression of the active form of vitamin D was significantly decreased once the CYP enzymes were inhibited (p<0.01). This demonstrates the regulation of vitamin D metabolism in MSCs.

Conclusion: Porcine MSCs possess vitamin D hydrolases and VDR to metabolize and respond to vitamin D. Hence, in vivo circulating 25-hydroxy vitamin D levels may have a significant role in regulating the differentiation of adipose MSCs into endothelial cells, which might assist in stem cell based re-endothelialization post-angioplasty.

70. **VITAMIN D SUPPLEMENTATION REDUCES TH17 CELLS IN THE LUNG AND SPLEEN OF CRA-SENSITIZED AND CHALLENGED MICE**

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Rationale: Asthma is a chronic inflammatory airway disease characterized by airway inflammation and airway hyperresponsiveness. Increased infiltration of CD4⁺ lymphocytes, especially Th17 subsets, in asthmatic lungs suggests their critical role in the pathophysiology of allergic asthma. Vitamin D is a potent immunoregulator modulating functional response of immune cells. There is growing evidence that vitamin D is inversely related to Th17 cell development, differentiation, proliferation and survival.

Methods: Female Balb/c mice were fed with Vitamin D-deficient (0 IU/kg), -sufficient (2,000 IU/kg) or -supplemented (10,000 IU/kg) diet, respectively and sensitized (i.p.) and challenged (aerosolized) with cockroach antigen (CRA). The mRNA transcripts and protein expression of IL-21R, IL-23R and ROR γ t on purified CD4⁺CD25⁻ lymphocytes isolated from lung and spleen of the mice were compared using qPCR, IL-21R⁺ and IL-

23R+ cells using flow cytometry and immunofluorescence analysis for ROR γ t. The IL-17 concentration in the bronchoalveolar lavage fluid (BALF) and serum was measured by ELISA.

Results: Vitamin D-deficiency significantly increased the density of CD4+CD25-IL-21R+, CD4+CD25-IL-23R+ and CD4+CD25-ROR γ t+ in the lung and spleen of mice sensitized and challenged with CRA. This was reversed by vitamin D-supplementation in a dose-dependent manner. The IL-17 levels in the serum and BALF correlated well with the infiltration of Th17 cells in the lung.

Conclusions: The decrease in IL-21R+, IL-23R+, ROR γ t+ CD4+CD25- lymphocytes and IL-17 levels by vitamin D-supplementation suggests the beneficial effect of vitamin D by inhibiting the differentiation and activation of inflammatory Th17 cells.

71. MUTATIONAL ANALYSIS OF THE C-TERMINUS OF HIV-1 MATRIX

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The Matrix (MA) protein of the human immunodeficiency virus type 1 (HIV-1) composes the N-terminal subunit of the structural Gag protein. It is composed of 132 amino acids and plays important roles in both the afferent and efferent stages of the viral life cycle. MA associates with the preintegration and reverse transcription complexes in the early of viral replication and is required for Gag targeting to membranes and envelope incorporation during assembly.

In this study, we used molecular cloning techniques to investigate the C-terminus of MA and specifically the role of amino acids 96 to 120 in both the afferent and efferent steps of viral replication. Infectivity assays and western blot analysis of cell or viral lysates were conducted to determine the infectivity and releasing ability of each mutant strain. It was found that all mutants with the amino acids 96-99 and 100-107 deleted had a release defect. In addition, Alanine mutants were constructed in order to determine if proper viral release was due to a structural or sequence specific interaction. It was determined that inhibition in viral release of the deletion mutants was due to structural ablation. Although viral release was found to be structurally related, the alanine mutants had very poor infectivity indicating that infection may be due to a sequence specific interaction.

72. OVER-EXPRESSION OF CYCLOPHILIN B INCREASES HIV-1 REPLICATION

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Purpose: Human immunodeficiency virus type 1 (HIV-1) exhibits a complex lifecycle and requires numerous host cell factors for replication. Prior proteomic studies in our laboratory identified Cyclophilin B (CypB) as a host factor up-regulated during HIV-1 infection. CypB is an immunophilin with multiple functions within the cell. The purpose of this study is to determine the mechanism by which CypB enhances HIV-1 infection.

Methods and Materials: Infectivity assays were performed using a HIV-1 luciferase (Luc) reporter virus pseudotyped with VSVg. 24 hours prior to transduction, 293T cells were transfected with CypB expression. 48 hours post transduction, cells were lysed; protein concentrations measured, and Luc activity determined. CypB expression constructs containing selective deletions or mutations were made by PCR mutagenesis. Extrachromosomal DNA was isolated using the modified Hirt protocol and subsequent DNA analysis performed by qPCR using primer sets specific for early reverse transcription, late reverse transcription and 2-LTR circle DNA products.

Results: Over-expression of CypB enhanced HIV-1 infection in a dose-dependent manner. CypB did not enhance the infection of murine leukemia virus, suggesting it is a HIV-1 specific factor. Moreover, overexpression of a related immunophilin, Cyclophilin A (CypA), a previously described HIV-1 factor caused no significant increase in

infectivity. Deletion analysis of CypB demonstrated that the N-terminus of the protein, including the ER signal sequence, was required for the enhancement of virus infection.

Conclusions: Over-expression of CypB enhances HIV-1 infection. The HIV-Luc virus is replication incompetent due to an envelope deletion, suggesting that the enhancement occurs at a step prior to or at transcription. The effect is HIV-1 specific and independent of the known HIV-1 factor CypA, nor does it require the peptidyl prolyl isomerase function of CypB. The N-terminal sequence appears to be essential for CypB enhancement. Combined our investigations suggest an important role for CypB in HIV-1 infection.

73. **COMPARISON OF EDUCATIONAL TRAINING AND USE OF PHYSICAL AGENT MODALITIES (PAMS) IN OCCUPATIONAL THERAPY**

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Purpose: This study aimed to investigate how entry-level OT programs meet Accreditation Council for Occupational Therapy Education (ACOTE) Standards regarding physical agent modalities (PAMs).

Methods: Participants included 38 ACOTE accredited entry-level occupational therapy programs in the United States as identified by American Occupational Therapy Association (AOTA). An electronic survey was sent to participants via e-mail.

Results: The majority of participants (76.7%) reported a specific course was not dedicated to PAMs with only 26.3% indicating a specific PAMs course was offered. Results indicated that 63.1% of entry-level OT programs use exam and practical or exam alone to test student's knowledge of PAMs. Regarding safe and effective application of PAMs, only 36.9% of entry-level OT programs use exam and practical or practical alone.

Conclusion: There appears to be a wide variation in academic content delivery related to PAMs. The assessment of knowledge and clinical application of PAMs varies among entry-level OT programs as well.

74. **INCIDENCE OF ACUTE KIDNEY INJURY WITH PIPERACILLIN-TAZOBACTAM: A BEFORE-AFTER EVALUATION**

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Purpose: To determine the incidence of acute kidney injury (AKI) in patients receiving piperacillin-tazobactam infused over 4 hours (extended infusion group, EIG) compared to patients receiving traditional dosing piperacillin-tazobactam infused over 30 minutes (intermittent infusion group, IIG).

Methods: A retrospective chart review was conducted at Alegent Creighton Health Bergan Mercy Medical Center comparing two different dosing regimens of piperacillin-tazobactam. We evaluated the use of piperacillin-tazobactam in the IIG from June 1 to June 30, 2011 and in the EIG from June 1 to June 30, 2012. Descriptive data was collected including patient demographics, co-administered nephrotoxins, serum creatinine levels, presence of AKI, location in ICU, Charlson Comorbidity Index, and dosing regimen (dose, frequency, and doses received).

Results: We reviewed 92 cases in the EIG and 96 cases in the IIG. Of these cases, 59 and 60, respectively, were included based on predefined criteria. The average age of patients in the EIG was 66 years, 42.3% were female, and 18.6% were located in the ICU. In the EIG, the incidence of AKI was 22% (13/59); 3 of these patients had AKI prior to starting piperacillin-tazobactam. Of the remaining 10 who developed AKI, 90% (9/10) were receiving concomitant nephrotoxins. In comparison, the average age was 68 years, 58.3% were female, and 33.3% were hospitalized in the ICU in the IIG. The incidence of AKI in the IIG was 25% (15/60); 8 of these patients had AKI prior to starting piperacillin-tazobactam. Of the remaining 7 who developed AKI, 85.7% (6/7) were receiving concomitant nephrotoxins.

Conclusion: There was no significant difference in the incidence of AKI between the EIG and the IIG.

Acknowledgement: This study was made possible by a grant from the Creighton University School of Pharmacy and Health Professions Student Research Program.

75. THE IMPACT ON THE EFFICACY OF SSRI_s BY CHRONIC NSAID USE

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Background: Medication adherence is essential to patient care and disease management. Concurrent use of medications may cause interactions, which may lead to increased side effects, and more importantly drug antagonism leading to improper disease control. The purpose of this retrospective pilot study, therefore, is to determine if concurrent use of NSAIDs with SSRIs impede the efficacy of patient drug regimen in treating depression.

Objectives: 1. Evaluate patient medication regimen during inpatient admissions. 2. Evaluate the possible correlation between non-steroidal anti-inflammatory (NSAID) use and Selective Serotonin Reuptake Inhibitors (SSRI) 3. Assess whether patient re-admittance and depression relapse is due to the chronic use of NSAIDs along with their SSRI anti-depressant regimen.

Methods: Patient data collection was performed using a retrospective analysis of N=720 patients with hospital admittance. Patient criteria includes those with an Axis I diagnosis of Major Depressive Disorder, Bipolar Disorder, Mood Disorder not otherwise stated (NOS), and Anxiety Disorders. Demographic data (age, gender, race) will also be collected along with other Axis II-IV diagnoses. All patients admitted on an SSRI anti-depressant will be evaluated, with focus on those patients who were also concurrently using an NSAID. For Objective 1, descriptive statistics will be used to describe the patient sample. For objective 2, a t-Test to see if there is a relationship between the use of NSAIDs and refractory depression, finally, for objective 3, a regression analysis with correlation to determine the strength or relation between the use of the two classes of drugs.

Outcomes: This retrospective pilot study showed there is no relation between long term use of NSAIDs along with SSRI therapy. The t-Test using Two sample showed a p-value of 0.5 describing that there is no effect between the use of NSAIDs and SSRIs. A Pearson Correlation was also insignificant with a relation of 0.121

76. LAB TO BALLOON TIME BETWEEN THE RADIAL AND FEMORAL APPROACH IN PATIENTS WITH ST-ELEVATED MYOCARDIAL INFARCTION

David Brooks, and Michael Del Core, School of Medicine, Creighton University, Omaha, NE

Purpose: The purpose of this study was to determine if there is a significant difference in catheterization lab to balloon times between the radial and femoral approach to cardiac catheterization in patients presenting with ST-elevated myocardial infarction (STEMI).

Methods and Materials: Retrospective analysis was completed on medical records of 183 patients who had previously undergone cardiac catheterization for a STEMI. Three separate time intervals were collected from these records: cath-to-sheath, sheath-to-balloon, and cath-to-balloon. Patients were grouped based on whether the radial or femoral approach was used. For both the radial and the femoral approach, the mean time was calculated for all three intervals. A 2 sample T-test was used to determine if a significant difference ($P < 0.05$) existed between the radial and femoral approaches in regards to the three time intervals being studied.

Results: The mean cath-to-sheath time for the femoral approach was 14.5 ± 1.7 minutes compared to mean radial approach time of 13.6 ± 1.2 minutes, the difference was not statistically significant ($P = 0.40$). There was no significant difference between the mean sheath-to-balloon times for the femoral approach (16.8 ± 2.0 minutes) compared to the radial approach (18.6 ± 1.8 minutes, $P = 0.19$). The mean cath-to-balloon time for the femoral approach was 31.3 ± 2.8 minutes compared to 32.2 ± 2.3 minutes for the radial approach, the difference was not statistically significant ($P = 0.63$).

Conclusions: There was no significant difference between the femoral and radial approaches in regards to mean times of the three intervals studied. The radial approach to cardiac catheterization can be used in emergent situations, such as an acute myocardial infarction, without fear of prolonging the time required to re-establish flow in the obstructed coronary artery.

77. **DRIVING FACTORS OF DOOR-TO-BALLOON TIME**

Gregory Campbell, and Michael Del Core, School of Medicine, Creighton University, Omaha, NE

Purpose: The purpose of this study is to determine the driving factors of door-to-balloon time at Creighton University Medical Center (CUMC) and to investigate the effect of certain variables on door-to-balloon time. Rapid treatment of myocardial infarction is essential for reducing mortality and preventing future complications. Determining which factors drive the door-to-balloon is important for identifying ways to improve the process in the future.

Methods: This is a retrospective study investigating which factors drive door-to-balloon times at CUMC. Dr. Michael Del Core provided data and patient charts for 178 patients who presented with ST-elevation myocardial infarction (STEMI) at CUMC from 2007-2012. Key time points were determined and correlations for the true correlation between each time interval and the overall door-to-balloon time were calculated. The fraction of variance explained was then calculated to determine the proportion of variance in door-to-balloon time explained by each time interval.

Results: Mean door-to-balloon time for all patients was 79.4 +/- 5.6 min. The sample correlation for every time interval except staff arrival-to-ER notification time (p-value = 0.1231) and ER notification-to-patient arrival time (p-value = 0.0622) had a p-value < 0.0001. Door-to-ECG time had the highest correlation to overall door-to-balloon time with a true correlation of 0.73 and a fraction of variance explained of 0.53.

Conclusions: Based on the sample correlation, door-to-ECG time had the highest correlation with overall door-to-balloon time. The data indicates that 53% of the variance in door-to-balloon time is explained by door-to-ECG time, making it the largest driving factor of door-to-balloon time. Based on these results, improving the process when a patient first presents to the emergency department with chest discomfort so that an ECG is obtained as quickly as possible could result in a further decrease in overall time.

78. **MUTANT KRAS IS NECESSARY FOR MUC2 PRODUCTION IN MUCINOUS PERITONEAL CANCERS**

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Purpose: Very little is known about the pathogenesis of mucinous colorectal adenocarcinoma (MCA) and pseudomyxoma peritonei (PMP), two mucin producing cancers that metastasize to the peritoneum. In these cancers, overproduction of mucin (predominantly MUC2) is associated with complications seen in advanced disease (bowel obstruction, ascites etc.). Our studies and those of others indicate a high rate of KRAS mutations in MCA (50%) and PMP (~60%). The purpose of this study was to test the hypothesis that mutant KRAS is necessary for MUC2 over production in MCA and PMP.

Methods: Our studies were performed in MUC2 producing MCA cell lines LS174T and RW7213 that carry KRAS G12D and G12C mutations respectively. Mutant KRAS activity was reduced by KRAS short hairpin RNA (shRNA)-mediated knock down. Signaling effectors downstream of mutant KRAS (MEK and PI3K) were inactivated using small molecule inhibitors.

Results: Stable lines of LS174T and RW7213 that allow inducible and reversible knockdown of mutant KRAS were established. Reduction of mutant KRAS reduced MUC2 protein levels. Restoration of mutant KRAS allowed recovery of MUC2 protein expression and this recovery was blocked by PI3K and MEK inhibitors. Combined addition of the two inhibitors produced a more pronounced effect than addition of either one of them alone.

Conclusions: Our results suggest that mutant KRAS (a) is necessary for MUC2 production in vitro and (b) synergistically engages PI3K/AKT and MEK/ERK pathways to regulate MUC2 expression. These results define a novel role for oncogenic KRAS in mucinous cancers. These studies position us to examine the effect of mutant KRAS reduction on MUC2 production in PMP cell lines and MCA and PMP patient-derived xenograft mouse models that we have established in our laboratory.

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79. **WEIGHT LIFTING PROTHESIS**

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One to two percent of newborns are born with congenital defects, and 10% of them have congenital differences of the upper extremity. It is estimated that in the USA, more than two million individuals suffer from major upper limb amputation and the CDC estimates that about one in every 33 individuals are born with upper limb reductions. Participation in sports and physical activity improves amputee's physical conditioning and overall well-being. Individuals with unilateral upper limb reductions suffer from significant amount of muscle atrophy in the affected limb. This muscle weakness and muscle atrophy has detrimental effect on posture and the onset of overuse injuries. Financial resources play a crucial role in the prescription of sport specific prosthesis, especially when private insurance and public funding are not available for this type of devices. 3D printing is a process of making a 3D solid object of virtually any shape from a digital 3D model. Advancements in 3D technology offer the possibility of designing and printing custom plastic prosthesis devices and attachments at a very low cost. Thus, the purpose of the current study is to model and manufacture a prototype of a new prosthesis for weight lifting using 3D modeling and 3D printing technology. The purpose of this project is to develop a specialized low-cost weight lifting hand for adolescents and adults with upper limb differences. Our working hypothesis is that the development of a new, low-cost, and specialized prosthetic device design for strength training would give those individuals with upper limb differences the opportunity to participate in strength and conditioning activities. Upper body strength and conditioning are crucial for the prevention of muscle atrophy, overuse injuries, and improve posture and well-being of below elbow amputees and amputees in general.

80. **REPEATABILITY OF TRUNK MUSCLE REFLEX RESPONSES FROM A PERTURBATION DEVICE FOR THE STUDY OF LOW BACK PAIN**

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Purpose: The Trunk Reflex Examination Device (TRED) was designed to evaluate trunk muscle reflex responses, which have been shown to be delayed and attenuated in people with low back pain (LBP). This investigation examined the within and between session repeatability of the magnitude and timing of muscle reflexes elicited by the TRED in subjects with and without LBP. Preliminary data is reported for 20 of the planned sample size of 30 subjects.

Methods: Twenty adults [13 control (21.4±0.8 yrs, 67.5±10.6 kg, 1.71±0.1 m) and 7 LBP (23.1±1.9 yrs, 68.9±11.3 kg, 1.75 ±0.1 m) attended 2 sessions space 1 week apart. The TRED applied perturbation forces at variable times to the torso of the subjects while muscle activity was recorded using surface electromyography (SEMG) bilaterally over the erector spinae and multifidus muscles. A single trial consisted of 45 perturbations of ± 30N (after reaching a 100N preload). Each session included 3 trials. Maximum voluntary contractions (MVC) were obtained for SEMG normalization.

Results: Reflex responses were elicited from about 50% of the perturbations for each subject. Within session repeatability was acceptable (ICC_{3,1} = 0.73 to 0.93) for muscle reflex magnitudes but between session repeatability was poor with an ICC < 0.75 for 3 out of 4 muscles. For reflex timing (latency), within and between session repeatability was poor for all muscles.

Conclusion: Reliable measurements are an important step in assessing the usefulness of a research device. Preliminary data indicates that trunk muscle responses elicited from the TRED show a high degree of variability in timing and magnitude. Some of this may be attributed to normal variations in neuromuscular behavior. Refinement of the methods and analyses will be pursued in an effort to improve reliability.

Acknowledgement: This study was funded by the Dr. George F. Haddix President's Faculty Research Fund.

81. **SYNTHESIS AND HOLISTIC CHARACTERIZATION OF GLUCOGENIC AMINO ACID COMPLEXES AS ERGOGENIC AIDS**

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Purpose: The study's aim was to synthesize, purify, and characterize glucogenic and essential amino acid complexes of physiologically relevant metal ions.

Methods: Essential or glucogenic amino acid complexes of L-glycine, L-alanine, L-glutamic acid, L-valine and L-glutamine were synthesized by using the hydroxides of sodium and potassium as well as chloride salts of calcium and magnesium. Solutions of the amino acids and metals were prepared and lyophilized to form the complexes. Synthesized complexes were separated by filtration. The complexes were characterized by electron spray ionization mass spectrometer (ESI-MS). The ESI-MS parameters were optimized manually. The complexes were further analyzed using Infrared spectrum analysis (FTIR) in the range of 400 to 4000 cm⁻¹. Flame atomic absorption spectroscopy (AAS) was measured for sodium and potassium concentrations on a calibrated Varian SpectraAA®. The concentration of calcium and magnesium and the yield for the respective complex was analyzed by standard EDTA titration using Eriochrome Black T as the indicator.

Results: The ESI-MS analysis should m/z peaks corresponding to their theoretical mass of the complexes. The FTIR spectra showed the broadening of -NH₂ stretch, decreased intensity of N-H stretch, symmetric and asymmetric -COO- stretch all confirmed complex formation. The metal content of the complexes was in accordance with the mole ratio of the complexes. In case of calcium and magnesium complexes the yields obtained for polar amino acid were significantly higher than the amino acids with aliphatic side chain.

Conclusion: Amino acid complexes were synthesized successfully and yields were optimized. The ESI-MS, FTIR spectra and confirmed the formation of a different chemical entity

82. **EVALUATION OF MODIFIED LIQUID IMPACTION SURFACES IN THE NEXT GENERATION IMPACTOR (NGI)**

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Purpose: To propose and validate modifications to the NGI collection surfaces for evaluation of fluorescent dye dissolution following aerodynamic deposition.

Methods: Custom made impaction surfaces were designed to contain 5mL liquid volumes. These custom liquid impaction surfaces were incorporated into the Gravimetric Cup stage (MSP Corporation). Liquid impaction surfaces were then incorporated into varying stages within the NGI. Evaporative liquid loss was evaluated in the NGI for up to 15 minutes. Liquid impaction surfaces were also validated for aerosolized particle deposition and aerodynamic particle size characterizations with both nebulized and dry powder formulations. Fluorescent dye dissolution was then evaluated using liquid impaction surfaces and a controlled-release dry powder formulation.

Results: Minimal fluid loss occurred when exposed to varying airflow rates in the NGI for varying lengths of time. There were no significant differences between the deposition of nebulization drug solution and dry powder formulations between the normal and liquid impaction surfaces. There were also no significant differences between aerodynamic particle size characteristics between normal and liquid impaction surfaces for either nebulized liquids

or dry powder formulations. Modified liquid impaction surfaces were also able to evaluate controlled fluorescent dye dissolution over 24 hours.

Conclusion: The proposed custom liquid impaction surfaces are suitable for further formulation evaluation for aerosolized dry powder formulations.

83. **CHARACTERIZATION OF A NEBULIZER NOZZLE FOR LABORATORY-SCALE SPRAY DRYING**

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Purpose: To characterize spray dried excipients using a novel nebulizer nozzle incorporated into a Büchi B-290 laboratory-scale spray dryer.

Methods: Aqueous or ethanolic solutions of lactose, hydroxyl propyl cellulose, or ethyl cellulose were spray dried using a laboratoryscale. Mini Spray Dryer (Büchi B-290) using the conventional two-fluid nozzle and a custom-made nebulizer nozzle. The particle size distributions of spray dried powders were evaluated using a Malvern Mastersizer 2000 and Scirocco 2000 dry powder unit. Residual moisture content of spray dried powders was determined using a Karl Fischer's apparatus. Differential scanning calorimetry was used to evaluate the physical state of spray dried powders. Powders were also morphologically evaluated using a scanning electron microscope.

Results: Both the conventional two-fluid nozzle and custom-made nebulizer nozzle produced free flowing, de-agglomerated particles. The Malvern particle size analyzer revealed that lactose, hydroxyl propyl cellulose and ethyl cellulose when spray dried through the two fluid nozzle had a mean particle size of approximately 5µm, 4µm and 2µm respectively. Powders produced using the nebulizer nozzle had particle sizes in nanometer size range. No significant differences were observed between residual moisture content of spray dried powders. The DSC results showed that no differences were observed for the physical state for spray dried powders. The scanning electron microscopy showed round and disaggregated particles that were micrometer sized for the two-fluid nozzle and nanometer sized for the nebulizer nozzle.

Conclusion: The two fluid nozzle and nebulizer nozzle were able to produce spherical and free flowing spray dried particles. While the novel nebulizer nozzle produced nano-sized particles as compared to the micro-sized particles obtained after spray drying through the conventional nozzle. These nanoparticles can then be further investigated for their application in various drug delivery systems.

84. **MODIFICATION OF THE NEXT GENERATION IMPACTOR (NGI) AND INCORPORATION OF PSEUDOMONAS AERUGINOSA AS AN IN VITRO MODEL FOR DRUG DEL**

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Purpose: To develop a model that incorporates bacterial cultures into the Next Generation Impactor and to evaluate the antibacterial action of aerosolized drugs using this model.

Methods: Modifications to the collection cup at stage 4 in the NGI were made to incorporate bacterial cultures. Baseline parameters and proof of concept were developed by using *E. coli*. To further develop the in vitro model, *Pseudomonas aeruginosa* was incorporated in place of *E. coli*. Nebulization of ceftazidime using the Aeroneb Pro nebulizer showed significant killing of *P. aeruginosa* when compared with control bacterial cultures. Additional studies were performed to evaluate effective treatment parameters such as concentration of drug, exposure time, and dosing intervals.

Results: A 10 minute nebulization time of ceftazidime using the Aeroneb Pro nebulizer produced concentrations in the modified stage 4 of an average of 37 µg/ml. This value is above the MIC for ceftazidime, showing significant killing in both *E. coli* and *P. aeruginosa* when compared to control bacterial cultures. Time kill studies showed that

once exposed to the antibiotic, *P. aeruginosa* showed significant killing (at least one log difference in growth) in the 6 to 8 hour range.

Conclusion: The modified NGI could evaluate the antibacterial efficacy of an aerosolized formulation and dosing parameters of ceftazidime in *Pseudomonas aeruginosa* were developed.

85. **CHARACTERIZATION AND COMPARISON OF LIDOCAINE-TETRACAINE AND LIDOCAINE-TETRACAINE HYDROCHLORIDE EUTECTIC MIXTURES**

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Purpose: To characterize and compare Lidocaine-Tetracaine and Lidocaine-Tetracaine Hydrochloride eutectic mixture based on their amorphization ability.

Materials: Lidocaine was purchased from PCCA, Tetracaine and Tetracaine Hydrochloride were purchased from Sigma-Aldrich.

Methods: Eutectic mixtures of Lidocaine-Tetracaine and Lidocaine-Tetracaine Hydrochloride were prepared at 1:1 w/w ratio by uniform mixing. Thermogravimetric analysis [TGA] (Temperature: 30-300 0C; Rate: 100C/min) was used to determine degradation behavior. Modulated Differential Scanning Calorimetry [MDSC] (Temperature: -40-200 0C; Rate: 20C/min) was used to look at thermal transitions during heating and cooling cycles. X-ray diffraction studies were used to determine the crystallinity of these mixtures.

Results and Discussion: Tetracaine Hydrochloride was found to be most thermostable followed by Tetracaine and Lidocaine respectively. Lidocaine, Tetracaine, Tetracaine Hydrochloride showed melting endotherms at 68.49, 43.14, 140.04 0C and recrystallization exotherms at 31.53, 29.40, 97.63 0C respectively. The Lidocaine-Tetracaine eutectic mixture showed a single melting endotherm at lower temperature than that of pure compounds and Lidocaine-Tetracaine Hydrochloride eutectic mixture showed two melting endotherms both being lesser than that of pure compounds respectively. Both systems showed no events in cooling and second heating cycles. X-ray diffraction data showed that Lidocaine, Tetracaine, Tetracaine HCl and Lidocaine-Tetracaine Hydrochloride eutectic mixture are crystalline in nature whereas, Lidocaine-Tetracaine eutectic mixture is amorphous in nature. Thus, it can be inferred that salt formation retards the Hydrogen-bonding ability of a compound and thus retards eutectic mixture formation. As a result, amorphization of a system is prevented.

Conclusions: Salt formation increases the melting point and thermostability of a compound and retards its eutectic mixture forming ability. These findings are critical during designing of the formulations based on eutectic mixture phenomena.

86. **ASSESSMENT OF BLOOD GLUCOSE CONTROL IN GENERAL MEDICINE PATIENTS TREATED WITH SUBCUTANEOUS INSULIN IN A COMMUNITY HOSPITAL**

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Purpose: The purpose of this study was to investigate the level of blood glucose (BG) control in general medicine patients treated with subcutaneous insulin at our institution and to discover what subcutaneous insulin regimen is most successful in obtaining BG control.

Methods: The institution's electronic medical record (EMR) was used to retrospectively review charts of adult, general medicine patients who were prescribed subcutaneous insulin during September 2013. The insulin regimen and all point-of-care glucose readings were recorded for each patient-day.

Preliminary Results: Of 136 patient-days evaluated, the patient-day mean BG (mBG) was within the target range of 100 – 180 mg/dL 45.6% of the time. The average patient-day mBG was 198.6 mg/dL. Hypoglycemia (BG < 70

mg/dL) occurred during 4 (2.9%) patient-days. Hyperglycemia (BG > 180 mg/dL) occurred during 103 (75.7%) patient-days. The patient-day mBG for the correctional insulin regimen and the basal insulin plus correctional insulin regimen was within the target range 61.5% (40/65) and 24.2% (15/62) of patient-days respectively ($p < 0.001$). The average patient-day mBG for the correctional insulin strategy and the basal insulin plus correctional insulin strategy was 173.7 mg/dL and 229.7 mg/dL respectively ($p < 0.001$).

Conclusion: Blood glucose in general medicine patients treated with subcutaneous insulin at our institution is not well controlled. Better glucose control was achieved when correctional insulin was used alone. This may be a result of selection bias if patients who have poorer glucose control are those who receive the basal insulin plus correctional insulin regimen. Further review is needed to educate pharmacists on the desired insulin regimen for general medicine patients and direct physician prescribing habits to improve blood glucose control at our institution.

87. **A RETROSPECTIVE ANALYSIS OF INTRAVENOUS ACETAMINOPHEN USE IN SPINAL SURGERY PATIENTS**

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Purpose: Intravenous acetaminophen was added to the Alegant Creighton formulary in January 2013. Intravenous acetaminophen (IV APAP), Ofirmev®, is approved for the management of moderate to severe pain with adjunctive opioid analgesics in a variety of surgical populations but has not yet been studied in spinal surgery. Previous studies in various surgical populations have shown improved pain scores and decreased opioid consumption with pre and postoperative use of IV APAP. Opioids have long been associated with significant adverse events such as respiratory depression, nausea/vomiting, and constipation, all of which increase health care needs. This study aimed to determine if IV APAP could decrease visual analog pain scores (VAS), opioid exposure and subsequent opioid related adverse effects (nausea, vomiting, constipation) in spinal surgery patients.

Methods: Thirty four spinal surgery patients to date have received IV APAP since its addition to the formulary. The electronic medical record was accessed on all patients who received at least one dose pre or post operatively to collect postoperative opioid consumption (in morphine equivalents), number of antiemetic and laxative doses, use of naloxone, and VAS pain scores from arrival to surgical unit through postop day two. An equivalent number of patients who did not receive any IV APAP were selected and matched on the basis of opioid use prior to admission, surgery type, surgeon, age, and sex to constitute the control group.

Results: The IV APAP group used significantly less opioids than the control group ($p = 0.015$). Frequency of antiemetic and laxative use and VAS pain scores did not differ significantly between the two groups.

Conclusions: It appears IV APAP can be used effectively as an adjuvant pain management therapy in spinal surgery patients to decrease opioid exposure, but does not necessarily reduce the incidence of opioid related adverse effects or VAS pain scores.

Key Words: pain management, intravenous acetaminophen, spinal surgery, postoperative pain

88. **PREPARATION AND CHARACTERIZATION OF MICROPARTICLES CONTAINING IRON NANOPARTICLES FOR LUNG DELIVERY**

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The aim of this project is to develop and characterize multifunctional nano/micro particulate drug delivery system intended for pulmonary delivery for lung cancer treatment. This multifunctional approach is designed with an aim of utilizing both chemotherapeutic agent as well as radio frequency (RF) heating for targeted therapy of lung tumors.

Methods: Iron oxide nanoparticles were prepared by co-precipitation from stoichiometric mix of solution of Fe(II) and Fe(III) salts. Iron nanoparticles were then incorporated into a chitosan solution and spray-dried using a Buchi Mini Spray Dryer. Iron content of the chitosan microparticles was determined using spectrometry; particle size of

the microspheres was determined by scanning electron microscopy (SEM) and optical microscopy. Surface charge (zeta potential) and particle size of the nano particles were measured by a zetameter.

Results: The particle size of iron oxide nanoparticles prepared by co-precipitation method, was found to be around 200nm. SEM and optical microscopic studies indicated that the size range of chitosan microparticles prepared by spray drying was within 3 to 6 micrometers. These microparticles were spherical with a smooth surface topography. The entrapment efficiency of the chitosan microparticles revealed that the iron oxide nanoparticles were successfully entrapped into the chitosan microparticles.

Conclusion/Significance: An inhalable dosage form of chitosan microparticles containing iron oxide has been fabricated via spray drying technique. To develop multifunctional use, chemotherapeutic agents relevant for lung cancer therapy can be loaded into these particles. This method can be further optimized and modified to yield particles with favorable aerodynamic properties desired for alveolar deposition and can be targeted for lung cancer therapy.

89. **ASYMPTOMATIC BACTERIURIA IN ADULT ACUTE CARE PATIENTS: A DESCRIPTIVE ANALYSIS**

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Purpose: Asymptomatic bacteriuria (ASB) is defined as isolation of a specified quantitative count of bacteria in an appropriately collected urine specimen obtained from a person without symptoms suggestive of urinary infection (UTI). ASB is a common finding, particularly in hospitalized and long-term care facility residents. Despite available clinical practice guidelines for the screening and treatment of ASB, it is often misdiagnosed and inappropriately treated with antimicrobials. The purpose of this study is to determine the number of patients admitted to a hospital medicine service in a private community hospital that have documented findings consistent with ASB that are treated with antimicrobials.

Methods: This study was approved exempt by the Creighton University IRB. Patients admitted during a specified time period with a positive urine culture within 24 hours of admission were evaluated for inclusion. Patients were excluded if they were under 19 years of age, pregnant, immunocompromised, previous or planned urologic procedures, or suspected/proven infection at another anatomic site. Antimicrobial use was considered inappropriate if bacteriuria was treated and urinary urgency or frequency, dysuria, suprapubic tenderness, flank pain, rigors, gross hematuria, delirium or altered mental status, or fever were NOT documented. Descriptive statistics were used for baseline demographics and continuous and nominal variables.

Results: One hundred thirty one subjects had bacteriuria. Seventy seven (59%) did not have documented UTI symptoms and 60 (78%) received antibiotics. 47% (62/131) of included subjects were determined inappropriate antibiotic usage.

Conclusion/Significance: Patients admitted to this institution are inappropriately screened for ASB and treated with antimicrobials. Interventions such as prescriber education, improved urinary specimen collection techniques, and prospective audit with feedback may reduce inappropriate antimicrobial use at our institution.

91. **MATERNAL MEDICATIONS AND NEONATE THERAPIES IN INFANTS EXPOSED TO MATERNAL MILK**

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Background: Several questions pertaining to the safety of various neonatal pharmacotherapies in infants admitted to the Neonatal Intensive Care Unit (NICU) have arisen in the medical community. Of particular concern is medication use in post-partum mothers who are actively breastfeeding infants admitted to the NICU. While the risks associated with maternal drugs in lactation have been extensively researched, there are currently no available

studies that evaluate the potential for adverse drug interactions that may result in the infant from the combination of neonatal medications administered to the infant in the NICU, with maternal medications received by the infant via breast milk.

Objective: To explore the potential for drug-drug interactions between maternal medications in breast milk and medications prescribed to infants admitted to the NICU.

Methods: Mothers with neonates admitted to the NICU at our institution between August 2012 and March 2013 were interviewed and data pertaining to their post-partum medication use was collected. This verbal list of medications was later cross-referenced with the maternal medications listed in the NICU discharge summaries for each respective infant. Mothers and infants were followed for the duration of their stay in the NICU. A complete medication history for each infant was then obtained from the hospital's electronic health record upon the infant's discharge, and a de-identified list of post-partum maternal medications was evaluated with a de-identified list of infant medications for drug-drug interactions via the drug information databases Micromedex® and LexiComp®. All drug-drug interactions identified as significant (category D or X) per the aforementioned clinical databases were then individually assessed for their potential to produce adverse effects in the neonate.

Results: Ninety-two mothers providing breast milk and their 104 infants were included in this study. A combined total of 141 drugs were utilized in the treatment of these mother-infant groups, resulting in a possible 170 significant drug-drug interactions.

Conclusion: Breastfeeding infants receiving pharmacologic therapy are at low risk for experiencing adverse effects secondary to drug-drug interactions between maternal and neonatal medications.

Acknowledgment: A grant for this study was funded by Creighton University.

92. **KEY PHYSICOCHEMICAL FACTORS FOR AMORPHIZATION OF POORLY SOLUBLE DRUGS IN SOLID DISPERSION**

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Purpose: Solid dispersion is a promising technique for improving the solubility of poorly water soluble drugs. The objective of this study was to explore the key physicochemical properties that contribute to the "amorphization" i.e. crystal to glass transition.

Methods: Solid dispersions of five different drugs (Griseofulvin, Flutamide, Curcumin, Indomethacin and Dipyridamole) with drug loading of 70% w/w were prepared by solvent evaporation method using vacuum drying. Four hydrophilic polymers including polyethylene glycol (PEG), Eudragit, hydroxypropyl methylcellulose (HPMC) and polyvinyl pyrrolidone (PVP) with varied physicochemical properties were used to prepare the solid dispersions. Physical state of drug in the solid dispersions was characterized by X-ray diffraction (XRD) and modulated differential scanning calorimetry (MDSC). Role of physicochemical properties; Flory-Huggins interaction parameter estimated to predict API-polymer miscibility and intermolecular interaction predicted by structure analysis was correlated with the amorphization of drugs.

Results: Table 1 shows the physical state of drugs in solid dispersions. The crystallization tendency of drugs in solid dispersions is found to be correlated to crystallization tendency of the pure drugs. The T_g of polymer, drug-polymer miscibility and drug-polymer interaction plays an important role in amorphization. Estimation of intermolecular H-bond is not sufficient to predict the true cohesive interaction in solid dispersion, interactions such as intramolecular H-bond and/or electrostatic interaction may also play an important role in drug-polymer molecular interaction.

Conclusion: Properties like crystallization tendency of pure drugs, glass temperature of polymers used in the preparation of solid dispersions and drug-polymer miscibility appears to be in correlation with tendency for amorphization.

Table. 1. Physical state of drug in solid dispersion

	Griseofulvin	Flutamide	Curcumin	Indomethacin	Dipyridamole
PVP	A	A	C	A	A
HPMC	C	C	A	A	A
Eudragit	C	C	A	A	C
PEG	C	C	A	A*	C

A: amorphous; C: crystalline

93. **VARIABLES ASSOCIATED WITH THE INTENSITY OF OFFICE- BASED PT AND OT SERVICES IN THE OP MEDICARE POPULATION**

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Introduction: A 2013 Medicare Payment Advisory Commission (MedPAC) report recommended a reduction in the annual financial limitation (cap) and the certification period for outpatient therapy services. MedPAC acknowledged a need to collect functional limitation and severity condition data of beneficiaries in order to better understand the costs. The purpose of this study was to determine if an association exists between the number of office-based therapy visits (dependent variable; a proxy for costs) and hypothesized demographic, functional status, and medical condition (independent) variables in the Medicare B and Medicare Managed Care populations with a therapy visit from 2009-2011.

Methods: Data for this study was taken from public use consolidated data files of the 2009- 2011 Medical Expenditure Panel Survey. An analytic file was created for this analysis by pooling data from the three years of the study survey. Descriptive statistics of therapy utilization in the outpatient Medicare population was completed. A Poisson regression analysis of the dependent and independent variables was performed to determine the association between the variables.

Results: Age (IRR=.983, $p<.049$) and receipt of Supplemental Security Income (IRR=1.000068, $p<.032$) were demographic variables associated with the number of therapy visits. The following functional status variables had a statistically significant positive association with the number of visits: report of physical function limitations (IRR=1.275, $p<.049$, report of cognitive limitations (IRR=1.758, $p<.01$), difficulty walking up 10 steps (IRR=1.086, $p<.036$), difficulty walking a mile (IRR=1.073, $p<.048$), difficulty bending/stooping (IRR=1.093, $p<.043$), difficulty reaching (IRR=1.12, $p<.032$ and report of IADL limitations expected for at least 3 months (IRR=1.758, $p<.01$). Cancer diagnosis (IRR=1.474, $p<.001$) was negatively associated with number of therapy visits.

Conclusion: Several age, income and functional status variables were associated with the number of office-based therapy visits. The results suggest that outpatient benefit growth is due, in part, to the needs of patients.

94. **THE EFFECT OF WALKING SPEED AND DOPAMINERGIC MEDICATION ON KNEE MUSCLE PERFORMANCE IN PEOPLE WITH PARKINSON'S DISEASE**

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Objective: The purpose of the present study was twofold: (1) to assess thigh muscle performance of people with fatigue associated with Parkinsons Disease (PD-fatigue) whilst on and off dopaminergic medication (DMed) compared to younger and older control subjects and (2) to determine whether self-selected walking speed is associated with deficits in muscle performance.

Methods: Twelve PD-fatigue (9M, 3F; age=65.4±6; BMI=27.2±4; Parkinson's Fatigue Scale=10.8±2), 13 younger unimpaired (7M, 6F; age=24.8±3; BMI=24.7±3) and 10 older (8M, 2F; age=64.9±8; BMI=27.1±2) volunteers were assessed. We further stratified PD subjects based on their speed during a 6-minute walking test into PD-SLOW (6 subjects; speed=1.11m/sec; range=1.01-1.19m/sec) and PD-FAST (6 subjects; speed=1.46m/sec; range=1.37-

1.64m/sec). Subjects with PD-fatigue were tested twice (minimum of 4 days apart), OFF DMed (withdrawn 12 hours prior to the test) and ON DMed. The primary outcome was peak isometric knee extension torque normalized to body weight (nPT).

Results: DMed withdrawal produced a significant decrease in quadriceps knee extension nPT (-14%; $p=0.01$) only in the PD-SLOW group. Younger controls produced statistically higher nPT than any other group ($p<0.001$). The older controls produced nPT comparable with the ON medication state of the PD-SLOW and PD-FAST groups, as well as with the OFF medication state of the PD-FAST group.

Conclusions: Our results demonstrated that muscle performance was age dependent and not necessarily due to PD. Participants with PD that walked slower than 1.2m/sec appeared to have suppressed muscle performance in the absence of DMed, whereas fast walkers maintained their peak torque even when DMed was withdrawn.

95. **THE ENHANCEMENT OF CEREBROCORTICAL NEURON NEURITE OUTGROWTH BY A VGSC ACTIVATOR REQUIRES BOTH THE NMDA AND PAK1**

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Brevetoxin 2 (PbTx-2) is a voltage-gated sodium channel activator (VGSC) that increases neuronal $[Na^+]_i$. PbTx-2 induced Ca^{2+} influx in DIV 8-10 cerebrocortical neurons involved GluN2B, but not GluN2A, C or D containing receptors. Stimulation of neurite outgrowth by PbTx-2 required Ca^{2+} influx and Rac1 activation. Either a p21 protein (Cdc42/Rac)-activated kinase 1 (PAK1) specific inhibitor or transfection with a GFP-tagged PAK1 siRNA decreased PbTx-2 induced neurite outgrowth. PbTx-2 also robustly increased the density of dendritic filopodia and the frequency of mEPSCs in a PAK1 sensitive manner. The influence of PbTx-2 on neuronal structural plasticity and F-actin dynamics requires the GluN2B subunit and PAK1.

96. **EFFECTS OF THE DUAL OREXIN RECEPTOR ANTAGONIST ALMOREXANT ON SLEEP IN THE KCNA1-NULL MOUSE MODEL OF EPILEPSY**

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Purpose: This study was designed to test the effects of almorexant, a dual orexin receptor antagonist, on the Kcna1-null (KO) mouse. The Kcna1-null mouse is a model for temporal lobe epilepsy that also experience co-morbid sleep disorder.

Methods and Materials: KO mice were implanted with subdural electroencephalography (EEG) electrodes and electromyography (EMG) electrodes under isoflurane anesthesia at postnatal day 35. After 7 days of recovery, mice were given vehicle (25% DMSO in sterile saline, i.p., approximately $<100 \mu L$.) for 3 days followed by almorexant (100 mg/kg in 25% DMSO in sterile saline) for 3 days. Injections occurred at the start of lights on (Zeitgeber = 00:00 hours). Mice were monitored for 48 hours starting on the second day of vehicle or almorexant. Analysis was constrained to the rest period after the third injection of vehicle or almorexant (Zeitgeber = 00:00 to 12:00).

Results: Recordings were divided into 30s epochs and categorized into NREM, REM, and wake states based on EEG power in the Delta band (0.5 to 4 Hz), EMG power in the 10-50 Hz range, and behavior. All states were analyzed for total number of epochs and number of arousals during REM and NREM. Preliminary data suggests that almorexant leads to an approximately 30% increase in NREM and 25% decrease in time spent awake for KO mice during their active phase. The number of arousals, normalized to total sleep time, remain consistent for vehicle and almorexant treated mice.

Conclusions: Orexin receptor antagonism has been suggested as an alternative to current pharmacological sleep therapies due to a decreased likelihood of side-effects such as cognitive impairment and daytime drowsiness in non-epileptic people with sleep disorders. In this study, we are the first to demonstrate that almorexant, a dual orexin

receptor antagonist, is capable of increasing sleep in the Kcna1-null mouse, a clinically relevant model of epilepsy with co-morbid sleep disorders.

97. **ALCOHOL USE PROLONGS HEALING TIME IN OPEN ORTHOPEDIC TRAUMA WOUNDS TREATED WITH NEGATIVE PRESSURE WOUND THERAPY**

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Purpose: The purpose of our study was to evaluate the influence of various comorbidities on wound healing time in orthopedic trauma wounds treated with negative pressure wound therapy (NPWT).

Materials and Methods: A retrospective chart review was conducted for orthopedic trauma wounds that were initially treated with NPWT during a span of approximately 3 years at Creighton University Medical Center. The factors that were evaluated were diabetes mellitus, alcohol use, obesity, peripheral vascular disease, chronic lung disease, immunosuppressive therapy, tobacco use, renal disease, and anemia. The final model included NPWT duration (p-value = 0.0018) as the covariate, and alcohol use (p-value = 0.0478) and diabetes mellitus (p-value = 0.0059) as explanatory comorbidities.

Results: This study yielded a total of 41 orthopedic trauma wounds initially treated with NPWT. A significant difference was found for patients with a positive history of alcohol use. Wounds in these patients had an average healing time of 81 days, which was an average of 19 days longer than the mean (p = 0.0478).

Conclusions: Our study showed that concomitant alcohol usage prolonged wound healing-time in orthopedic trauma patients treated with NPWT. Our study points toward the influence of a single comorbidity; however, future studies could improve the guidelines for wound treatment in patients with a positive history of alcohol use and other comorbidities.

98. **CLOZAPINE AND CONCOMITANT CHEMOTHERAPY IN A PATIENT WITH SCHIZOPHRENIA AND NEW ONSET ESOPHAGEAL CANCER**

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Introduction: Clozapine is an effective agent for treatment-resistant schizophrenia. Clozapine therapy is associated with risk of neutropenia and agranulocytosis. The use of clozapine in patients diagnosed with cancer and receiving chemo radiation therapy poses a therapeutic dilemma. Potential loss of therapeutic benefits from clozapine and risk of a psychotic relapse must be carefully weighed against the accentuated risk of drug-induced neutropenia. There is limited clinical evidence available to guide clinicians faced with such situations. We report the case of a patient maintained on clozapine treatment despite chemotherapy for squamous cell carcinoma of the distal esophagus.

Case Report: The authors present a case of an elderly male with schizophrenia and on stable clozapine therapy that developed new onset squamous cell carcinoma of the distal esophagus. Patient was doing fairly well on clozapine maintenance therapy until he developed symptoms of progressive dysphagia to solid foods and accompanying weight loss. Hematology oncology workup revealed T3-4N1M0 squamous cell carcinoma of the lower esophagus with no liver metastasis. He was suggested to undergo chemo-radiation therapy for his condition. Patient had a J-tube placed and was started on weekly carboplatin and paclitaxel. He was also switched to the rapidly disintegrating tablet formulation of clozapine. A decision to continue clozapine therapy was made. A special monitoring protocol was developed for the patient. This included weekly monitoring of CBC and differential counts along with modified hematological parameters. Patient was able to receive full dose of chemotherapy along with his regular dose of clozapine. There was no reemergence of psychosis, development of neutropenia or agranulocytosis.

Conclusions: Clozapine and chemotherapy can be successful combined despite the risks involved. However, this should only be undertaken if the risk-to-benefit ratio for the patient favors continuation of clozapine and in a setting where close monitoring and collaboration between providers is possible.

99. **WORKING MEMORY DEFICITS IN VETERANS WITH COMBAT-RELATED PTSD: A MAGNETOENCEPHALOGRAPHY STUDY**

Timothy J. McDermott, Amy S. Badura Brack, Elizabeth Heinrichs-Graham, and Tony W. Wilson, Department of Psychology, Creighton University, Omaha, NE

Posttraumatic stress disorder (PTSD) is known to be associated with memory problems, but research is limited in the areas of working memory and executive function and even less is known about the neurophysiological correlates of these deficits. Magnetoencephalography (MEG) is a noninvasive neurophysiological recording method that quantifies neural activity by measuring the magnetic fields generated by the brain's neuronal activity. To this end, the classic Sternberg task was used as it allows working memory to be divided into three distinct phases: encoding, maintenance/rehearsal, and information retrieval. Essentially, we examined working memory functions using MEG in 16 male combat (Operation Iraqi Freedom/Operation Enduring Freedom) veterans with PTSD diagnosed using the Clinician Administered PTSD Scale (CAPS), and 15 psychologically healthy, demographically-matched control participants. The resultant MEG data was imaged using advanced beamforming methodology, and the output maps were converted into statistical parametric maps (SPM) for group comparisons. These maps reflect the neurophysiological correlates of working memory during each of the three phases, yet this poster focuses specifically on the encoding phase. Our results showed that, despite comparable performance, veterans with PTSD had neurophysiological deficits in the right dorsolateral prefrontal cortex (dlPFC) and the right inferior frontal gyrus as compared to healthy controls during the encoding of stimuli. We propose that these deficits may reflect compensatory processing in the veterans suffering from PTSD, and that this may explain the comparable behavioral performance. Group differences were characterized by greater desynchronized neural activity in the PTSD group at the high-alpha frequency (10-14 Hz) as compared to the control group. This poster describes the first neuroimaging study to characterize working memory processes in patients with PTSD using magnetoencephalography. We are hopeful further research on the heels of these initial findings will lead to advances in focused psychological and medical interventions for PTSD. *This poster was funded by a Creighton College of Arts and Sciences Summer Fellowship.

100. **COLORING TOYS FOR GIRLS AND BOYS**

Amy Wu, David Herr, and Isabelle D. Cherney, Department of Psychology, Creighton University, Omaha, NE

Children's toy preferences are gender-typed and influence their memory, attitudes, and behaviors. These gender-typed preferences may be based on gender roles, schemas, or other characteristics acquired through socialization. It is unclear, however, how the color of toys influences children's reasoning and gender stereotyping about toys. The present study examined the categorization of three- to five-year-old boys' and girls' sex-typed and ambiguously colored toys. Children were shown 40 pictures of gender-typed, neutral and ambiguous toys as well as four abstract objects that were used as a control. The color of the toys was changed to different hues. Preliminary findings showed a complex relationship between the characteristics that contribute to gender stereotyping and a child's interpretation of these features. Overall, gender stereotyped colors like pink, regardless of type of toy, seemed to be a leading determinant for children's gender categorization for the toy.

101. **RISK, PSYCHOPATHY, AND CROSSOVER OFFENDERS**

Jared Ruchensky, Robin Strominger, Tara Ryan, Timothy McDermott, Jackie Paxton, and Matthew T. Huss, Department of Psychology, Creighton University, Omaha, NE

In the past, research has primarily focused on differentiating between different types of specialized sex offenders (Robertiello & Terry, 2007). Recent studies, however, have found that many offenders are crossover offenders, meaning they offend across victim gender, victim age, and the relationship between the offender and the victim (Heil, Ahlmeyer, & Simons, 2003). The present study found that crossover offenders and specialized offenders differ on key risk factors identified previously in the literature, specifically a social deviance related construct. The present study also examined potential differences in psychopathy.

The first author is a recipient of the CCAS Dean's Award for Undergraduate Research.

102. **EFFECTS OF MENTAL AND PHYSICAL COMORBIDITY ON OBSERVER STIGMA APPRAISAL**

Lauren Mason, Department of Psychology, Creighton University, Omaha, NE

Stigma and discrimination have significant impacts on all those they affect. People are stigmatized for various reasons leading to lower self-esteem and self-efficacy, and an overall decrease in subjective life quality. The stigma and discrimination associated with mental health problems is particularly problematic, as it has been identified as the largest barrier to treatment seeking. This population is also at greater risk for physical disorders, giving way to an additional set of stigmas. This study examines the differing affects of single and comorbid physical and mental disorders on observer attribution of stigma and discrimination. Hypothesized results indicate higher stigmatization for comorbid individuals.

103. **TRAIT IMPORTANCE AS A MODERATOR OF SELF-IDEAL ASSOCIATIVE STRENGTH**

Olivia Lickteig, Isabelle Laposha, and Corey Guenther, Department of Psychology, Creighton University, Omaha, NE

The tendency for individuals to evaluate themselves more favorably than others is one of the most robust phenomena in the social psychological literature. To understand the mechanisms underlying this effect, researchers have overwhelmingly focused on how judgments of others are generated in a manner that produces favorable outcomes for the self. Far less is known about the other half of this equation, namely how trait evaluations of self are derived in such contexts. The present study contends that spontaneous trait self-judgment comprises a heuristic-driven process wherein evaluations of self are anchored on and assimilated toward idiosyncratic ideal trait conceptions. Importantly, because we believe this association to be in the service of enhancing one's self-image, we assume that (1) associations with ideal are unique to the self and thus not afforded to judgments of the average person, and (2) that self-ideal associations should be markedly stronger for judgments on important trait dimensions (e.g., honesty, responsibility, competence) than on less important dimensions (e.g., agreeableness, imagination, outgoing). To test these hypotheses, 102 participants made "ideal" trait ratings on 5 important and 5 unimportant dimensions during a mass pre-testing session at the beginning of the academic semester. A minimum of four weeks later, these participants then made either self or average-peer ratings on the same trait dimensions, and also evaluated the relative importance of each trait dimension. Results largely supported our theoretical predictions: collapsing across trait dimensions, self-ratings deviated from ideal conceptions to significantly lesser degree than average-peer ratings. Moreover, the strength of the self-ideal association was significantly stronger for important trait domains compared to that for less important domains. Self-ratings were more strongly correlated with ideal ratings, and deviated from these ratings to a lesser degree, than did self-ratings on less important trait dimensions. Implications and directions for future research are discussed.

104. **DO TERM LIMITED LEGISLATORS VOTE DIFFERENTLY?**

Michael Abboud, Department of Political Science, Creighton University, Omaha, NE

Term limit legislation has become a popular tool of citizens to limit the professionalism of politicians. It has created a new paradigm for term limited legislators as they don't have to worry about reelection. These laws have had an effect on a multitude of different areas, including voting behavior. This study will answer whether term limits have had an impact on voting behavior on expanding Medicaid for the Affordable Care Act. The findings of the study suggest that term limits had an impact on the voting behavior of all legislators and a significant impact on term limited Republicans in states Obama won in 2012.

105. **The Effects of Political Efficacy through the General Election: A Closer look at American Indians**

O'Connor, Margaret, Department of Political Science, Creighton University, Omaha, NE

This paper examines the difference of political efficacy among American Indians and the non-native population. My findings suggest that American Indians have a lower level of political efficacy than other populations. This is likely due to their unique relationship with the US government, including abrogation of treaties and centuries of failed policies. Even controlling for traditional indicators for political efficacy, such as education, income and age, American Indians consistently exhibited low levels of political efficacy.

106. **EXPLAINING STATE VARIATION ON FRACKING LEGISLATION**

Taylor Benson, Department of Political Science, Creighton University, Omaha, NE

Production of natural gas from deep shale deposits in the United States by way of hydraulic fracturing has rapidly increased in recent years. As a result, there have been varying amounts of legislative attention drawn to environmental safety regulations among the states. This paper examines the factors leading to variation in the number of proposed and passed legislation over the past seven years, including state and citizen income, democratic legislative and executive control, state ideology, natural gas withdrawals, density of shale gas wells per person, strength of the state's planning role, and watershed vulnerability. A Correlated Panels Corrected Standard Errors linear regression for both passed and proposed legislation supports the hypotheses generated from the two variants on the Race to the Bottom Theory—the dominant interest influence model and ideological predisposition of state's citizenry as a determinant of state policy action—as well as the hypotheses from the Internal Determinants and Simple Responsive Policymaking Model. These results generate important conclusions for exploring the causal relationships between state legislation and hydraulic fracturing, and lay groundwork for further research linking state policy and environmental policy.

107. **THE EFFECTS OF INTERNET USAGE ON VOTER CHOICE IN THE 2012 PRESIDENTIAL ELECTIONS**

Media Ajir, Department of Political Science, Creighton University, Omaha, NE

The purpose of this study is to see the effects of Internet on modern day presidential elections. By testing Internet usage in 4 different ways, I am able to identify which behaviors influence voter choice in the 2012 Presidential Elections. Results suggest that those who visited a candidate's Presidential website during the campaign were more likely to vote for Barack Obama in 2012, while specific types of Internet usage were less reliable predictors of the vote.

108. **VARIATION IN THE DURATION OF UNEMPLOYMENT INSURANCE**

Stephanie Oliver, Department of Political Science, Creighton University, Omaha, NE

The purpose of this study is to explain the variation in the duration of people on unemployment insurance across U.S. states. I test how economic and political variables including presidential party support and state ideology affect the number of weeks people receive unemployment insurance. My findings suggest that unemployment rate, population, state budget, and Republican presidential party support are statistically significant in determining the length of unemployment insurance.

109. **THE IMPACT OF SOCIAL MEDIA ON SOCIAL MOVEMENTS**

Amandha Rohr Lopes, Department of Political Science, Creighton University, Omaha, NE

This paper seeks to explain and test the formation process social movements by addressing two overarching interrelated factors: opportunity structures and mobilizing structures. I hypothesize that social movements are caused by opportunity structures such as economic, institutional, and social contexts of a country conditioned by its access to social media. Social movements are not created by a single variable but rather by a set of variables that create an interaction effect. Discovering ways to mass organize is as essential for the occurrence of social movements as the grievances that make people want to organize in the first place. The introduction of social media into the discussion

is thought to have completely changed the way people are able to organize. In order to test my hypothesis, I use data from a number of different sources for all countries in 2008-2012.

110. **THE IMPACT OF MONETARY CONTRIBUTIONS ON MEDICAID EXPANSION DECISIONS IN THE 50 STATES**

Claire Wilka, Department of Political Science, Creighton University, Omaha, NE

I use two binary logistic regression models to test whether monetary contributions from health groups in support of Medicaid expansion to both Democrats and Republicans have marginal effects on a state's decision to implement Medicaid expansion across levels of interparty competition. I use marginal effects plots to clarify the substantive effects of the conditional relationship between interparty competition and monetary contributions, and how this influences a state's Medicaid expansion decision. I find my variables of interest to be statistically significant, but in surprising directions.

111. **THE TEA PARTY IN CONGRESS: EXAMINING VOTING TRENDS ON DEFENSE AND INTERNATIONAL TRADE LEGISLATION**

Peter Ganz, Department of Political Science, Creighton University, Omaha, NE

I test how members of the United States House of Representatives associated with the Tea Party movement vote on four pieces of legislation relating to both defense and international trade spending. Members with high FreedomWorks scores, an interest group rating associated with the Tea Party, were found to have distinctly different voting patterns than the House of Representatives in general, while representatives that self-identified themselves as Tea Party showed no distinct voting patterns.

112. **VARIATION IN MEDICAL MARIJUANA SUPPORT**

Ian Terayama, Department of Political Science, Creighton University, Omaha, NE

This study tests whether spatial diffusion meaningfully affects the likelihood of an individual's support for medical marijuana. I use the November 2012 CBS/60 Minutes/Vanity Fair National Survey data set to build a logistic regression model.

113. **STANDARDIZED TEST SCORES: DOES WHAT WE PAY OUR TEACHERS HURT OUR STUDENTS?**

Tara Whitley, Department of Political Science, Creighton University, Omaha, NE

I test whether meaningful differences between school administrator salaries and teacher salaries, as well as several important political variables affect the standardized test scores of 4th grade students in the United States. I use a compilation of data from the Department of Education to examine this relationship. I find that the ratio of teacher to administrative salaries, political party of Governor, percent Democratic vote in previous Presidential Election, presence of ballot initiative process, instructional expenditures per pupil, and income are statistically significant predictors of math test scores while only income is a statistically significant predictor of reading test scores.

114. **WOMEN IN POLITICS: EXAMINING THE GENDER GAP IN LATIN AMERICA AND THE CARIBBEAN NATIONAL PARLIAMENTS**

Alexandrea Swanson, Department of Political Science and International Relations Creighton University, Omaha, NE

Women remain a large minority in National Parliaments across the world. To further explain this variation, I test whether or not the presence of higher percentages of female mayors has an effect on the percentage of women elected to lower chambers of National Parliaments in Latin America and the Caribbean. I find higher percentages of female mayors to be significant in explaining the percentage of seats held by women in the lower chamber. This is

an important finding because as the percentage of female mayors increases so will the percent of women elected to National Parliaments. This study encourages women to get involved in lower levels of government, in order to help close the gender gap in politics.

115. **SECONDARY TEACHERS' PERCEPTIONS ON INSTRUCTIONAL COACHING**

April Buschelman, Interdisciplinary Ed.D. Program in Leadership, Creighton University, Omaha, NE

Background: Instructional coaching is a method of professional development used within schools to increase teacher's implementation of research-based methodologies and pedagogical constructs. It has been implemented in many middle and elementary level schools, but is not as prominent in the high school setting.

Purpose: The purpose of this phenomenological study is to explore the perceptions of public school secondary mathematics teachers regarding the usefulness of instructional coaching. At this stage in the research, instructional coaching will be generally defined as a form of individualized professional development focused on teacher improvement. It will provide possible insight into why there are few secondary content-focused instructional coaching programs and help answer the question: To what extent is instructional coaching useful in the area of secondary mathematics?

Methods: The author has chosen a phenomenological approach for the study, allowing for valuable information from participating teachers. Participants will be mathematics teachers working at public secondary schools that have been involved with or are currently involved with an instructional coaching program. Participation in the study will be voluntary and thirty to forty-five minute interviews will be conducted with each participant. Interviews will allow the researcher to receive both verbal and non-verbal information as the teachers discuss their experiences with the instructional coaching program. Using a phenomenological approach, the researcher will be looking for commonalities and hopefully determine a general "phenomenon" or perception amongst many of the participants.

Significance: Upon successful completion, this study will add to the extant literature on instructional coaching. It will also help fill the gap in literature formed by a lack of research at the secondary level. This study could assist administrators and fellow educational researchers in determining the overall usefulness of instructional coaching in its entirety as a program. It may also provide knowledge on the impact instructional coaching has on student performance and if it is a worthwhile allocation of funding for schools.

116. **EXPLAINING GANG ATTRACTION: THE EXAMPLE OF KAREN REFUGEE YOUTH IN OMAHA**

Andrew Smith, Department of Sociology and Anthropology, Creighton University, Omaha, NE

The Karen are an ethnic group in Burma, Myanmar. Many Karen have left their home country due to discrimination and violence and have spent years in Thai refugee camps before coming to the United States and finding a new home in Omaha, Nebraska. Exploratory research indicates that Karen male youth in Omaha are increasingly showing patterns of forming gangs. They are currently in the initial stages of gang formation, which includes gang idolization and modeling behavior after existing gangs. They are not yet involved in violence or other illegal activities. This Poster is based on research that identified the following factors explaining why Karen male youth are attracted to and become involved in gangs: they have limited access to finances and hope to obtain funds through gang activities, they experience cultural differences between themselves and their parents and find a new identity and sense of belonging within gangs, they are not well integrated in local schools and seek other forms of belonging, and they grow up with little parental intervention as most adults are working full-time. The broader significance of this research is to shed light on the scantily researched topic of refugees and gang formation. The findings of this study are currently shared with Karen community leaders to identify strategies to prevent the formation of gangs among their youth.

Andrew Smith is a recipient of the CCAS Dean's Award for Undergraduate Research

117. **BRIDGING THE GAP BETWEEN TRADITION AND MODERNITY: THE ETHNOMEDICAL PRACTICES OF NGÄBE TRADITIONAL HEALERS IN BOCA DEL TORO, PANAMA**

Kelsey Paradise, Department of Sociology and Anthropology, Creighton University, Omaha, NE

The Ngäbe and Buglé combine to make the Guaymí; the largest group of indigenous people that live in the Republic of Panama. These people were a coastal group until the Spanish conquest, when they were forced to flee to the mountains. In 1997, the Ngäbe Buglé obtained their own sovereign district and today, while some Ngäbe traditions are still visible within their communities, due to increasing modernization, cultural knowledge is increasingly threatened. This research focuses on a piece of Ngäbe culture that is still very much intact; their traditional medicine. Through ethnographic field work conducted among Ngäbe communities living in the Bocas del Toro region of Panama, I was able to collect information on the preparations of botanical medicine used by Ngäbe traditional healers (curanderos) within their own communities. Through participant observation and semi-structured interviews, I developed a database of 42 medicinal plants prepared by Ngäbe curanderos for treatment of general health ailments. I then go on to use the theories of Medical Pluralism and Medical Dominance in the analysis of the role of the curandero within Ngäbe society and their relationship to biomedical NGOs in the area. This research aims to bridge the gap in the relationship between Ngäbe curanderos and biomedical practitioners through a better understanding of ethnomedicine within the area; culminating in an effort to better the quality of the health care provided to these remote Ngäbe coastal villages.

118. **TREASURE FOUND: THE JOSLYN'S EARLY CHRISTIAN SARCOPHAGUS FRAGMENT**

Amanda Swisher and Greg Bucher, Department of Classical and Near Eastern Studies, Creighton University, Omaha, NE

Purpose: The purpose of this research project was to examine an unpublished fragment from what appeared to be an early Christian sarcophagus, located in the Joslyn Art Museum, to formulate a formal description of it including the material, dimensions, manner of breakage, carving techniques and the images on it, to learn specifically about early Christian sarcophagi and to amass comparative evidence.

Method: The project began by researching the historical timeline of early Christian art and its iconographical journey. Then comparative evidence was compiled through use of several early Christian sarcophagi catalogs as well as through in person analysis and comparison of several pieces located in the British Museum, Louvre, and Vatican Museums. Finally, the Joslyn fragment was analyzed in light of the comparanda.

Results: The fragment located in the Joslyn Art Museum originating in Rome clearly dates to the fourth century C.E., is a finished piece of sculpture, and is made from a local Italian marble—probably luna marble. The imagery is irrevocably an early Christian depiction of the Magi scene, and the piece broke off from the top right side of a lid of a sarcophagus.

Significance: Because this piece is part of an ancient Christian sarcophagus, it gives us insight into the burial practices of the time. The Joslyn fragment dates to a unique period when the Christian faith was not yet a dominant religion of the world, and therefore shows how the early Christian faith transitioned from a social taboo to the official religion of the Roman Empire, illustrating how Christianity and its iconography fit into the larger historical and political picture.

Acknowledgment: Much gratitude goes to the Creighton College of Arts and Sciences for their Undergraduate Research Grant, which allowed me to complete my research project.

119. **PORTRAIT OF A ROMAN BOY JAM 1947.208**

Joseph Baronovic, Sarah Copeland, and Ashley Weed, Department of Classical and Near Eastern Studies, Creighton University, Omaha, NE

This poster reports the research we carried out on a Roman portrait (JAM inv. 1947.208) in the Joslyn Art Museum. This portrait presents several intriguing problems in terms of style and coherence. For example, the object's hairstyle is characteristic of portraits from the Julio-Claudian period (14 C.E.-68 C.E.), specifically reminiscent of early Neronian portraiture. However, the drilled pupils suggest a substantially later date (after approximately 150 C.E.). Additionally, the bust rests on a square foot, uncharacteristic of usual Roman practice, which was to use round bust-feet.

Scrutiny of the object in the Joslyn's vaults seems to indicate that the portrait has been assembled from several disparate pieces, most likely for the art market. For example, we observed that the ears, themselves of incongruous style, and posterior portions of the head have been inserted into a framework of carved slots in what appears to have been a pre-existing but damaged head. Much of the face itself has also been restored, the tip of the nose having been replaced with a putty-like substance, and a large fragment of the chin restored. Moreover, the head has been joined to the bust at the neck, and it is unclear whether bust and head originally went together. The square foot attached to the bust is also of a different type of marble from the rest of the object.

We are thus able to explain the inconsistencies in style and several other difficulties raised by our initial examination of the object. We document and explain these with arguments presented in our poster.

STUDENT ORAL PRESENTATION ABSTRACTS

1. **NEUROMUSCULAR, METABOLIC, AND MUSCLE MORPHOLOGY CONTRIBUTIONS TO FATIGUE ON INDIVIDUALS WITH A HISTORY OF KNEE INJURIES**

9:15:00 AM– Room 3028A

Elizabeth Bracciano, Maureen Turner; Jorge Zuniga, Department of Exercise Science, Creighton University, Omaha NE

The purpose of the present study was to compare neuromuscular, metabolic, and muscle morphology parameters and their contributions to fatigue on the vastus lateralis muscle (VL) on individuals with a history of knee injuries. Six individuals with a history of knee injuries [mean \pm SD, age = 24.6 ± 1.8 yrs; weight = 77.4 ± 5.7 kg] participated in the study. All subjects performed an incremental cycle ergometer test to exhaustion while gas exchange variables were recorded. Two surface EMG electrode arrangements were placed over the VL of the injured and non-injured legs. Ultrasound images were taken on both legs to compare muscle morphology variables (muscle thickness, pennation angle, and echo intensity). The results of the present study indicated that the VL from the injured leg fatigued at a lower power output (108.23 ± 9.98) than non-injured leg (163.82 ± 49.31). There were no significant differences, however, on any of the muscle morphology variables.

2. **DOES THE CYBER NETWORK REFLECT STATE INTERACTION IN THE INTERNATIONAL SYSTEM?**

9:30:00 AM– Room 3028A

Kelly Burdine, Ciprianna Dudding, Department of Political Science, Department of International Relations, Creighton University, Omaha NE

Purpose: The purpose of this project is to determine to what degree that internet connections replicate the other means by which the current global system is tied together. The hypothesis is that states in the international system communicate and interact along a limited number of paths, and they do so along the same paths consistently no matter what the nature of the interaction.

Method: I use social network analysis to create networks of the international system that are tied together by means of airline traffic, diplomatic exchange, telephone minute exchange, electricity exchange, human trafficking, and submarine cables. I then compare these networks against the internet connection network using a quadratic assignment procedure to test the likelihood that a connection in one network will exist in another network.

Results: The results are statistically significant and show that if there is a connection in one of the other networks then there is at least an 81% chance that the same connection will exist in the internet connection network.

Conclusion: These results show that the cyber world replicates the various means of interactions between states in the international system and creates further interdependence in the world which could impact factors such as vulnerability and power within a state.

3. **TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION DOES NOT IMPACT CLINICAL MEASURES OF ATHLETIC PERFORMANCE**

9:45:00 AM– Room 3028A

Drew Burggraff Brittany Whitmore, Sam K. Morton, Marcus Palimenio, Dimitrios Katsavelis, Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE

PURPOSE: To determine the effects of transcutaneous electrical nerve stimulation (TENS) on jumping ability and peak vertical acceleration forces.

METHODS: Twenty healthy participants (age=23.5±1.1 years, height=176.0±11.4 cm, mass=77.3±18.9 kg) performed a battery of three single leg hops for distance (single hop, triple hop, crossover hop) measured in centimeters (cm) and one timed hop test (6-meters) measured in seconds (s). A tri-axial accelerometer was attached to the sacrum using an elastic wrap and was used to measure peak vertical acceleration. Participants performed one practice trial and two test trials for each jump, with an average used for data analysis. Sensory TENS was applied to the knee joint for 20 minutes. Participants then performed the same testing sequence while TENS continued to be applied. Paired t-tests were performed with jumping distance, time, and peak vertical acceleration forces used as outcome variables. Significance was set a priori at $P < .05$.

RESULTS: There was a significant increase in jumping distance; single leg hop ($P = .02$; Pre= 171.71±43.43 cm, Post= 180.41±46.17 cm), triple hop ($P = .02$; Pre= 517.88±133.12 cm, Post= 530.82±136.15 cm), and crossover hop ($P = .001$; Pre= 466.94±144.83 cm, Post= 487.10±146.30 cm). There was a significant decrease in 6-meter hop time ($P = .01$; Pre= 1.97±0.43 s, Post= 1.91±0.45 s). There were no significant differences for peak vertical acceleration during any of the jumping tests; single leg hop ($P = .43$; Pre= 8.47±2.43 g, Post= 7.79±2.65 g), triple hop ($P = .98$; Pre= 7.77±2.02 g, Post= 7.78±1.57 g), crossover hop ($P = .29$; Pre= 7.79±1.60 g, Post= 7.47±1.63 g), 6-meter timed hop ($P = .60$; Pre= 7.31±1.22 g, Post= 7.02±1.47 g).

CONCLUSION: While TENS is thought to disrupt somatosensory signals from the area of application, TENS applied at the knee joint resulted in increased jumping ability (greater distance or speed) and did not result greater peak vertical acceleration.

4. **TANDEM PREPARATION OF 4-FORMYL AND 4-IMINE 1,2,3-TRIAZOLES**

10:00:00 AM– Room 3028A

Joseph Christensen and James Fletcher, Department of Chemistry, Creighton University, Omaha NE

One of the most attractive features of the Sharpless-Meldal click reaction is its orthogonal reactivity and resulting compatibility with a wide range of functional groups. This feature also makes it amenable for tandem reaction development. Examples of tandem click reactions include those involving azide substitution or trimethylsilylalkyne deprotection steps taking place in the same reaction vessel promoting the click formation of 1,2,3-triazole products. There are currently no reported examples of tandem click reactions involving acetal deprotection leading to aldehyde-functionalized products. Such compounds are of interest due to the bioactivity of 4-formyl-1,2,3-triazole compounds, as well as the utility of the formyl group as a synthetic precursor for bioactive functionality such as pyridines, quinolines and difluoromethyl groups. While formyl groups are also commonly utilized to form imines via condensation with amine reactants, no examples of tandem click reactions involving condensation reactions have been reported either. Therefore, establishing tandem methods to prepare formyl and imine substituted 1,2,3-triazoles would be of interest as a way to increase the efficiency of preparing molecules established as versatile synthons and bioactive compounds themselves. This study aimed to identify reaction conditions enabling two-step and three-step tandem preparation of 4-formyl-1,2,3-triazoles, and an extension to the three-step tandem preparation of 4-imine-substituted-1,2,3-triazoles. Propargyl aldehyde diethyl acetal was mixed with electron poor 4-nitrophenyl, electron rich 4-diethylaminophenyl, and intermediate phenyl azides in room temperature and heated (70°C) flasks. The deprotected 4-formyl-1,2,3-triazole product was found to be the minor product, less than 10%, at low temperature, and at high temperature complete deprotection of the acetal was observed. The electronic nature of the

azide did not significantly impact the deprotection in the two-step tandem reaction. Experimental details and reaction outcomes will be presented.

5. **COMPARISON AND CHARACTERIZATION OF ENDOGENOUS PrPC LEVELS IN HAMSTER LYMPHOID TISSUE**

10:15:00 AM– Room 3028A

Melissa D. Clouse, Jason C. Bartz and Anthony E. Kincaid, Pharmacy Sciences, and MMI, Creighton University, Department of Pharmacy Sciences, Department of Biomedical Sciences and Department of Medical Microbiology and Immunology, Creighton University, Omaha NE

Purpose: The key event in the pathogenesis of the transmissible spongiform encephalopathies is a template-dependent misfolding event where an infectious isoform of the prion protein (PrP^{Sc}) comes into contact with native prion protein (PrP^C) and changes its natural conformation to PrP^{Sc}. The role of PrP^C in this critical step was demonstrated by the inability of PrP^C null mice to develop disease when the infectious agent is inoculated into the brain. The objective of this study was to compare levels of PrP^C in hamster lymphoid tissues involved in the early pathogenesis of prion infection via nasal inoculation, a highly efficient route of infection.

Methods: Lymphoid tissues were collected from golden Syrian hamsters and Western blot analysis was performed to quantify PrP^C levels in tissue homogenates. PrP^C immunohistochemistry (IHC) of paraffin embedded tissue sections was performed to identify PrP^C distribution.

Results: Nasal associated lymphoid tissue (NALT) contained the highest PrP^C level followed by Peyer's patch, mesenteric and submandibular lymph nodes, and spleen. Unique Western blot electrophoretic migration patterns of PrP^C indicated possible differences in glycosylation between tissues. Examination of IHC processed tissue correlated strongly with Western blot analysis with lymphoid tissues demonstrating variable ratios of PrP^C expression to overall tissue content.

Conclusion: High levels of PrP^C in lymphoid tissues closely associated with the nasal cavity could contribute to the efficiency of nasal inoculation of prions as variable levels of PrP^C have been shown to correlate with efficiency of prion infection. Variations of glycosylation patterns of PrP^C between tissues may contribute to inoculation efficiency as manipulation of PrP^C glycosylation leads to a conformation which more closely approximates that of PrP^{Sc} suggesting that certain glycosylation profiles may be especially suited to misfolding.

Acknowledgement: RO1 NS061994

6. **AMQP Message Queue Performance at a Large Nuclear Physics Experiment**

10:30:00 AM– Room 3028A

Charles Costello, Department of Physics, Creighton University, Omaha NE

Purpose:

Data and Meta-Data needs in high energy and nuclear physics experiments have grown substantially during the last few years. The Solenoidal Tracker at RHIC (STAR) is a large nuclear physics experiment at Brookhaven National Laboratory. At STAR, these needs are especially acute due to the addition of new sub-detectors, which increases the overall data rate. To handle those rates, a new message queue database architecture has been developed.

Methods:

This architecture utilizes Advanced Message Queue Protocol (AMQP) to implement configurable message queues to

collect, store, and distribute STAR data. In order to ascertain the performance of these messages queues, an Apache Qpid program was developed to test them.

Conclusion:

Testing was then carried out to obtain the message transfer speeds when transferring specific numbers of messages of specific sizes, as well as in the case of multiple publishers. An overview of the Qpid infrastructure, as well as a progress report and future plans on performance testing will be presented.

7. NUDE LAYER DRAWINGS: A CUBIST APPROACH

10:45:00 AM– Room 3028A

Nina Fredericks , Department of Fine Arts, Creighton University, Omaha NE

This multimedia art project, which I have been working on since the spring of 2013, embraces aspects of Cubism and incorporates the classicism of nude figure drawing. Each work depicts a figure that is drawn from several different angles, thus providing a Cubist feel, along with a particular organ system. When drawing nude figures, I primarily drew from analytical Cubism - a process of analyzing a particular object, breaking it down visually, and reconstructing it in simultaneous views. In this way, my artworks provide a new take on “layer drawings”, such as those found in anatomy textbooks where skin is transparent and organs are seen underneath. In particular, I have drawn inspiration from works of master anatomical draftsmen such as Andrea Vesalius, Frank Netter, and Henry Gray. My final project has encompassed the following organ systems: cardiac, pulmonary, digestive, female reproductive, neurological, male urinary, and female urinary.

8. RELATIONSHIP BETWEEN CLINICAL MEASURES OF ATHLETIC PERFORMANCE AND LABORATORY MEASURES OF QUADRICEPS FUNCTION

11:00:00 AM– Room 3028A

Jesup Fritsch, Matthew Bubak, Sam K. Morton, Marcus Palimenio, Jorge Zuniga, Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE

PURPOSE: To determine the relationship between quadriceps torque-generating capacity and clinical measures of athletic performance in healthy individuals.

METHODS: Twenty participants (age=23.4±1.3 years, height=173.9±11.9 cm, mass=73.4±14.3 kg, Tegner=6.7±1.7) volunteered for this study. All participants were considered healthy. Clinical measures of athletic performance included single leg hop for distance (meters) and a 6-meter timed hop (seconds). Quadriceps torque-generating capacity was quantified by examining maximum torque during a maximal voluntary isometric contraction (MVIC) and maximal twitch potentiation following an electrical stimulation (resting twitch, RT) with the muscle in a relaxed state. Maximal torque was normalized to body mass (N*m/kg). Correlations between outcome measures were determined using Pearson product-moment correlation coefficients.

RESULTS: Descriptives for the outcome measures are as follows MVIC (3.0±1.1 N*m/kg), RT (1.4±0.4 N*m/kg), single hop distance (1.99±.46 m), 6-meter timed hop (1.8±0.3 seconds). There was a significant positive correlation with both MVIC ($r = .661$, $P = .002$) and RT ($r = .703$, $P = .001$) and single hop distance. There was a significant negative correlation with both MVIC ($r = -.447$, $P = .05$) and RT ($r = -.459$, $P = .04$) and 6-meter timed hop.

CONCLUSION: The results of this study indicate that both maximum torque normalized to body mass during an MVIC and RT can explain 20-50% of the variance in jumping distance and 6-meter hop time. While the quadriceps muscle is not the sole muscle responsible for jumping performance, it does substantially contribute to performance

of jumping tasks. This information may be valuable for clinicians who work with individuals following knee injury or surgery who are considering return to sporting activities.

9. **NEW SUBMAXIMAL FATIGUE THRESHOLD TEST FOR MUSCULAR FUNCTION**

11:15:00 AM– Room 3028A

Chelsee James, Tai Hoan, Tai Hoang, and Jorge Zuniga, Department of Exercise Science, Creighton University, Omaha NE

The purposes of this study were 1) to apply the computerized V-slope mathematical algorithm used to determine the anaerobic threshold (AT) and respiratory compensation point (RCP) to the amplitude content of the electromyographic (EMG) signal; and 2) to compare and correlate the oxygen uptake (VO₂) associated with the AT, RCP, and EMGV-slope.

Method: Seven male (mean ± SD age = 21.8 ± 2.9 years; body weight = 81.5 ± 13.0 kg) performed an incremental treadmill test to exhaustion while the EMG signal was recorded from the vastus lateralis muscle and gas exchange parameters were collected. The computerized V-slope mathematical model successfully identified a breaking point for the EMG amplitude versus VO₂ relationship during incremental treadmill running for all subjects in the study.

Results/Conclusion: The significant correlations ($r = 0.93-0.94$) and no mean differences between the AT and EMGV-slope for VO₂ (3.52 ± 0.95 and 3.60 ± 0.94 L•min⁻¹, respectively) suggested that these fatigue thresholds may be mediated by a common underlying physiological mechanism.

Acknowledgements: This project was funded by the NASA Nebraska Space Grant Fellowship Program.

10. **THE HOLMAN AFFAIR AS A FAMILY AFFAIR: CONFLICTS WITHIN THE "FIRST MISSIONARY FAMILY" IN HAWAII**

1:30:00 PM– Room 3028A

Rachel Bonini, Department of American Studies, Creighton University, Omaha NE

Less than one year since landing on the shores of Hawai'i in 1820, the members of the Sandwich Islands Mission faced looming conflict. Two members of their company, Dr. Thomas and Mrs. Lucia Holman, had decided to relocate from the Big Island of Hawai'i to the Island of Maui without the consent of the rest of the company. The resulting conflict caused by this defiant action was later termed the Holman Affair. Although the eventual excommunication of Dr. Holman and suspension of Lucia Holman from the church caused distress for the company, most scholars have granted the Affair little notice or have over-simplified it, leaving room for additional interpretation. This paper conducts a close reading of archival documents in order to address how the home and family were used to organize power relationships within the company. Because the constructs of the home and family characterize many historical reconstructions of the larger missionary narrative, they are fitting lenses through which to interpret this conflict. Including these constructs in an interpretation of the Holman Affair affords complexity to the narrative of this colonizing force, subverting the simplified characterizations of colonizers in the narrative of U.S. imperialism. The home acts as a symbolic and a physical construct when analyzing the Holman Affair, and these two understandings of the home are intimately linked to the familial relationships by which the company functioned. Ultimately, because the Holmans did not fulfill their expected familial roles within the missionary home, they were banished from the missionary family.

This project was funded by a 2013 Creighton College of Arts & Sciences Dean's Summer Research Scholarship.

11. **THE EFFECTS OF MUSCLE TEMPERATURE IN NEUROMUSCULAR FATIGUE THRESHOLDS**

1:45:00 PM– Room 3028A

Matthew Bubak Austin Ketter, Jorge Zuniga, Department of Exercise Science, Creighton University, Omaha NE

The purpose of the present study was to examine the effects of the vastus lateralis superficial muscle temperature on the assessment of neuromuscular fatigue thresholds derived from the amplitude and frequency contents of the EMG signal. Ten male participants (mean±SD, age=21.6±3.8 yrs; weight=84.4±14.1 kg) visited the laboratory and performed an incremental test to exhaustion on the cycle ergometer. Before the cycling test either the left or right vastus lateralis muscle was pre-cooled using an ice pack for a period of 15 min. The surface thigh temperature and EMG was recorded during the cycling ergometer test from the cooled and non-cooled thighs. The results indicated that cooling the surface of the muscle resulted in a greater power output for the neuromuscular fatigue threshold derived from EMG frequency (MPFFT=226.8±37.8 W) than those derived from the EMG amplitude from the cooled (PWCFT= 134.0 ± 69.5 W) and non-cooled (PWCFT= 157.0 ± 75.6 W) conditions.

This project was funded by the NASA Nebraska Space Grant Fellowship Program.

12. **WHAT THE CRISIS IN THE UKRAINE MEANS FOR IT AND TWENTY-FIRST CENTURY INTERNATIONAL POLITICS**

2:00:00 PM– Room 3028A

Florick, Davis, Department of East West Studies, Creighton University, Omaha NE

The current crisis in the Ukraine poses a grave threat to the post-Cold War international system. With the fall of the Warsaw Pact and Soviet Union arose a region largely supportive of the United States. However, since President Putin's rise to power the Russian Federation has sought to reassert itself along what it considers its "near abroad." The culmination of this approach, the Eurasian Union, and the Ukraine's bid to join the group sparked the demonstrations in Kiev which have led to so much turmoil. In the wake of the ongoing intrusions upon the Ukraine's territorial sovereignty by Russia four serious issues have arisen. First, the US and Europe must find a means to curtail any further encroachments against the Ukraine's territorial integrity. Second, Crimea needs to be returned to Kiev otherwise a very dangerous precedent is set elsewhere. Third, Washington must address concerns of its allies and partners regarding America's ability to assure their safety and security. Fourth, Washington cannot avoid questions over its ability to credibly deter potential future adversaries. Facing these problems head on will permit US foreign policy-makers to turn the catastrophe in the Crimea into a victory against Cold War despotism.

13. **MUSCLE MORPHOLOGY DOES IMPACT QUADRICEPS TORQUE-GENERATING CAPACITY**

2:15:00 PM– Room 3028A

Matthew Bubak Jesup Fritsch, Sam K. Morton, Marcus Palimenio, Jorge Zuniga, Terry L. Grindstaff, Department of Exercise Science, Creighton University, Omaha NE

PURPOSE: To determine the relationship between muscle morphology and quadriceps torque-generating capacity

METHODS: Twenty participants (age=23.4±1.3 years, height=173.9±11.9 cm, mass=73.4±14.3 kg, Tegner=6.7±1.7) volunteered for this study. All participants were considered healthy. Exclusion criteria included traumatic lower extremity injury within the past 6 months or individuals with contraindications to electrical

stimulation. Quadriceps torque-generating capacity was quantified by examining maximum torque during a maximal voluntary isometric contraction (MVIC) and maximal twitch potentiation following an electrical stimulation (resting twitch, RT) with the muscle in a relaxed state. Measures of muscle morphology included the deep pennation angle (degrees) and thickness (centimeters) of the vastus lateralis, determined by the orientation of muscle fibers with the deep aponeurosis and the distance between the superficial and the deep aponeurosis respectively. Correlations between outcome measures were determined using Pearson product-moment correlation coefficients.

RESULTS: Descriptives for the outcome measures are as follows MVIC (226.4±105.3 N*m), RT (103.3±39.9 N*m), deep pennation angle (11.2±2.9°), and thickness (3.1±0.9 cm). There was a significant positive correlation between the deep pennation angle of the vastus lateralis and the MVIC ($r = .502$, $P = .02$). There was also a significant positive correlation between the thickness of the vastus lateralis and the RT ($r = .469$, $P = .04$).

CONCLUSION: The results of this study indicate that the orientation of muscle fibers and thickness of the vastus lateralis have an impact on the torque-generating capacity of the quadriceps. Participants with greater pennation angle and muscle thickness of the vastus lateralis demonstrated greater quadriceps torque-generating capacity during a MVIC and RT.

14. **CREATING INTERACTIVE KNOWLEDGE FOR COLLEGE**

2:30:00 PM– Room 3028A

Anna German, Ashton Kuchera, Anisha Singh, Department of Psychology, Creighton University, Omaha NE

Creating Interactive Knowledge for College Why are we creating a website? -We are creating a website as a study tool for a gender studies textbook -This website will be interactive to aid in student learning to help the students grasp a better understanding of the major concepts

15. **NUMBER OF PRACTICE TRIALS NECESSARY TO CAPTURE BEST PERFORMANCE ON A MOTOR IMAGERY TASK**

9:15:00 AM– Room 3028B

Erika Klein, Salma Sulaiman, Sam K. Morton, Marcus Palimenio, Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE

PURPOSE: To determine the number of practice trials necessary to best capture best performance on a motor imagery task.

METHODS: Thirty-eight healthy subjects (10 males, 28 females; mean age= 23.3±2.7 years, height= 170.4±9.1 cm, mass= 70.1±14.4 kg) were recruited from a population of convenience. Participants performed a motor imagery task (Recognise Knees v 1.0; noigroup South Australia, Australia) on a tablet computer (iPad mini; Apple Inc, Cupertino, CA). The motor imagery task consisted of photographs of right or left knees in a variety of postures. The photographs were rotated or mirrored and displayed for a maximum of 5 seconds. Participants were instructed to determine if the knee corresponded to the right or left side of the body as quickly and accurately as possible. Three trials were performed with one minute rest between trials. Separate repeated measures analyses of variance were performed with accuracy (percent correct) and speed (seconds (s)) as the outcome variables. Significance was set a priori at $P < .05$.

RESULTS: Descriptive statistics (mean ± standard deviation) are provided for accuracy (Trial 1= 73.2±16.8%, Trial 2= 69.7±17.5%, Trial 3= 76.3±17.3%) and speed (Trial 1= 2.10±0.51 s, Trial 2= 1.98±0.51 s, Trial 3= 1.90±0.49 s). There was a significant trial by time interaction for accuracy ($F_{2,150} = 3.65$, $P = .03$) and speed ($F_{2,150} = 7.99$, $P =$

.001). Accuracy was significantly greater at trial 3 compared to trial 2 ($P = .01$). Speed was significantly lower at trial 3 compared to trial 1 ($P = .03$), but was not significantly different from trial 2 ($P = .12$). There were no other significant differences ($P > .05$) between any of the other trials.

CONCLUSION: The results of this study indicate that accuracy and speed performance improves across trials. At least 2 practice trials are needed to capture best performance in healthy individuals.

16. **PSEUDOMONAS SYRINGAE TRIGGERED DEACETYLATION OF HOST H3-K9 IS TYPE III EFFECTOR DRIVEN AND MAY INVOLVE DEACETYLASE HDA5**

9:30:00 AM– Room 3028B

Gloria Larson, Michael Visenio, Hayley Geisterfer, and Karin van Dijk, Department of Biology, Creighton University, Omaha NE

Pseudomonas syringae employs a type III secretion system (T3SS) to inject effector proteins (T3Es) into plant cells and cause disease. Although the specific molecular mechanisms of many T3Es have yet to be discerned, T3Es collectively contribute to disease primarily by suppressing plant innate immunity. We have found a rapid deacetylation of host histone H3 lysine 9 (H3K9) in response to *P. syringae* with a functional T3SS but not a T3SS-negative mutant. This deacetylation correlates with decreased expression of a set of innate immunity genes. To determine which of the roughly 40 T3Es are involved in the deacetylation, we analyzed plants infiltrated with polyeffecter mutants lacking different combinations of T3E genes. Immunoblot analysis showed no deacetylation in plants infiltrated with a mutant deleted for most of the T3Es, affirming a T3E role in deacetylation. Preliminary data suggests multiple T3Es are involved in the deacetylation. We have also focused on determining which host proteins participate in the deacetylation process. Since it is possible that a reduction in H3K9 acetylation is caused by downregulation of histone acetyltransferases (HACs) or upregulation of histone deacetylases (HDACs), we analyzed transcriptional changes using qPCR for a subset of HACs and HDACs in *P. syringae*-exposed plants. We found at least one HDAC, HDA5, to be upregulated in plants exposed to the wildtype strain compared to those exposed to the T3SS-negative mutant. We are currently determining if HDA5 possesses any role in deacetylating H3K9 along innate immunity genes and if it is affected by T3Es.

17. **RELATIONSHIP BETWEEN QUADRICEPS MUSCLE MORPHOLOGY AND CLINICAL MEASURES OF ATHLETIC PERFORMANCE**

9:45:00 AM– Room 3028B

Sam K. Morton, Jesup Fritsch, Matthew Bubak, Marcus Palimenio, Jorge Zuniga, Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE

PURPOSE: To determine the relationship between muscle morphology and clinical measures of athletic performance in healthy individuals.

METHODS: Twenty participants (age=23.4±1.3 years, height=173.9±11.9 cm, mass=73.4±14.3 kg, Tegner=6.7±1.7) volunteered for this study. All participants were considered healthy. Exclusion criteria included traumatic lower extremity injury within the past 6 months or individuals with contraindications to electrical stimulation. Clinical measures of athletic performance included vertical jump (meters), triple hop distance (meters), crossover hop distance (meters), 6-meter timed hop (seconds). Outcomes measured were the greatest jump height (vertical), maximum hop distance (triple and crossover), and fastest time (6-meter). Measure of muscle morphology was limited to the deep pennation angle (degrees) and thickness (cm) of the vastus lateralis. Correlations between outcome measures were determined using Pearson product-moment correlation coefficients.

RESULTS: Descriptives for the hop measurements were as follows vertical jump (.58±15.0 m), triple hop (5.82±1.3 m), crossover hop (5.2±1.5 m), timed hop (1.8±0.3 seconds). There was a significant positive correlation between the pennation angle of the vastus lateralis (11.2±2.9°) and three hop measures vertical jump ($r = .551$, $P = .01$), triple hop ($r = .475$, $P = .04$), and crossover hop ($r = .477$, $P = .03$). There was also a significant negative correlation between pennation angle and the fourth hop measure, timed hop ($r = -.613$, $P = .004$). Vastus lateralis thickness (3.08±0.9 cm) showed no correlation with any of the jump measurements.

CONCLUSION: The results of this study indicate that the orientation of muscle fibers and fiber type has an impact on jumping performance rather than muscle thickness. It was shown that participants with greater pennation angles were able to perform better in the jumping outcomes measured.

18. **PROFOUND DEAFNESS AND HAIR CELL LOSS IN MIR-183 FAMILY KNOCKOUT MODELS**

10:00:00 AM– Room 3028B

Marsha L. Pierce, Heather C. Jensen-Smith, Garrett A. Soukup, Department of Biomedical Sciences, Creighton University, Omaha NE

PURPOSE

MicroRNAs (miRNAs) are small-noncoding RNAs that function to post-transcriptionally regulate target genes. miR-183 family (miR-183, miR-96, and miR-182) is highly conserved and coordinately expressed in neurosensory cells. Mutations in miR-96 lead to profound deafness in both humans and mice, however mutations can contribute to loss of function (LOF) and gain of function (GOF). To investigate miR-183 family member LOF exclusively, we are examining two miR-183 family knockout (KO) models.

METHODS

To assess miR-183 family member LOF, we acquired miR-183/96 KO and miR-182 KO mouse lines. To confirm each model, we performed in situ hybridization (ISH). To grossly assess hair cell (HC) function, behavioral observations and evaluation of Preyer's reflex were used. To assess HC loss, we performed immunohistochemistry (IHC) using anti-MyoVIIa antibody.

RESULTS

ISH for miR-183 family members demonstrated that both models function as expected. In miR-183/96 KO mice, miR-183 and miR-96 were not detected, with no apparent perturbation of miR-182. Likewise, in miR-182 KO mice, miR-182 was not detected, with no apparent perturbation of miR-183 or miR-96. Additionally, miR-183/96 KO mice exhibit head-bobbing and circling beyond ~P70. Moreover, miR-183/96 KO mice fail to exhibit Preyer's reflex at any age, whereas miR-183/96 heterozygous mice and miR-182 KO mice show an age-dependent loss of Preyer's reflex. IHC for MyoVIIa demonstrates HC loss consistent with loss of Preyer's reflex.

CONCLUSIONS

Results demonstrate that miR-183 family LOF leads to HC loss and hearing loss. Additionally, HC loss in miR-183/96 heterozygous mice suggests that miRNA concentration or "dose" is crucial for hair cell function and survival. Moreover, profound vestibular defects are only observed in miR-183/96 knockout mice, suggesting that vestibular HCs are less sensitive to miR-183 family expression levels. Understanding miR-183 family function is expected to provide insight to approaches for preventing HC loss or stimulating regeneration of neurosensory cells.

ACKNOWLEDGEMENT

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19. **PENTADIC CRITICISM: GONE WITH THE WIND**

10:15:00 AM– Room 3028B

Paige Rainforth , Department of Communication Studies, Creighton University, Omaha NE

PURPOSE: This paper analyzes *Gone with the Wind* and its parallel to dramatism through the fictional aspect of its presentation and pentadic criticism which allows the reader to understand the possible motive behind Mitchell's story by revealing two dominant ratios of the pentad. Thus, pentadic criticism of this novel provides a better understanding of southern ideologies throughout the war.

METHODS: Pentadic criticism, a form of rhetorical critique, stems from the word "pentad" which consists of five components that Kenneth Burke thought useful for one in performing criticism. Pentadic criticism is derived from dramatism which Burke describes as an evaluation of people's behavioral characteristics through the objective lens of the study of drama. The five elements of the pentad are act, agent, agency, scene, and purpose. One can combine two elements to form a pentadic ratio in order to find which element is dominant over the other. Thus, a ratio serves as an aid in interpreting a situation. In order to determine which ratios of the pentad were prevalent, I read through the book to establish details about which sections seemed to develop the most around a particular ratio. After finding what I perceived to be a specific pentadic ratio, I selected certain pieces from the section of the novel that most supported and illustrated the ratio.

RESULTS: In using pentadic criticism, I found that the scene element had the strongest impact throughout *Gone with the Wind*; the scene determined the roles of the act and agent elements throughout the story. Specifically, the scene, the South, had the most influence on the agent, Scarlett.

CONCLUSION: Mitchell's motive was to create a persona of the south through Scarlett as a way of documenting the facts of the war through fiction.

20. **THE SELF-MEDICATION HYPOTHESIS AND BIPOLAR DISORDER : A RESEARCH PROPOSAL**

10:30:00 AM– Room 3028B

Christopher A. Salvatore , Department of Psychology, Creighton University, Omaha NE

Purpose: Khantzian is considered to be the father of the self-medication hypothesis. Posited as an explanation for the development of substance use disorders among individuals afflicted by mental health disorders, the concept behind the self-medication hypothesis is that individuals experience dysphoria from a mental health disorder and alleviate that dysphoria through drug use (Khantzian, 2003). Although some research challenges the self-medication hypothesis, there is an equal if not greater amount of research that supports the hypothesis. The purpose of this paper is to propose a research experiment that tests the validity of the self-medication hypothesis.

Methods: The experiment involves screening participants for the presence of comorbid bipolar disorder and substance use disorder. The participants would then be given a choice of drug, either cocaine or heroin, which they would self-administer.

Results: The proposed outcome is that individuals who experience the depressive symptoms of bipolar disorder will self-medicate with cocaine in order to achieve normalization while those individuals who experience the manic symptoms of bipolar disorder will self-medicate with heroin for the same reason.

Conclusion: The results of this experiment would help further understand the etiology of this type of comorbidity. With an understanding of the etiology, the hope is that new, more effective treatments can be created specific to comorbid substance use disorder and mental health disorder.

21. **VARIABILITY OF MASS OUTFLOWS IN ACTIVE GALACTIC NUCLEI**

10:45:00 AM– Room 3028B

Benjamin Schmachtenberger Jack Gabel, Zach Monti, Department of Physics, Creighton University, Omaha NE

Our research group is involved in an observing campaign to monitor mass outflows in Active Galactic Nuclei (AGN). We present analysis and results from UV spectra obtained from the Cosmic Origin Spectrograph (COS) aboard NASA's Hubble Space Telescope (HST). Comparing the results to HST/STIS spectra obtained more than a decade ago, we analyze variability in the absorption allowing us to constrain the physical conditions and geometry of the mass outflows. Our results are important in the investigation of the link between galactic and black hole growth.

22. **RELIABILITY OF QUANTITATIVE SENSORY TESTING PERFORMED BY A NOVICE EXAMINER**

11:00:00 AM– Room 3028B

Salma Sulaiman, Erika Klein, Sam K. Morton, Marcus Palimenio, Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE

PURPOSE: To determine the within and between session reliability for a novice examiner performing quantitative sensory testing in healthy individuals.

METHODS: Sixteen healthy participants (5 males, 11 females; age= 22.6±1.2 years, height= 172.6±11.3 cm, mass= 72.1±18.2 kg) volunteered for this study. Pressure pain threshold (PPT) was determined at three sites around the knee (medial joint line, lateral joint line, and 12 cm distal to lateral joint line) and one at the ipsilateral heel on both limbs (right and left). Vibration detection threshold (VDT) was determined at four sites (medial and lateral femoral condyles and medial and lateral malleolus). Each location was tested three times, with the average used for data analysis. After the initial testing sequence participants sat for 10 minutes and were reassessed using identical procedures. Participants were then brought back 24-72 hours later to be assessed one additional time using the same procedures. Within and between session reliability was determined using an intraclass correlation coefficient (ICC_{3,3}) and associated confidence intervals (95% CI). Calculations were also made for the standard error of measurement (SEM) and minimal detectable change (MDC).

RESULTS: There was no significant difference between sides ($P > .07$) for any of the outcome measures. Reliability for PPT was good both within the same session PPT (ICC_{3,3} > .81, 95% CI= 0.61-0.98; SEM <1.4; MDC < 16.6) and between sessions (ICC_{3,3} > .79, 95% CI= 0.52-0.96; SEM <6.02; MDC < 16.68). Reliability for VDT was also good both within the same session PPT (ICC_{3,3} > .83, 95% CI= 0.65-0.97; SEM <1.4; MDC < 3.8) and between sessions (ICC_{3,3} > .79, 95% CI= 0.30-0.95; SEM <2.6; MDC < 7.3).

CONCLUSION: The results of this study indicate that a novice examiner can reliably obtain quantitative sensory test measures both within the same session and between sessions.

23. **TRANSCUTANEOUS ELECTRICAL NERVE STIMULATION DOES NOT IMPACT CLINICAL MEASURES OF BALANCE**

11:15:00 AM– Room 3028B

Brittany Whitmore, Drew Burggraff, Sam K. Morton, Marcus Palimenio, Dimitrios Katsavelis, Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE

PURPOSE: To determine the effects of transcutaneous electrical nerve stimulation (TENS) on static and dynamic balance.

METHODS: Twenty healthy participants (age=23.5±1.1 years, height=176.0±11.4 cm, mass=77.3±18.9 kg) performed a battery of balance tests. Static balance was assessed during single limb stance with eyes closed on both a stable and unstable surface using an instrumented balance platform (HUMAC Balance; Computer Sports Medicine Inc). Balance was quantified using the average velocity of the center of pressure (COP). Dynamic balance was assessed during the Star Excursion Balance Test (SEBT) in the anterior, posteromedial (PM), and posterolateral (PL) directions. The furthest progression of the unilateral limb (cm) was recorded and normalized to leg length. Sensory TENS was applied to the knee joint for 20 minutes. Participants then performed the same testing sequence while TENS continued to be applied. Paired t-tests were performed with COP velocity and normalized reach distances (anterior, PM, PL) used as outcome variables. Significance was set a priori at $P < .05$.

RESULTS: There was no significant difference in COP velocity on the stable surface ($P = .09$; Pre= 3.21±0.36 cm/s, Post= 2.80±.48 cm/s) or unstable surface ($P = .22$; Pre= 5.18±0.81 cm/s, Post= 4.65±0.74 cm/s) after the application of TENS. There was also no significant difference in SEBT reach distance in any direction, anterior ($P > .38$; Pre= 63.9±6.9 cm, Post= 64.1±6.9 cm), PM ($P = .001$; Pre= 78.2±10.1 cm, Post= 77.2±8.6 cm), or PL ($P = .001$; Pre= 82.3±8.7 cm, Post= 81.8±8.6 cm) after the application of TENS.

CONCLUSION: TENS has been shown to improve bilateral static balance in healthy individuals. These results indicate that TENS applied at the knee joint resulted in no significant changes to unilateral static or dynamic balance.

24. **ELECTRON-POSITRON PRODUCTION IN ULTRA-PERIPHERAL COLLISIONS AT STAR**

1:30:00 PM– Room 3028B

Ryan Gnabasik, Jared Bang, Dr. Janet Seger, Department of Physics, Creighton University, Omaha NE

Purpose:

The Relativistic Heavy Ion Collider (RHIC) accelerates two ion beams to close to the speed of light in opposite directions. Ultra-Peripheral Collisions of particles at the Solenoidal Tracker at RHIC (STAR) occur when these ions collide at impact parameters greater than twice the nuclear radius. In these events, the two ions interact electromagnetically via high fluxes of mostly real photons. The goal is to measure the photoproduction cross section of electron-positron pairs in gold-gold collisions at 200 GeV/nucleon providing insight into non-perturbative quantum electrodynamics.

Methods:

Electron-Positron pair production in ultra-peripheral collisions creates exactly two oppositely charged pairs in our detector and events are selected based on this criterion. The particles are then identified to be electrons or positrons based on the energy they deposit in the detector and their speed. A background is then estimated using the above selection criterion, but for like-sign pairs Monte Carlo simulations are used to determine the efficiency of the detectors when measuring electron-positron events.

Results:

Preliminary measurements of the invariant mass, rapidity, and transverse momentum for these pairs will be presented along with a preliminary cross section.

Conclusion: These preliminary results appear to be consistent with previous measurements with lower statistics.

25. **THE EPITAPH OF ALLIA POTESTAS CIL VI 37965 = CLE 1988**

1:45:00 PM– Room 3028B

Ximing Lu , Department of Classical and Near Eastern Studies, Creighton University, Omaha NE

Since its discovery in 1912, the enigmatic Epitaph of Allia Potestas has interested many scholars. This Latin verse inscription commemorates a freedwoman, Allia Potestas from Perugia, in an unusually grand scale. Its explicit eroticism and the polyandry among Allia and two young men have aroused many scholarly debates. Horsfall, having investigated prior scholarship, concludes that the two young men are two lovers of Allia, one of whom is Allius, the poet of our inscription, but he thinks that their relationships are “extra-legal”. In this paper, I incorporate artistic, literary, epigraphic, and legal evidence to argue that this eroticism was acceptable in the Roman context; meanwhile the polyandry may have been legal. I shall argue that Allius was a freedman himself and that initially Allia was the contubernalis of both Allius and the other man when they were all slaves together. While there is no definitive proof for my proposal, a close reading of the text and comparisons with Latin literature and Roman visual art illuminate Roman social history, especially in the area of gender and slavery.

26. **POLICY, PREJUDICE, AND PROTEST: A NEW LOOK INTO THE HISTORY OF THE 477TH BOMBARDMENT GROUP**

2:00:00 PM– Room 3028B

Jason W. Rogers , Department of History, Creighton University, Omaha NE

Black serviceman’s contributions to the World War II war effort paved the way for the Civil Rights Movement in the 1960s. The all-black 477th Bombardment Group has often been written as a side note in the margins of World War II black history. A recent analysis of rarely read primary sources has provided new historical context for this lesser known unit within the historical discourse. The 477th’s story reveals how the War Department’s racial policy, although progressive, was not enough to keep racial forces from incapacitating the effectiveness of the fighting unit. When viewed in this light, one can see how the 477th’s experience was pivotal in the desegregation of the Armed Forces in 1947.

27. **“NOT THAT THERE’S ANYTHING WRONG WITH THAT”: IDEOGRAPHIC ANALYSIS OF <BROMANCE>**

2:15:00 PM– Room 3028B

Daniel Steiner , Department of Communication Studies, Creighton University, Omaha NE

Recently, the word “bromance” has become a common way to describe platonic male-male friendships. This word mash-up appears in everyday conversations, in news reports, and even in a song devoted to the subject with 23 million views on YouTube. In this paper, I employ a rhetorical criticism to reveal the attitudes and motives used in communication to promote or suppress ideologies. Focusing on this word as an ideograph, which is a word or phrase that is especially meaningful for an ideology, uncovers that through the use of <bromance> contemporary

masculinity is revealed to be in crisis and people deploy humor as a response. Masked through the use of humor, <bromance> exists in rhetoric to promote societal norms. I argue that <bromance> reveals that there has been little, if any, change in the hegemonic principals of heteronormativity.

28. **A SURVEY OF COMMUNITY PARAMEDICINE COURSE OFFERINGS AND PLANNED OFFERINGS**

2:30:00 PM– Room 3028B

Michael Weber, William Raynovich, Michael Wilcox, MD, Gary Wingrove, Anne Robinson-Matera & Susan Long, Department of Emergency Medical Services Education, Creighton University, Omaha NE

These are the results of a survey that was sent to every recipient of a standardized Community Paramedic™ (CP) curriculum. The researchers sought to obtain feedback about the curriculum, determine the extent of utilization and project planned future CP course offerings that would utilize the CP curriculum with the goal of guiding further curriculum development and design of CP training.

SUMMER FACULTY FELLOW ABSTRACTS

1. **CAPOTE IN BROOKLYN & OTHER POEMS**

Susan Aizenberg, Department of English, Creighton University, Omaha, NE.

In the field of creative writing, the standard trajectory for publication is that individual poems are published in journals until one has published enough for a collection (usually 45-60 ms. pages) at which time the poet collects her work, often revises and adds new poems to those already published, and assembles them into a collection to submit for book publication. For my fellowship project I assembled, revised, composed new poems for, and completed such a collection. Titled *Capote in Brooklyn & Other Poems*, my new book was accepted for publication by BkMk Press and is scheduled to be released in early 2015.

The book is comprised of poems inspired by a range of subjects and executed in various poetic styles. There are poems based on the lives of artists and writers and poems inspired by works of art; poems drawn from family history; poems drawn from the news and world history. Many of these poems make use of research – biography, history, etc. – and many draw on place as inspiration. I have poems written in received forms, such as sonnets and other traditional forms, and poems written in open form, or “free verse.” Always my poems reflect my ongoing passion for language and the elements of art and craft specific to poetic composition: diction, syntax, image, metaphor, sound, rhythm, etc., as well as my belief that the best poetry serves not only to create beauty, but also as a means of investigating the world and of encouraging empathy and compassion.

I gratefully acknowledge the generous support of the Creighton Summer Faculty Fellowship in completing this collection.

2. **The Monstrous and the Uncanny: a Re-evaluation of Apotropaic Objects in Iron Age Cyprus**

Erin Walcek Averett, Department of Fine and Performing Arts, Creighton University, Omaha, NE.

This project re-evaluates the use of apotropaic imagery in Iron Age Cyprus, ca. 1100-400 BCE. Cyprus's position at the intersection of east and west provided fertile ground for a wide range of grotesque and monstrous representations. Such images are a notable part of the island's material culture, from sculpted figures and masks found in sanctuaries to furniture appliques and amulets associated with funerary and domestic contexts. The stunning iconography of these objects attracts the viewer's gaze and emphasizes the grotesque and uncanny through disembodied heads or faces (masks), distorted or exaggerated features, gaping mouths with extended tongues and prominent teeth, or theriomorphic traits. By casting these images within the realm of otherworldly, they break the monotony of human and animal subjects and become visually distinct, powerful apotropaic objects. While commonly attributed supernatural powers, the variety of contexts and intended audiences has been underappreciated by scholars. Likewise, their seemingly universal appeal to different groups argues against a single interpretation of their meaning. Grotesque visages and monstrous figures have been found in wealthy tombs and palaces and on jewelry and monumental sarcophagi, but also in industrial workshops, sanctuaries, and on furniture, household items, and religious paraphernalia. Thus, the efficacy of their apotropaic power was not reserved (or restricted) to an elite class, but also protected artisans, worshippers, and even children.

3. **SOLVENT-INDUCED ORDERING OF SELF-ASSEMBLED BLOCK COPOLYMER THIN FILMS**

Andrew Baruth, Rustin Haase, Ryan Gnabasik, Mark Akubo, Department of Physics, Creighton University, Omaha, NE.

Nanolithography, the ability to fabricate useful structures with at least one lateral dimension between the size of an individual atom and 100 nm, is an essential component to modern industry and is fundamental to many emerging technologies. This emergence is primarily due to the materials properties entering a new regime at these size scales, where discoveries of novel material interactions are continually being made. At present, these innovations are pushing beyond the capabilities of traditional optical lithography, and, instead, rely on very expensive and time-intensive methods, including electron and focused ion beam lithography. Many useful structures for application and

fundamental study rely on periodicity (e.g., repeating lines, dots, rings, etc.); such structures naturally lend themselves to organic materials that self-assemble into periodic shapes.

This presentation focuses on the construction and testing of an advanced solvent vapor reaction chamber for block copolymer thin films. Despite its efficacy to produce well-ordered, periodic nanostructures, the intricate role multiple parameters play in solvent vapor annealing has not been fully established. In solvent vapor annealing a thin polymer film is exposed to the vapors of a solvent thus forming a swollen and mobile layer to direct the self-assembly process at the nanoscale. Recent developments in both theory and experiment have directly identified critical parameters, but controlling them in any systematic way has proven non-trivial. A purpose-built solvent vapor annealing chamber was designed and constructed to address these identified parameters, including vapor pressure, solvent concentration in the film, and, critically, the solvent evaporation rate. The all-metal chamber is inert to solvent exposure and pneumatically actuated valves allow for precision timing in the introduction and withdrawal of solvent vapor. The successful solvent-induced directed ordering is demonstrated via atomic force microscopy of the annealed films. Funded by the Creighton University Summer Research Grant.

4. **RELIGIOUS CONGREGATIONS AND COMMUNITY HEALTH:
CLIENTS' PERCEPTIONS OF FAITH COMMUNITY NURSING'S IMPACT ON THEIR
HEALTH**

Roedlach, Alexander, Department of Sociology, Anthropology and Social Work, Creighton University, Omaha, NE.

Rationale

- Health care organizations and households struggle to provide care for an increasing number of individuals living with chronic diseases, and to deal with the concomitant financial, psychological, and social burden. Since the late 1980s, religious organizations have established faith community (FC) nursing programs within their congregations that provide health education and prevention services through professional and licensed nurses. The impact of FC nursing on the physical, psychological, and spiritual health of individuals receiving services provided by FC nurses, as perceived by the recipients, is not sufficiently understood.

Methods

- This exploratory project used qualitative methods: 25 in-depth interviews were conducted during June and July of 2013 in Omaha with FC nurses, their clients, and pastors. The resulting texts are currently being analyzed (grounded theory approach).

Preliminary Results

- Most services address various aspects of health and clients tend to report simultaneous improvements in all aspects of health addressed. Future research is planned on synergies between different components of health in these services.
- The ability of nurses to connect with clients is directly related to perceptions of improved health. Future research is planned to better understand how relational skills of nurses can result in improved perceptions of services.
- Clients, who are already socially involved with others, are more likely to access services than others. Future research is planned to better understand how services can better tap into existing social interactions to motivate individuals to participate in services.
- Trust and rapport was developed with the nurses, which is a solid foundation for a yearlong fulltime study, starting July 1, 2014.

Acknowledgment

This study was funded by a 2013 Summer Faculty Fellowship.

HADDIX RESEARCH SCHOLAR ABSTRACTS

1. **Starting the Conversation: First Steps Toward Articulating and Defining a “Good Death” in Nebraska—Medically, Legally, and Interpersonally**

Helen S. Chapple Jackie Font-Guzman, Center for Health Policy and Ethics, College of Nursing, The Werner Institute., Creighton University, Omaha, NE.

Abstract: We used three domains to explore the question of a good death in the state. First, we conducted a literature review to explore the influence of advance care planning on the overall dying experience. Second, we compared parameters and demographics around dying in Nebraska with those in surrounding states, building on existing research from the Nebraska Unicameral and the Nebraska Hospice and Palliative Care Association. Third, we investigated the personal domain by convening three facilitated conversations in Omaha to hear concerns about dying. We conducted ethnographic research at the 2013 Nebraska State Fair and the UNL LEAD symposium.

Methods: Literature review; comparison of parameters and demographics in Nebraska with its surrounding states; ethnography; qualitative analysis of recorded conversations about dying in Nebraska at three events.

Results: Data analysis of the facilitated conversations is ongoing. The literature review revealed that conversations about preferences at the end of life have a positive influence on end of life situations apart from the documents themselves. Comparison of parameters between Nebraska and the surrounding states revealed that Nebraska's population and rate of death is in the middle demographically, it is the only state among them without a statewide template for out of hospital DNR orders,

Conclusion/Significance: Without access to a standardized form for code status, frail elderly patients and persons with life-threatening chronic or terminal illness cannot be sure that their preferences regarding CPR will be respected. They are more vulnerable to inconsistent and/or inappropriate care in emergencies.

Acknowledgement: The George F. Haddix President's Faculty Research Fund

2. **Effects of Buggy Creek Virus Infection on Avian Bone Development**

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Purpose: Experimental studies of free-living animals such as wild birds are often plagued by the lack of sophisticated reagents and tools to explore specific physiological or cellular processes, and thus our understanding of how physiological processes such as bone growth are affected by events such as viral infections is limited to mammalian or domestic poultry models. In this project we explored how nestling bone growth and structure is affected during infection with an arthropod-borne alphavirus (Buggy Creek virus, BCRV).

Methods: Nestling house sparrows (*Passer domesticus*) were infected with 3,000 PFUs BCRV at 7 days of age and euthanized between 9-11 days of age. Following euthanasia, bones (femur, humerus, tibia, vertebral body) were dissected from the nestlings and placed in 70% ethanol. We then used micro-CT to analyze bone structure and density, and three-point bending methodology to determine bone strength.

Results: Bone strength measurements indicated that bone strength increased with nestling age, and was adversely affected by BCRV infection. Specifically, BCRV (lineage A) infection resulted in lower bone strength, especially for the humerus. Additionally, BCRV (lineage A) infection impaired bone growth (as measured by total bone length) in growing nestling birds. Lastly, multiple baseline indices of bone morphometrics and strength were recorded for this species.

Conclusion: This is the first study to describe bone characteristics of nestling birds, and also the impacts that an alphavirus infection can have on bone development in developing animals. The results obtained in this study will improve our understanding of avian bone development, and provide a possible alternative model for examining osteology during viral infection and or intense growth periods.

Acknowledgement: Funding was provided by the Dr. George F. Haddix President's Faculty Research Fund

3. **REPEATABILITY OF TRUNK MUSCLE REFLEX RESPONSES FROM A PERTURBATION DEVICE FOR THE STUDY OF LOW BACK PAIN**

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Purpose: The Trunk Reflex Examination Device (TRED) was designed to evaluate trunk muscle reflex responses, which have been shown to be delayed and attenuated in people with low back pain (LBP). This investigation examined the within and between session repeatability of the magnitude and timing of muscle reflexes elicited by the TRED in subjects with and without LBP. Preliminary data is reported for 20 of the planned sample size of 30 subjects.

Methods: Twenty adults [13 control (21.4±0.8 yrs, 67.5±10.6 kg, 1.71±0.1 m) and 7 LBP (23.1±1.9 yrs, 68.9±11.3 kg, 1.75 ±0.1 m) attended 2 sessions space 1 week apart. The TRED applied perturbation forces at variable times to the torso of the subjects while muscle activity was recorded using surface electromyography (SEMG) bilaterally over the erector spinae and multifidus muscles. A single trial consisted of 45 perturbations of ± 30N (after reaching a 100N preload). Each session included 3 trials. Maximum voluntary contractions (MVC) were obtained for SEMG normalization.

Results: Reflex responses were elicited from about 50% of the perturbations for each subject. Within session repeatability was acceptable (ICC_{3,1} = 0.73 to 0.93) for muscle reflex magnitudes but between session repeatability was poor with an ICC < 0.75 for 3 out of 4 muscles. For reflex timing (latency), within and between session repeatability was poor for all muscles.

Conclusion: Reliable measurements are an important step in assessing the usefulness of a research device. Preliminary data indicates that trunk muscle responses elicited from the TRED show a high degree of variability in timing and magnitude. Some of this may be attributed to normal variations in neuromuscular behavior. Refinement of the methods and analyses will be pursued in an effort to improve reliability.

Acknowledgement: This study was funded by the Dr. George F. Haddix President's Faculty Research Fund.

4. **PACIFIC CURRENTS AND AMERICAN EMPIRES: RELIGIOUS AND SCIENTIFIC AWAKENINGS IN THE NINETEENTH CENTURY**

Tracy Leavelle, Department of History, Creighton University, Omaha, NE.

Protestant missionaries from the American Board of Commissioners for Foreign Missions started their labors in Hawai'i in 1820. After years of only modest success, missionaries on the Island of Hawai'i documented a revival among Native Hawaiians in 1837 and 1838, revivals that corresponded with a devastating tidal wave. The missionary Titus Coan guided the religious awakening, but he showed an equal interest in the tidal wave and the natural history of the Pacific. Over the years, he developed an international reputation as a missionary and as an expert on the active volcanoes on the Island of Hawai'i. Missionaries like Coan were an integral part of the American colonial apparatus in the nineteenth century, and this project examines the crucial links between missionaries and the growing scientific enterprise that supported American expansionism in the nineteenth century.

5. **ANALYSIS OF A NOVEL COMBINATION OF ANTI-RETROVIRAL NANOPARTICLES FOR HIV PROPHYLAXIS**

Annemarie Shibata Krista LaBruzzo¹, Patrick Bruck¹, Emily McMullen², Abhijit Date³, Christopher Destache³, ¹Biology Department, Creighton University, Omaha, NE 68178; ²University of Iowa Carver College of Medicine, Iowa City, IA 52242; ³Creighton University School of Pharmacy and Health Professions, Omaha, NE, 68178., Creighton University, Omaha, NE.

Approximately 34 million people are infected with human immunodeficiency type-1 (HIV-1) world-wide. These statistics could be reduced if at-risk groups, including those individuals with a high likelihood of repeated exposure to HIV-1, were provided antiretroviral pre-exposure prophylaxis (PrEP). This experiment is designed to evaluate the efficacy of nanoparticles in gel as carrier systems for the simultaneous transport and sustained release of three antiviral drugs in cellular model systems for human disease associated with HIV infection. A thermosensitive vaginal gel containing raltegravir + efavirenz (RAL+EFV-NP), cellulose acetate phthalate (CAP), or cellulose acetate phthalate + efavirenz (CAP+EFV-NP) loaded PLGA nanoparticles for pre-exposure prophylaxis of HIV was prepared in order to test the efficacy of drug-loaded nanoparticles. The CAP, CAP+EFV and RAL+EFV-NPs were fabricated using a modified emulsion-solvent evaporation method and characterized for size and zeta potential. Thermosensitive vaginal gel containing RAL+EFV-NPs was successfully prepared using a combination of Pluronic F127 (20% w/v) and Pluronic F68 (1% w/v). A thermosensitive gel containing CAP-NPs and CAP+EFV-NPs was successfully prepared using a combination of Pluronic F127 (20% w/v) and Pluronic F68 (1% w/v). The EC90 of RAL+EFV-NPs was lower than raltegravir + efavirenz (RAL+EFV) solution but did not reach significance. Compared to control HeLa cells without any treatment, RAL+EFV-NPs or blank gel were not cytotoxic for 14 days in vitro. The intracellular levels of efavirenz in RAL+EFV-NPs treated HeLa cells were above the EC90 for 14 days whereas raltegravir intracellular concentrations were eliminated within 6 days. The CAP, CAP+EFV, and RAL+EFV-NPs were evaluated for inhibition of HIV-1NL4-3 using TZM-bl indicator cells. Our preliminary data show that novel nanoparticle formulations of the CAP and EFV significantly inhibit HIV-1 replication at concentrations well below the IC50 of free drug or CAP alone. Transwell experiments of NPs-in-gel demonstrated rapid transfer of fluorescent nanoparticles from the gel and uptake in HeLa cells within 30 min. These data demonstrate the potential of antiretroviral NP-embedded vaginal gels for long-term vaginal pre-exposure prophylaxis of heterosexual HIV-1 transmission. Furthermore, novel drug carrier systems, such as nanoparticles, are promising tools that may help overcome current therapeutic obstacles and provide successful universal therapy. This work was partially made possible by Grant Number P20GM103427 from the National Institute for General Medical Science, a component of the National Institutes of Health and the Creighton University George Haddix Faculty Research Fund.

6. **BUILDING BRIDGES BETWEEN BASIC SCIENCES: AN EDUCATIONAL AND RESEARCH COMPUTATIONAL MOLECULAR BIOPHYSICS APPROACH**

Patricia Soto, Department of Physics, Creighton University, Omaha, NE.

My professional goal is to bridge physical and life sciences in an integrated educational and research program at a primarily undergraduate institution and focuses on the study of protein-surface interactions in distinct molecular scenarios by using multi scale modeling. I seek to establish collaborations with faculty from varied fields in either my research (do you need my group to model your protein?) or my educational (do you want to work together on curricular implementation, development or transformation of physics for the life sciences courses?) endeavors.

7. **Promoting Oral Cancer Examinations to Medical Professionals at Primary Care Clinics in Nebraska**

Alvin Wee Lani M. Zimmerman, Syed Mohiuddin, Lauren Ridgeway, Fausto R. Loberiza, Michael A. Sitorius, James R. Anderson, and Carol H. Pullen, Department of Prosthodontics, Creighton University School of Dentistry, College of Nursing, University of Nebraska Medical Center, Department of Prosthodontics, Creighton University School of Dentistry, Department of Family Medicine, College of Medicine, University of Nebraska Medical Center, Department of Biostatistics, College of Public Health, University of Nebraska Medical Center, Department of Community-Based Health, College of Nursing, University of Nebraska Medical Center, Creighton University, Omaha, NE.

Oral and oropharyngeal cancers (OPC) are usually diagnosed in their later stages, resulting in a low five-year survival rate and high morbidity rate due to treatment modalities such as surgery, radiation, and chemotherapy. Groups at high risk for OPC are more likely to see a medical professional for their medical problems than they are to get regular dental care from a dentist. Unfortunately, medical professionals (MDs, PAs, and NPs) often are not familiar with the oral cavity and do not regularly conduct routine non-symptomatic oral cancer examinations (OCE). This decreases patients' likelihood of receiving an OCE. The specific aims of this research are as follows: (1) To

compare the percentage of patients who had an OCE by their medical professional in a primary care clinic participating in the web-based educational intervention to the percentage of patients who had OCEs in a primary care clinic not participating in the web-based educational intervention; (2) To determine the effects of a web-based educational intervention for medical professionals in primary care clinics participating in the web-based educational intervention as compared to those in a non-participating primary care clinic on: (a) index of knowledge of oral cancer risk factors and (b) index of knowledge of oral cancer diagnostic procedures; and (3) To evaluate the feasibility of implementing the web-based educational intervention for medical professionals in primary care clinics as part of a larger multi-site randomized controlled trial. Methods: This is a randomized control study with a web-based educational intervention and a wait list control group. Six eligible primary care clinics that are part of the Alegant-Creighton University and University of Nebraska Medical Center's health network will be recruited to participate in this study and randomly assigned to the intervention or wait list control group. The family and internal medicine MDs, PAs, and NPs in the clinics will be invited to participate in this study. All statistical analysis will be conducted with the intent-to-treat analysis. The group cluster means for: (1) the percentage of patients who received an OCE for the two groups in Aim #1, and (2) overall scores for the two indices at the group cluster level in Aim #2, will be analyzed using generalized estimating equation to account for potential correlation among the outcomes at $\alpha = 0.05$. For Aim #3, descriptive statistics will be used to evaluate the delivery and evaluation of the web-based educational intervention.

This proposal is relevant to public health because a discovery of an intervention to increase oral cancer screening by family and primary care medical professionals (MDs, PAs, and NPs) will "increase the proportion of oral and pharyngeal cancers detected at the earliest stage", which is one of the Healthy People 2020 objectives.

8. **LASER-COOLING ATOMS: MAKING THE COLDEST STUFF IN THE UNIVERSE**

Wrubel, J., Prathivadhi, S., and Schmachtenberger, B., Department of Physics, Creighton University, Omaha, NE.

Purpose: Our goal is to study the quantum behavior of matter using atoms cooled to less than a millionth of a degree above absolute zero. At these temperatures the atoms form a state called the Bose-Einstein condensate, which is the coldest matter anywhere in the universe. We plan to use the quantum-nature of the Bose-Einstein condensate to study the coexistence and competition between magnetic and superfluid ordering in matter.

Results: Achieving a Bose-Einstein condensate will take some time. Here we highlight the progress made by two undergraduate students during the summer of 2013. They built two critical initial components of the apparatus: the laser used to cool the atoms, and a wavelength-meter needed to tune the laser.

Conclusion: The laser and wavelength-meter are working and progress is continuing on other components of the apparatus.

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