



St. Albert's Day
Student Research Forum

April 12, 2016

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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Franco, Matthew	11:15 AM	3028A	Shaw, Jeff	9:15 AM	3028A
Ivy, Maddie	9:45 AM	3028B	Stanley, Samantha	2:00 PM	3028A
Kenyon, Garrett	1:45 PM	3028A	Suelter, Corey	10:00 AM	3028A
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Nguyen, Austin	9:30 AM	3028A	White, Allison	3:00 PM	3028A
Palimenio, Marcus	11:00 AM	3028A	Wulbert, Hannah	11:15 AM	3028B
Pañares, Alessandra	10:30 AM	3028A	Ziomek, Madeline	10:30 AM	3028B
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SUMMER FACULTY FELLOWSHIP PARTICIPANTS

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Villa, Eric*

HADDIX RESEARCH SCHOLAR PARTICIPANTS

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Gasper, Rebecca*
Shikiya, Ronald*
Soto, Patricia*
Shea, John*
Zuniga, Jorge

CURAS FACULTY RESEARCH FUND PARTICIPANTS

Badura Brack, Amy*
Chauhan, Harsh
Hansen, Laura*
Klanecky, Alicia*
Shibata, Annemarie*
Smith, David D.*
Taylor, Mackenzie*
Weston, Mike*
Yilmazer-Hanke, Deniz*

* Presented by students

CLARE BOOTHE LUCE

Giffei, Bridget
Dang, Christie
Wilden, Ana
Mullally, Hannah
Knowles, Sara
Zieba, Brianna
Drapes, Chloe
Grant, Meagan
Desa, Danielle
Riley, Erinn

CURAS UNDERGRADUATE RESEARCH AWARDEES

COLLEGE OF ARTS AND SCIENCES DEAN'S SUMMER RESEARCH PARTICIPANTS

Gregoire, LiseAnne
Heinen, Rachel
Kokotajlo, Christopher
Larson, Krysta
Preston, Kailey
Stanley, Samantha
Tzegai, Mesel

HONOR'S PROGRAM SUMMER RESEARCH PARTICIPANTS

Paz, Sofia

FERLIC SUMMER SCHOLARSHIP PARTICIPANTS

Akkoseoglu, Suna
Cheek, Anna
Desa, Danielle
Jones, Katherine
Kresock, Daniel
Nelson, Gunnar
Ponce, Aaron
Prathivadhi-Bhayankaram, Sruti
Rowan, Troy
Satkauskas, Monika
Tarter, Alex

DEPARTMENT OF HISTORY UNDERGRADUATE RESEARCH AWARD

Pañares, Alessandra

KLUTZNICK CHAIR HOLOCAUST AND GENOCIDE UNDERGRADUATE RESEARCH AWARD

Austin, Hailey

CURAS JESUIT MISSION UNDERGRADUATE RESEARCH AWARD

Eastlund, Angela
Hagen, Sam
Hanser, Allison

* Summer Faculty Fellow Recipient

** Haddix Grant Recipient

† CURAS Faculty Research Fund Recipient

‡ CURAS Undergraduate Research Awardee

§ Clare Boothe Luce Research Award Recipient

STUDENT POSTER ABSTRACTS

1. **LONG TERM BIOMASS DYNAMICS OF SPARTINA ALTERNIFLORA IN GEORGIA SALT MARSHES**

John O'Donnell and John Schalles, Department of Atmospheric Science, Creighton University, Omaha, NE.

Analysis of long-term datasets can provide a better understanding of the impact external ecosystem forcings (ex. river discharge, precipitation, temperature) have on annual and phenological primary production patterns in coastal wetlands. This project examined whether long-term plot-based plant biomass observations of Marsh Cordgrass (*Spartina alterniflora*), the dominate vascular plant in Southeastern Atlantic salt marshes, could be scaled to larger spatial and temporal scales using 28 years of Landsat 5 TM satellite imagery. We selected 294 scenes with low cloud cover and aerosol haze and tide stage less than 0.65 m NAVD88. We restricted our analysis to salt marshes within the Georgia Coastal Ecosystem Long Term Ecological Research project domain. A strong statistical relationship was found between a rescaled, high resolution above-ground biomass map from hyperspectral AISA imagery data and NDVI calculations from respective Landsat 5 TM pixels in a closely timed scene. The resultant biomass algorithm was applied to each scene. A total of 1,222 *Spartina* pixels were assigned to one of 3 canopy height classes (<0.5 m, 0.5-1 m, and > 1 m; short, medium, and tall) and extracted from each scene. To calculate monthly averages for the 28 years, data were binned by month. Tall *Spartina* ranged from 611(February) to 1710 (September), medium from 445 to 943, and short from 292 to 581 g dry weight per m². Strong temporal variability patterns were found across years and within seasonal phenologies. Initial regression analysis established that monthly river discharge (9 month running average), monthly precipitation (3 month running average), and monthly mean and monthly minimum temperatures (3 month running average) were the best indicators for *Spartina* biomass variability. Additional findings suggest *Spartina* biomass had a modest decline over our 28-year study period, suggesting decreased marsh health. This observation appears related to increased drought frequency over the last 15 years.

2. **QUANTIFYING THE VARIABILITY OF THE ELECTRON DENSITY IN THE IONOSPHERE DURING SSW EVENTS**

CJ Begalke and Naomi Maruyama, Department of Atmospheric Science, Creighton University, Omaha, NE.

Three sources have been understood to generate the day-to-day variability in the F-region Ionosphere: the solar flux variation, geomagnetic activity, and lower atmospheric forcing. It is a challenge to evaluate the relative roles of the three sources, partially because the mechanism of how the meteorological perturbation generates the variation in the upper atmosphere is not well understood. The lower atmosphere perturbations are not well represented in previous modelling studies. Recently, our understanding of the mechanism as well as modelling capability to incorporate the lower atmospheric forcing has significantly improved attributing to numerous recent studies on Sudden Stratospheric Warming (SSW) events. In this project, the degree of the variability of the F-region ionosphere electron density has been quantified during the SSW 2009 event, because many studies have reported the significant importance of the lower atmospheric forcing in the ionospheric variability during the period. Specifically, the NmF2 (F-region peak electron density) and the hmF2 (height of F-region peak electron density) have been analyzed from the National Geophysical Data Center's (NGDC) Space Physics Interactive Data Resource (SPIDR) ionosonde dataset. The variability from the observation is significantly larger than that of the International Reference Ionosphere (IRI), which is an empirical model widely used in the field that depicts mainly the solar and geomagnetic variations. Furthermore, we have compared the observed NmF2 and HmF2 with the physics based Ionosphere-Plasmasphere Electrodynamics (IPE) Model, driven by the thermospheric neutral wind obtained from the Whole Atmosphere

Model (WAM) that describes an impact of the meteorological disturbances on the upper atmosphere. The comparison of the variability between the observations and model would help us quantify the relative role of the lower atmospheric forcing.

3. **MECHANISTIC INVESTIGATION OF NATURAL PRODUCTS AND EXTRACTS FOR POTENTIAL RIBOSWITCH LIGANDS**

Adam Kotula, Shelby Lennon, and Sam Stoupa, Department of Biochemistry, Creighton University, Omaha, NE.

In biochemistry, ligands bind to biological molecules for a variety of purposes. Riboswitches are noncoding RNAs that utilize binding of ligands (metabolites) to affect gene expression. This study is focused on a riboswitch that is also a ribozyme. The catalytic glmS riboswitch/ribozyme undergoes self-cleavage upon binding of the ligand Glucosamine-6-phosphate (GlcN6P), resulting in degradation of the RNA and down-regulation of gene expression. The current investigation utilizes a series of natural products and extracts that contain potential riboswitch ligands. Kinetic analyses are performed to identify potential activators and inhibitors of glmS riboswitch self-cleavage. The results of this project will determine which extracts should undergo further characterization.

4. **BUGGY CREEK VIRUS DISTRIBUTION AND DYNAMICS IN SWALLOW BUGS (OECIACUS VICARIOUS) IN CLIFF SWALLOW (PETROCHELIDON PYRRHONOTA) COLONIES IN SOUTHEAST NEBRASKA AND SOUTHWEST IOWA[‡]**

Troy Rowan and Dr. Carol Fassbinder-Orth, Department of Biology, Creighton University, Omaha, NE.

Purpose: Alphaviruses are positive sense RNA viruses carried by arthropods that are responsible for a number of diseases in vertebrates. Buggy Creek Virus (BCRV) is an alphavirus that is transmitted to birds by the cimicid swallow bug (*Oeciacus vicarius*) via infestation of the birds' nests. It is hypothesized that in times of high stress (such as in overwintering bugs), BCRV produces incomplete particles called defective interfering (DI) particles that prevent assembly of the full wild type phenotype. This research focuses on understanding viral changes in an insect vector due to environmental stress.

Methods: We located five active cliff swallow colonies with swallow bugs and tested swallow bugs for the presence of BCRV over time and in different age classes of swallow bugs. Upon monthly collection, bugs were sorted into five age groups, homogenized and frozen for downstream testing of viral presence and cytopathic effect. Viral RNA was detected via RT-PCR. We performed a modified TCID50 procedure to test for cytopathic effect.

Results: Over the course of three months, we saw a positive correlation between cliff swallow nesting activity and swallow bug populations, as well as detectable BCRV. Specifically, detectable BCRV decreased 52% in bug pools after cliff swallows left our sites.

Conclusion: Our results indicate that BCRV persistence in swallow bugs is highly dependent on the presence of cliff swallows, with peak BCRV RNA being detected during the nesting season. Although high levels of BCRV RNA were detected across multiple swallow bug age classes and sites, the virus was only minimally cytopathic. Future work will focus on determining the genomic structure of BCRV isolates from swallow bugs and to confirm involvement of DI particles in the viral dynamic patterns observed in this project.

Acknowledgments: Funding provided by CURAS Ferlic Summer Undergraduate Research grant, and INBRE from NIH.

5. **PARASITE-HOST BEHAVIOUR IN DEFINITIVE HOST TENEBRIO MOLITOR AND PERIPLANETA AMERICANA FROM TRANSPOSITION OF PARAGORDIUS VARIUS IN THE LAND SNAIL**

Sangamithra Sathian and Father John Shea S.J., Department of Biology Creighton University, Omaha, NE.

Paragordius varius, or Gordian worms, are free swimming as adults but parasitic as juveniles. The worm encysts in a transport host (aquatic insect or snail) and grows into its adult form in a definitive host (often crickets). Infected definitive hosts exhibit suicidal behaviour in which the land insect seeks water. This behaviour has been studied in crickets, but not yet in beetles, which are easier to maintain in the laboratory or cockroaches, which are able to withstand extreme conditions. To test this, we exposed *Tenebrio molitor* (mealworm) and *Periplaneta americana* (cockroach) to a homogeneous mixture of snails from a site known to have horsehair worms to determine if the chosen model systems were viable definitive hosts. We were unable to confirm growth of *Paragordius varius* in the definitive hosts. Inquiry into taxonomically similar model systems could be an area of further exploration, as chosen model systems may have been ineffective due to size limitations or body structure.

6. **INVESTIGATING THE POTENTIAL ROLE OF LONG NON-CODING RNA IN MICROGLIAL POLARITY[†]**

Manaswita Tappata and Annemarie Shibata, Department of Biology, Creighton University, Omaha, NE.

We have established an in vitro system to address a timely and important issue that differential expression of long non-coding RNA (lncRNA) regulates microglial plasticity and determines whether microglia function as pro-inflammatory (M1), neurogenic (M2), or homeostatic surveillance cells. Our preliminary data suggest that microglia responding to damaged neurons acquire an M2 phenotype expressing higher levels of M2 markers CD206 and Arg1, and lower levels of M1 markers CD45 and MHCII. Media from co-cultured microglia and damaged neurons contains a significant decrease in M1 neurotoxic cytokines IFN-g and TNF α , and a 23 \pm 2.5% increase in the M2 neurogenic cytokine MCP-1. Reactive nitrogen species (RNS) production by homeostatic microglia was 2.20 \pm 0.06 mM and by M2 microglia was 1.26 \pm 0.09 mM which differed significantly from RNS production by M1 microglia (6.05 \pm 0.06 mM) as measured by Greiss reaction. RTPCR analysis is being performed to verify ELISA data regarding the M1 and M2 states. We have demonstrated that the long intergenic ncRNA (lincRNA), lincRNA-Cox2 is an early-primary gene controlled by NF- κ B signaling in M1 stimulated microglia, suggesting that other lncRNAs may be involved in microglia plasticity and polarization. LncRNAs may be critical mediators of microglial functional plasticity and may participate in pathogenesis of various inflammatory and neurodegenerative diseases making them targets for therapeutic interventions.

Acknowledgments: This project was funded by a Health Science Strategic Initiative Award (Creighton University).

7. **CARBON SUBSTRATE UTILIZATION OF DOUGLAS ST. RAIN GARDEN SOIL COMMUNITIES**

Daniel Dean, Department of Biology, Creighton University, Omaha, NE.

A key environmental problem with urban, impermeable landscapes is high runoff of water and pollutants. Rain gardens are an expanding green infrastructure countermeasure, improving water infiltration and quality. Soil metabolic processes are thought to play a significant role in this functional capacity. We studied microbial communities from Omaha's Douglas Street rain gardens, evaluating metabolic functional diversity (indexed by carbon substrate utilization) as

affected by spatial position and plant location in the gardens. Our data suggest a positive correlation between functional diversity and plant root presence among well-drained soil profiles, corroborating existing plant management techniques and laying groundwork for further investigation.

8. **REPRODUCTIVE DEVELOPMENT IN THE AQUATIC SPECIES *RUPPIA MARITIMA*^{†§}**

Bridget Giffei, Christie L. Dang, Ana E. Wilden, and Mackenzie L. Taylor, Department of Biology, Creighton University, Omaha, NE.

Purpose: *Ruppia maritima* is an aquatic angiosperm found in brackish waters on every continent except Antarctica. *R. maritima* exhibits water pollination, in which pollen grains are transported across the water surface in pollen rafts to receptive stigmas. The transition to hydrophily is known to be accompanied by modifications in pollen structure, but the consequences of this evolutionary transition for reproductive development are not well-understood. The goal of this research was to characterize reproductive development in *R. maritima*, focusing on the progamic phase, the life history phase that occurs between pollen germination to fertilization.

Methods: Naturally-pollinated flowers were collected in order to determine reproductive timing. To determine the rate of pollen germination and pollen tube growth, immature flowers were collected and kept in individual aquaria in the greenhouse until stigmas became receptive. The flowers were then hand-pollinated and collected at intervals of 5 to 15 minutes after pollination. Carpels were stained and imaged using fluorescence microscopy to determine the proportion of germinated pollen grains and the length of the longest leading pollen tube.

Results: Stigma receptivity precedes and overlaps anther dehiscence. Pollen grains germinated within five minutes after pollination and fertilization was achieved within an hour after pollination. Self-pollen germinated on *R. maritima* stigmas, suggesting that plants can self-fertilize, thus improving the chance for reproductive success.

Significance: Rapid pollen germination and pollen tube growth rates in *R. maritima* are important for achieving reproductive success, as fertilization must occur before pollen grains are washed off of the stigma. This study not only yields data regarding the progamic phase in *R. maritima*, but also provides insight into reproductive traits associated with successful water-pollination.

Acknowledgment: This study was supported by the CURAS Faculty Research Fund and the Clare Boothe Luce program for women in science.

9. **PARASITES AS AN ECOLOGICAL BAROMETER****

Allison Hanser, Samuel Hagen, Requaw West, Rebecca Gasper Ph.D., and John Shea, S.J., Ph.D., Department of Biology, Creighton University, Omaha, NE.

Biological surveys help us understand inter-species interactions in ecosystems. Relatively little is known about parasite species distributions within Native American Reservations and South Dakota in general (Ahterson 1917). Previous studies suggest that the environment plays a role in parasite distribution (Faulkner 2014) and so may indicate ecosystem health. Parasites have complicated life cycles that utilize a variety of hosts (Gaston 2006). Thus their presence or absence can indicate the disturbance level and relative health of an ecosystem (Froeschke 2013). Higher parasite diversity should indicate a less disturbed ecosystem while lower parasite diversity should indicate a more disturbed ecosystem. To test this, we surveyed small mammals and their parasites at two sites in Pine Ridge reservation that differed in human disturbance. Yellow Bear Dam, located 10 miles south of Kyle, SD is a little used recreation park while Piya Wiconi, located on the campus of Oglala Lakota College in Kyle, compromised the more disturbed site. We predicted that the healthier, less disturbed environment would have a greater species diversity of parasites and hosts. Our results confirmed this hypothesis with greater

Shannon diversity indices for host, ectoparasites and endoparasites at Yellow Bear Dam. However, our small sample size (39 hosts) from only two sites precludes making statistically significant conclusions. Further, the two sites also differed in their ecology and so could explain the differences in diversity. Future work will focus on sampling more hosts at different sites.

Acknowledgment: The Haddix grant supported this research.

10. **EFFECTS OF VARYING NITRATE LEVELS ON WATER PREFERENCE OF PHYSA SPP****

Tyler Jones, Requaw West, Rebecca Gasper, and John F. Shea, S.J., Department of Biology, Creighton University, Omaha, NE.

Nitrate (NO₃⁻), an important factor in both the natural cycling of nitrogen and in agriculture, impacts aquatic ecosystems. Nitrate promotes growth of algae, a food source for aquatic snails (*Physa* spp.), but relatively few studies have tested snail preference for water with varying levels of nitrate. We collected snails from sites that varied in nitrate levels and tested their preference. By placing a snail between two dishes of water with different nitrate concentrations, we observed in which dish the snail moved. We predicted that snails would prefer lower nitrate concentrations, but found no correlation between nitrate concentration and snail behavior. This research was conducted in collaboration with the Oglala Lakota College (OLC) Center for Science and Technology Collections and Tribal Repository. A special thanks to Oglala Lakota College OLC faculty, and staff and students for its partnership in this endeavor, especially Ale Higa, Rebecca Bingham, Hannan LaGarry, Camille Griffith, and the OLC Field Ecology class. Thank you also to Red Cloud High School's Augustina "Gusti" Terkildsen and Jeff Pourier. Special thanks to Sacred Heart Church. Thanks to the research team of Allison Hanser, Sam Hagen, Allison Mause, Elizabeth Mause and Maria Bertha for all their field and lab assistance. Thanks also to Dr. Gasper's research team for data analysis.

Acknowledgment: We thank the Haddix Grant for supporting this work.

11. **ANALYSIS OF EDUCATION'S ROLE IN SUSTAINING WATER QUALITY IN RURAL COMMUNITIES OF THE DOMINICAN REPUBLIC**

Annie Pearson, Alysha Illies, Gary Michels, Ph.D., and Alistair Cullum, Ph.D., Department of Biology, Creighton University, Omaha, NE.

For over 40 years, the mission of the Institute of Latin American Concern (ILAC) has been to improve the health of impoverished communities in rural areas of the Dominican Republic. In 2005, ILAC addressed the root of many health issues, unsafe drinking water, through instituting the Water Quality Program. This program uses point-of-use filters to improve water potability, as well as provides education to community healthcare overseers and individual filter owners to sustain water filter maintenance. To test the effectiveness of this work, water samples and overall filter and user knowledge assessments were gathered. Our objectives are to (1) analyze the filters through five numeric measures, (2) correlate the data based on these measures, and (3) use this data to assess the impact of applied behavioral intervention in a developing country as an effective strategy to sustain water quality. User knowledge scores, developed through a ten question survey, were used to determine each individual's understanding of using and maintaining their water filter. These scores have statistically demonstrated predictive capabilities in determining the likelihood of an individual's filter to have high coliform counts, indicative of non-sterility, as well as high *E. Coli* counts, indicative of unsafe drinking water. This suggests through educating and empowering impoverished Dominican households, the quality of water their filters produces will also improve significantly.

12. **QUANTIFYING THE PATHOGENICITY OF BUGGY CREEK VIRUS IN CELL CULTURE[‡]**

Aaron Ponce, and Carol Fassbinder-Orth, Department of Biology Creighton University, Omaha, NE.

The alphavirus called Buggy Creek Virus (BCRV) is known to be capable of infecting and transmitting itself through avian, and arthropod organisms. Recently, there has been a noticeable increase in the spread of alphaviruses around the world. Infection with the Buggy Creek Virus on the cellular level is poorly understood. In this experiment, mammalian cells (Vero), and avian cells (DF-1) were inoculated with the virus from one of three lineages (A, B, or DI particles) of the Buggy Creek Virus. DI particles are viral fragments lacking proper replication properties to replicate itself completely in cells, and are commonly found in organisms infected with BCRV during times of high environmental stress, such as during the winter months. The cell lines were incubated at the appropriate conditions, and inoculated with one of the three lineages of BCRV. The media from the cells were extracted at various time points up to 5 days. The extracted media was then quantified for viral presence through TCID₅₀. The results of the experiment quantitatively expressed that BCRVA is 33x as virulent in Vero cells than in DF-1 cells. DF-1 cells exhibited persistence in viral production overtime when infected with BCRVA, as viral production did not decrease over the span of this experiment (virus concentration at day 5 being 6.0 log PFUs, compared to 5.0 log PFUs on day 3). 4.0x the viral titer of BCRVB was produced in Vero cells (2 log PFU increase) compared to DF-1 cells (1.4 log PFU increase) in the same time period. DI particles exhibit a quantitatively similar virulence pattern to BCRVB in both cell lines. There was an unexpected stop in viral production of DI particles after day 3 in Vero cells, highlighting evidence that DI particles have a unique replicative process in cell culture which has yet to be understood.

13. **CHAETOGASTER INTENSITY AND SNAIL (PHYSA) SIZE****

Aaron Thompson, Requaw West, Rebecca Gasper, and John F. Shea, Department of Biology Creighton University, Omaha, NE.

Schistosoma species (Trematoda), the causative agent of the debilitating human disease schistosomiasis, possess a larval stage that parasitizes freshwater snails. After development, this stage swims out of the snail to penetrate the skin of humans bathing or swimming in infested water. Chaetogaster limnaei (Annelida) may serve as a biological control of Schistosoma sp. and other genera of parasitic trematodes. Chaetogasters live in a commensal relationship (benefiting from but not affecting the host) with freshwater snails, an intermediate host of many parasitic trematodes. These worms feed upon the larval trematodes and have been shown to control the infection rates of the parasite in the snail. Since these worms live in the snail, we expect that larger snails would harbor more chaetogasters. To test this, we used pasta strainers as a way of fishing the snails out of the body of water. We then “euthanized” the snails by crushing them. After that, we put the remains on a plate then used a microscope to see if there was any of these worms present in or on the snails and to count the amount of worms, if there was any, on the snail. We found that our hypothesis did not match up with the results. We found a small but unreliable trend that shows that the bigger a snail is, the more worms that are found on them.

Acknowledgment: We thank the Haddix grant for supporting this work.

14. **INTERACTIONS AND ORIENTATION OF THE PRION PROTEIN AT THE MEMBRANE INTERFACE**

Jesse Woo, Jason C. Bartz, and Patricia Soto, Department of Biology, Creighton University, Omaha, NE.

Prion proteins may act as infectious agents that cause transmissible spongiform encephalopathies (TSEs), a class of fatal neurodegenerative diseases in many mammals, including humans. The physiological function and misfolding pathway of prion proteins is not well known, but they are normally found GPI-anchored to the outside of cells throughout the body and brain. Understanding how prion proteins interact with the membrane interface and surrounding environment provides insight on these uncertainties. In this presentation, we will discuss our results based on biomolecular modeling techniques that identify favorable modes of interaction of the PrPc molecule with model membranes. We found that factors such as prion protein orientation with respect to the membrane, membrane thickness, and lipid head group size influence PrPc binding on the membrane interface.

15. **MICROGLIA POLARIZED TO AN M2-LIKE STATE BY NEURONAL DAMAGE ENHANCE NEUROGENESIS**

Erin Whiteford, Steven Yackley, and Annemarie Shibata PhD, Department of Biology, Creighton University, Omaha, NE.

Microglia are immune cells found in the central nervous system. Microglia exhibit functional polarization becoming pro-inflammatory (M1) or anti-inflammatory (M2) depending upon the activating stimulus, such as IL-4 (M2) or LPS (M1). The response of microglia to traumatic injury of cortical neurons has not been well characterized and little is known about the intracellular mechanisms regulating microglial activation states. We hypothesize that traumatic injury to cortical neurons activates microglia to induce neurogenesis (enhance migration) by acquiring an M2-like phenotype. We have developed an in vitro model system to examine how the effects of neuronal damage influence microglial polarization as compared to classic IL-4 and LPS stimulation to M1 and M2 states respectively. Microglia are cultured with following stimuli, 1. damaged primary cortical neurons, 2. non-damaged primary cortical neuron cultures, 3. IL-4 (20ng/ml). or 4. LPS (50 ug/ml) for 24 h. Microglia cultured in media alone serve as the control. Following stimulation, immunocytochemical and western blot analysis is used to determine microglial polarization by examining expression of M1 (CD86, CD45, MHCII) or M2 (CD206, Arg 1) protein markers. Our data suggest that microglia acquire a neurogenic M2-like state in response to traumatic neuronal damage. Future studies will focus on investigating intracellular signaling pathways and epigenetic modifications underlying microglial polarization.

16. **REMOTE SENSING AND APPLIED VEGETATION INDICES AS A MEASURE OF BIO-PRODUCTIVITY OF WETLANDS ALONG A SALINITY GRADIENT IN THE CHOPTANK ESTUARY AND WATERSHED.**

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The Choptank river system in the Delmarva Peninsula in eastern Maryland feeds into the Chesapeake Bay estuary. Our study compares the spatial patterns and bio productivity of wetland habitat vegetation with the salinity gradient of the estuary. We used remote sensing 8 band imagery from Digital Globe Worldview two and three satellites to assess complex vegetation patterns. The imagery we received had to be atmospherically corrected and translated into the proper format so we could isolate the wetland habitats for study. Environment Visualizing Images Geospatial software (ENVI) was used to process the data. We applied an algorithm based on measures of reflectance to determine the quantity and distribution of vegetation within different

wetlands along the Choptank. A standard pixel of our imagery represents a two square meter plot of wetland habitat. This data processed in ENVI was then compared to measures of biomass from previous field data. The information and vegetation patterns observed were compared to the salinity gradient of the estuary to observe the influence on productivity.

Acknowledgment: This study is sponsored by NOAA, USGS, and the Maryland Department of Natural Resources.

17. **MOLECULAR DYNAMICS SIMULATION OF THE COMBINATORIAL DIPEPTIDE LIBRARY USING THE CHARMM36 FORCE FIELD**

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Molecular dynamics (MD) simulations are used to determine structure and biophysical properties of proteins. For simulations a force field, which is a parametric approximation of the exact quantum mechanical treatment, is used to calculate potential energy function. The force field is a set of parameters describing chemical bond, dihedral angle, and non-binding interactions of all atoms in a given molecular system. The ability of the CHARMM36 parameters to reproduce experimental H α chemical shifts and J coupling constants has not been investigated systematically yet. Therefore, we produced a virtual combinatorial dipeptide library (202 = 400 dipeptides) to determine their H α chemical shifts and J coupling constants using MD simulation with the CHARMM36 force field. All peptides were N- and C-terminally capped with acetyl and N-methyl amide, respectively, groups using the YASARA program. The dipeptides were solvated with TIP3P water molecules containing 150 mM NaCl and the systems were energy minimized and then three 100 ns MD simulations were performed for each dipeptide. From the trajectories, the J coupling constant and H α chemical shifts were calculated. The efficiency of the CHARMM36 force field was evaluated by comparison the obtained values to that of the experimental determined by Graf and colleagues [1]. Here we present the results for all dipeptides starting with A, R, N, D, C, E, Q, G and H residues. The data is in good agreement statistically with experimental data for most of the dipeptides. With the exception of some dipeptides in which V and A residues are present, whose H α and J coupling values deviate from the experimental data the most. Our results show that the CHARMM36 force field is just as good as the AMBER ff99SB-ilnd-nmr force field evaluated by Li and colleagues [2].

Acknowledgment: The present work was supported by the Center for Undergraduate Research and Scholarship's (CURAS) Director's Fund scholarship.

References:

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18. **OTOGELIN-LIKE INFLUENCES ZEBRAFISH OTOLITH ORGANIZATION**

Catharine Kral and Kenneth L. Kramer, Department of Biomedical Sciences, Creighton University, Omaha, NE.

Rationale: Hearing and balance are dependent on linking an extracellular matrix to sensory hair cells. While human defects in the linkage proteins alpha-Tectorin (TECTA), Otogelin (OTOG), and Otogelin-like (OTOGL) are associated with hearing loss at various frequencies, it is not clear how each protein functions in other vertebrates. In zebrafish, recent results have demonstrated that homologs of TECTA, OTOG, and OTOGL all mediate linkage of the sensory hair cells to an extracellular otolithic matrix. However, it is not clear if these linkage proteins influence the

structure of the overlying otolith. We hypothesized that TECTA, OTOG, and OTOGL have distinct roles in mediating otolith organization.

Methods: Zebrafish embryos were injected with morpholinos designed to knockdown expression of the linkage proteins TECTA, OTOG, and OTOGL. We collected embryos at 32 hours post fertilization (hpf) for immunohistochemistry using antibodies to the otolith proteins Oc90 and Starmaker. Immunofluorescence was imaged on a confocal microscope.

Results: In control embryos at 32 hpf, Oc90 expression was restricted to the center of the otolith while Starmaker expression was concentrated to the outside of the otolith. Similar expression was observed in otog- and tecta-morphant embryos at 32 hpf. However, Oc90 and Starmaker expression overlapped in otogl morphant embryos.

Conclusions: We conclude that zebrafish otolith organization is mediated by the linkage protein OTOGL.

19. **PDGF-BB INDUCES PHOSPHORYLATION OF POLO-LIKE KINASE-1 TO POTENTIATE PROLIFERATION OF SMOOTH MUSCLE CELLS IN HUMAN SAPHENOUS VEIN: POTENTIAL IMPLICATION IN VEIN-GRAFT DISEASE**

Swastika Sur, Songcang Chen, Jeffrey T. Sugimoto, and Devendra K. Agrawal, Department of Biomedical Sciences, Creighton University, Omaha, NE.

Objective: Coronary artery bypass grafting (CABG) is the choice of procedure in patients with multi-vessel or left main coronary artery disease. Patency of saphenous vein graft (SVG) significantly declines following surgery compared to internal mammary artery (IMA). Intimal hyperplasia is the key event in SVG failure. PDGF-BB is a major growth factor released at the site of graft injury.

Methods and Results: Here, we examined, for the first time, the expression of PLK1 and pPLK1 in isolated human SV and IMA conduits that were freshly collected, SMCs isolated and cultured. In cultured SMCs, effect of PDGF-BB was examined on total PLK1, pPLK1, CDC2 and pCDC2 by Western blot analysis. Cell proliferation was measured using cell count and immunoblotting against the phosphorylated histone H3 tail. We found significantly higher expression of pPLK1, total PLK1, CDC2 and pCDC2 in PDGF-stimulated SV SMCs than IMA. These data suggest a greater and sustained sensitivity of SV SMCs to PDGF-BB-induced PLK1 activity than in IMA. A PLK1 inhibitor attenuated PDGF-induced proliferation in both IMA and SV SMCs.

Conclusions: This could partly explain the development of intimal hyperplasia in SV conduits compared to IMA following CABG. Thus, inhibition of PLK1 could be a target in developing better therapeutic approach to prevent vein-graft disease.

Acknowledgment: Supported by NIH R01HL090580 grant.

20. **REGION-SPECIFIC EXPRESSION OF INTER-A-TRYPSIN INHIBITOR HEAVY CHAIN 3 (ITIH3) AND ITS CO-LOCALIZATION WITH PERINEURONAL NETS IN THE MOUSE BRAIN^{†‡}**

Suna Akkoseoglu, Dawson Johnson, Stefan Peterson, Rochelle Wickramasekara, and Deniz Yilmazer-Hanke, Department of Biomedical Sciences, Creighton University, Omaha, NE.

Fear and anxiety are evolutionarily conserved behaviors in response to anticipated threats. Pathological forms lead to anxiety disorders like posttraumatic stress disorder (PTSD). The main focus in our laboratory is a new mouse strain called the C3H-like recombinant inbred strain, which was created by backcrossing fearful C3H/HeJ mice on DBA/2J mice. A transcriptome study

indicated that the gene inter-alpha inhibitor heavy chain 3 (Itih3) is differentially expressed in the amygdala of C3HLRI and control DBA/2J mice. The goal of the present project is to characterize the cellular and extracellular expression pattern of Itih3 in the brain. Itih3 is known to contribute to the stabilization of the extracellular matrix through its hyaluronan-binding properties, suggesting involvement in the regulation of synaptic plasticity in the brain. Along with this, Itih3 may play a role in bipolar disorder, schizophrenia, and Alzheimer's and Parkinson's disease-related inflammation in the brain. The analyses from this project will reveal regions of the brain that express Itih3 and indicate if Itih3 co-localizes with other components of perineuronal nets (PNNs), such as Chondroitin Sulfate Proteoglycans (CSPGs), specifically Aggrecan, Hyaluronan (detected with Hyaluronan-binding Protein, HABP), Wisteria Floribunda Lectin (WFA) Lectin, and Glutamic acid Decarboxylase, isoform 67 kDa (GAD67).

Acknowledgment: This project was supported by the Ferlic Undergraduate Summer Research Scholarship (to SA), INBRE Funding NIH-NIGMS P20-GM103427 (to DJ) and CURAS Faculty Research Funds at Creighton University (to DYH).

21. **EFFECT OF YOHIMBINE AND CLONIDINE ON FEAR-RELATED BEHAVIORS OF NOVEL DXH RECOMBINANT INBRED MICE**

Rochelle Wickramasekara, Suna Akkoseoglu, and Deniz Yilmazer-Hanke, Department of Biomedical Sciences, Creighton University, Omaha, NE.

Purpose: Posttraumatic stress disorder (PTSD) is characterized by intrusive memories, flashbacks, increased noradrenergic activity and an enhanced startle response. Compared to control DBA/2J mice, C3H-like recombinant inbred (C3HLRI) mice, show enhanced startle reactivity, basal tissue norepinephrine (NE) levels and a poor NE response to stress as seen in patients with PTSD. Yohimbine is an α 2-adrenergic receptor antagonist which promotes anxiogenic effects, while clonidine is an α 2-adrenergic receptor agonist that promotes anxiolytic properties. Moreover, chronic stress has been shown to increase oxidative stress in the rodent brain. Here, we use yohimbine and clonidine to test the hypotheses that fearful/stress-prone C3HLRI mice are a model for PTSD and examine whether a chronically-stressed status leads to enhanced oxidative stress in these mice.

Methods: C3HLRI and control DBA/2J mice received intraperitoneal injections of Yohimbine, Clonidine or Saline (8-10 mice/group). Locomotor activity and anxiety-related measures were assessed in the open field test 30 minutes after drug injection. Freezing behavior was assessed in the auditory fear conditioning paradigm where mice received the same doses of drug/saline 30 minutes before fear recall. Oxidative stress was studied in the brain by measuring the ratio of oxidized to total glutathione levels.

Results: In the open field test, yohimbine reduced locomotor activity in both strains in a dose-dependent manner and increased anxiety-like behavior in C3HLRI but not control DBA/2J mice. Clonidine moderately reduced locomotor activity in both strains, however decreased anxiety in C3HLRI mice. The auditory cue fear conditioning test showed that yohimbine induces a deficit in fear extinction in both strains. No strain difference in Glutathione levels was observed in 4 brain regions critical for fear regulation.

Conclusion: The findings indicate that C3HLRI mice represent a putative model for studying PTSD-like symptoms. However, oxidative stress does not seem to be involved in inducing a fear phenotype in C3HLRI mice.

Acknowledgment: Funded through NIH-CoBRE 8P20GM103471-09 and LB692 to DYH.

22. **MECHANICALLY-INDUCED OSTEOCYTE-TH17 CELL SIGNALING AND OSTEOCLASTOGENESIS**

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Purpose: When mechanical loads of extreme force or repetition create tissue damage, osteocytes stimulate the targeted remodeling of the damaged bone matrix. The purpose of this project is to examine a novel, mechanically-induced osteocyte-Th17 cell signaling pathway; and we hypothesize that repetitive fluid shear stress (FSS) would induce osteocyte (MLO-Y4) secretion of cytokines (IL-6 and TGF- β 1) known to stimulate Th17 secretion of osteoclastogenic cytokine, IL-17.

Methods: MLO-Y4 osteocyte-like cells were exposed to FSS (7 ± 3 dynes and 10 ± 3 dynes, at 1Hz) or Static control for 15, 30, 60, or 180 minutes. Murine spleen cells were then cultured in T cell supportive conditions and treated with 25% FSS or Static MLO-Y4 medium for 72 hours. MLO-Y4 cells were then co-cultured with murine spleen cells in osteoclast supportive conditions and treated with 25% conditioned T cell medium (FSS or Static TX) for 10 days. Cells and culture medium were collected from each culture system.

Results: ELISA analysis of MLO-Y4 medium revealed greater IL-6 and TGF- β 1 in FSS versus Static groups. ELISA analysis of T cell culture medium revealed greater IL-17 in T cell cultures treated with MLO-Y4 FSS medium versus Static medium. TRAP stain analysis of osteoclast cultures revealed greater percent osteoclasts in cultures treated with T cell medium (FSS TX) versus T cell medium (Static TX).

Conclusion: The data illustrates that mechanically-stimulated MLO-Y4 cells secrete greater amounts of cytokines (IL-6 and TGF- β 1) known to stimulate murine Th17 cells. T cell cultures treated with MLO-Y4 FSS medium produced greater amounts of IL-17, and that the addition of T cell medium (FSS TX) to osteoclast cultures leads to greater osteoclast formation; thus suggesting that repetitive loading of osteocytes potentiates Th17 cell activity, and the subsequent formation of osteoclasts.

Acknowledgment: This project was supported by a NASA Nebraska Space Grant.

23. **CYTOPLASMIC CDC25A LOCALIZATION AND SUPPRESSION OF APOPTOSIS IN CANCER CELLS[†]**

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The cell cycle and apoptosis regulator CDC25A is increased in many cancers. We found increased cytoplasmic CDC25A in cutaneous SCC decreased cancer cell death. We hypothesized that cytoplasmic CDC25A may suppress cell death in other cancers as well. Subcellular localization and intensity of CDC25A was assessed using immunofluorescence while cell death was measured after inhibition of CDC25A with 25 mM NSC663284. CDC25A was primarily cytoplasmic in skin, breast, prostate, and head and neck cancer cells, while its inhibition was toxic in all but the prostate lines. Thus, increased cytoplasmic CDC25A may sensitize cancer cells to CDC25A inhibitors.

Acknowledgment: This research was supported by funding by the Creighton University Center for Undergraduate Research and Scholarship and the State of Nebraska LB595 Cancer and Smoking-related Diseases program and conducted in a facility with support from Research Facilities Improvement Grant Number 1 C06 RR 17417-01 from the National Center for Research.

24. **NUCLEAR EXPORT OF CDC25A BY EXPORTIN PROTEINS IN SQUAMOUS CELL CARCINOMA OF THE SKIN LEADS TO SUPPRESSION OF APOPTOSIS**

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Purpose: In the United States, the most common type of cancer is non-melanoma skin cancer, with squamous cell carcinoma (SCC) having the highest mortality. Each year over 700,000 people are diagnosed with cutaneous SCC with the major cause being ultraviolet (UV) radiation from the sun. UV-induced DNA damage leads to inactivation of CDC25A, a dual-specific phosphatase necessary for cell cycle progression that can also suppress apoptosis. CDC25A is often overexpressed in cancer and is frequently associated with a poor prognosis. Our laboratory previously documented an increase in cytoplasmic CDC25A in human skin cancer and a CDC25A-dependent suppression of apoptosis.

Hypothesis: From these data we hypothesized that exportin protein binding to CDC25A relocalizes it to the cytoplasm leading to increased CDC25A stability and suppression of apoptosis in SCC.

Methods/Results: Disruption of exportin binding to CDC25A using Leptomycin B (LMB) or silencing of exportin 1 or 6 led to more nuclear localization of CDC25A. Similarly, mutation of CDC25A's nuclear export signal (NES) relocalized CDC25A to the nucleus and eliminated its anti-apoptotic activity in SCC. To see if exportin proteins were also upregulated in SCC, immunohistochemistry was performed in normal skin, premalignant and malignant human skin cancers where a nuclear to cytoplasmic shift of exportin 6 was observed in the cancers compared to skin. SCC cell lines SCC12B.2 and SCC13 showed increased sensitivity to CDC25A inhibitors NSC663284 (IC₅₀=2.5 μM/13.2 μM) and Vitamin K3 (IC₅₀= 17 μM/7 μM) compared to nontumorigenic HaCaT keratinocytes (IC₅₀=6 μM and 70 μM respectively).

Conclusion: In conclusion, exportins relocalize CDC25A from the nucleus to the cytoplasm in SCC leading to suppression of apoptosis and an enhanced sensitivity to CDC25A targeting.

25. **ESTROGEN RECEPTOR A36 DECREASED CANCER STEM CELLS IN CUTANEOUS SQUAMOUS CELL CARCINOMA**

Matti Holmes, Yawah Nicholson, Brianna Hamiller, Tammy Wang, Zhaoyi Wang, and Laura A. Hansen, Department of Biomedical Sciences, Creighton University, Omaha, NE.

Estrogen receptor (ER)-α36, a variant of the more widely known ERα66, increases the growth of gastric, endometrial, ER-negative breast cancers, as well as breast cancer stem cells. A modulator of ERα36 named Icaritin has been developed that arrests cell cycle progression and increases apoptosis in breast cancer cells positive for ERα36. Skin cancers also express estrogen receptors, although ERα36 has not been previously identified in non-melanoma skin cancer, the most common form of cancer in the United States. Immunohistochemistry revealed expression of ERα36 in both normal and cutaneous squamous cell carcinoma tissues with increased levels in the carcinomas. To determine the role of ERα36 in skin cancer, nontumorigenic HaCaT, SCC12.B2, and SCC13 cells were treated with 17β-estradiol (a potent form of estrogen) or Icaritin. Neither agent impacted cell viability when the cells were grown in monolayer. However, Icaritin treatment reduced the number and size of tumor spheres, a measure of cancer stem cells in the population, by 30% and 44%, respectively. Treatment of the tumor spheres with 17β-estradiol did not impact tumor sphere growth. These data suggest that ERα36 may play a role in the maintenance or proliferation of cancer stem cells in squamous cell carcinomas of the skin.

26. **ALLERGEN EXPOSURE INCREASES TRIGGERING RECEPTOR EXPRESSED ON MYELOID CELL (TREM)-2 EXPRESSION ON LUNG DENDRITIC CELL SUBSETS IN A MURINE MODEL OF ASTHMA**

Sannette Hall and Devendra K. Agrawal, Department of Biomedical Sciences, Creighton University, Omaha, NE.

Rationale: Dendritic cells (DCs) are professional antigen presenting cells which traffic from the lungs to the lymph nodes to present processed antigens to T-cells driving an inflammatory (Th2) response in atopic individuals. The recently discovered TREM-2 surface receptor has been shown to be expressed on dendritic cells; however, its role in asthma is yet to be elucidated. Here, we examined the effect of allergen exposure on TREM-2 expression in the airways and on lung DC subsets.

Methods: Female Balb/c mice were sensitized and challenged with ovalbumin or PBS for a total of 20 days. Lung tissues from both groups were harvested and examined for protein and mRNA expression of TREM-2. DCs were sorted using autoMACS and FACS to determine TREM-2 - positive lung DC subsets.

Results: Sensitization and challenge with ovalbumin resulted in increased airway hyper-responsiveness, mucus secretion, airway eosinophilia, and total IgE in serum and BALF. TREM-2 mRNA expression in whole lung was significantly higher ($p < 0.05$) in the allergen-sensitized and challenged mice which was associated with increased protein expression in the lungs. Analysis of CD11c+MHC-IIhi lung DCs revealed that the OVA-sensitized and challenged group had greater density of cells that were CD11b+CD103- and CD11b+CD103+ compared to the control. TREM-2 expression was significantly higher ($p < 0.01$) on the CD11b+CD103+ cells when compared to the CD11b+CD103- cells.

Conclusion: Allergen-sensitization and challenge increases the expression of TREM-2 in the airways and on the surface of lung DC subsets which may contribute to increased airway inflammation in allergic asthma.

27. **INTERACTIONS BETWEEN CELLULAR PRION PROTEIN PRPC AND CHOLESTEROL MOLECULES AT THE CELL MEMBRANE ENVIRONMENT**

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Prions are infectious proteins that are responsible for causing the fatal neurodegenerative disease in mammals known as transmissible spongiform encephalopathies (TSEs). Prion proteins become infectious from the conversion of the non-pathological conformation, PrPc, into the harmful misfolded conformation, PrPsc. The mechanism behind the conversion, replication, and misfolding of PrPc into PrPsc is still under debate. PrPc is found in the extracellular fluid and is GPI-anchored usually to cholesterol-rich lipid rafts in the cell membrane. The goal of my project is to investigate the binding positions of cholesterol molecules on the PrPc surface and the interactions of the complex with the cell membrane environment. Specifically, I use molecular docking and continuum electrostatics modeling techniques to sample PrPc - cholesterol binding modes and to map the electrostatic contribution to the complex - membrane interactions.

28. **INVESTIGATING THE PARAMETERS OF 4-IMINO-1,2,3-TRIAZOLE L'ABBE REARRANGEMENTS[‡]**

Anna Cheek and Dr. James T. Fletcher, Department of Chemistry, Creighton University, Omaha, NE.

4-imino-1,2,3-triazoles are known to undergo ring-degenerate rearrangement reactions. Such rearrangements were observed to be promoted by combinations of electron-rich groups at the imine position and electron-poor groups at the 1-triazole position. This investigation aimed to revisit the parameters of the L'abbe rearrangement with increased diversity of functional group representation. In order to investigate how electronic changes at the 1-triazole position impacted rearrangement, 4-formyl-1,2,3-triazoles were each prepared using a tandem deprotection/CuAAC reaction approach with propargylaldehyde diethyl acetal as the alkyne component. These formyltriazoles were each condensed with a series of aromatic and aliphatic amines in order to investigate how steric and electronic changes at the imine position impacted L'abbe rearrangement. Details of the reaction conditions studied, kinetic outcomes and product characterization will be presented.

29. **COMPARISON OF REFERENCE ELECTRODE FABRICATION METHODS ON A MICROFLUIDIC DEVICE**

Dylan Hoyt, Joseph Folchert, and Dr. Erin Gross, Department of Chemistry, Creighton University, Omaha, NE.

Purpose: Carbon paste microelectrodes can be used to determine qualitative and quantitative information with electro-analytical techniques, and are easily fabricated, inexpensive and portable. The purpose of this research is to improve the efficiency of the fabrication method by comparing the results of a traditional electrode containing a Ag/AgCl reference with an electrode containing a quasi-carbon paste reference.

Methods: The electrodes were made by pouring PDMS over a silicon wafer, effectively creating molds for the working, counter and reference electrode channels. In the first method of electrode fabrication, the working and counter electrodes were filled with a carbon paste, and the reference electrode utilized a carbon paste with incorporated Ag/AgCl. Copper wires were attached to the electrodes using silver paint, and the attachments were secured with hot glue. With a solution of 100 μ M tripropylamine in 4mM Tris(2,2'-bipyridyl)ruthenium (II) chloride hexahydrate, cyclic voltammetry was used to compare the effectiveness of each electrode type.

Results: The results of testing the Ag/AgCl reference and the quasi-carbon paste reference found that both electrodes provided adequately determined the current and peak potential for both the anodic and cathodic segments of the cyclic voltammogram. The electrode that included the Ag/AgCl reference yielded a more ideally-shaped CV, but both electrodes were able to provide qualitative and quantitative results for the 100 μ M Tripropylamine in 4mM Ru(bpy)₃²⁺ solution. Comparing i_{pc}/i_{pa} and ΔE , the most notable difference was that the quasi-carbon reference electrodes exhibited a i_{pc}/i_{pa} much less than one, while the Ag/AgCl reference electrodes exhibited a i_{pc}/i_{pa} close to 1.

Conclusions: The quasi-carbon reference electrodes are suitable for use in cyclic voltammetric experiments. Future work will utilize these electrochemical cells in microfluidic devices to detect biogenic amines.

Acknowledgment: The Charles Henry Lab at Colorado State University provided the silicone wafers.

30. **BIOLOGICAL INDICATORS OF IMMUNE RESPONSE IN ANASA TRISTIS (SQUASH BUGS)**

Jadyn Rickert and Dr. Eric Haas, Department of Chemistry, Creighton University, Omaha, NE.

The aim of this project is to investigate the immune response of the prominent pest bugs *Anasa tristis* (Squash Bugs) when they are challenged with a bacterial infection. Squash bugs are an economically important pest insects causing millions of dollars of crop damage throughout the Midwest each year. We are trying to obtain a better understanding of the immune response by observing hemocyte proliferation and nodule formation, as well as analysis of lipid composition of various tissues in control versus challenged bugs. The hope is to develop new methods to reduce the damages this species does by proposing alternative forms of control for this species. Some of the lipids of particular interest include Palmitic acid (16:0), Palmitoleic acid (16:1), Stearic acid (18:0) and Oleic acid (18:1). We hope to also detect the presence of Arachidonic acid (20:4), a lipid that is vitally important to a successful immune response. The samples are collected from the colonies of squash bugs maintained in the campus greenhouse. After dissecting the bugs under a microscope to extract the relevant tissues, the lipids are extracted into Folch's solution and further processed. This processing includes extraction of unnecessary components by washing, TLC to separate the individual lipid fractions before saponification of the different lipids to yield Fatty Acid Methyl Esters (FAMES) that are then analyzed by a combination of GC-MS and GC-FID. Palmitic, palmitoleic, stearic and oleic acids have been successfully detected in commercial FAME standards as well as from the fat body from control insects not infected with pathogenic organisms.

31. **EXTRACTION AND QUANTIFICATION OF NICOTINE IN INCUBATED AVIAN EMBRYOS USING LIQUID-LIQUID EXTRACTION AND GC-MS**

Matthew Abrahms, Dr. David Dobberpuhl, and Dr. Mark Reedy, Department of Chemistry, Creighton University, Omaha, NE.

The goal of this project is to optimize liquid-liquid extraction methodology for the accurate and sensitive determination of nicotine from the biological matrices. Here, we present advances in the extraction and quantification of nicotine in the amniotic fluid of avian embryos. Detection was optimized on a gas chromatograph-mass spectrometer (GC-MS) with select ion monitoring (SIM) yielding a limit of quantification of 5 ppb for nicotine standards in methanol. A syringe washing protocol was designed to prevent nicotine carry-over between injections using a solution of acidified (HCl) methanol and a second solution of methanol with dilute ammonium hydroxide (NH₃OH). This method resulted in minimal nicotine carry over, with a 2.05% relative standard deviation (RSD). / Samples were taken from incubated five-day old avian eggs by removing the amniotic fluid by syringe extraction. A 40 microliter aliquot of the amniotic fluid was then spiked with 36-359 ppb nicotine before undergoing liquid-liquid extraction into chloroform followed by centrifugation. Nicotine quantification was performed by GC-MS using select ion monitoring of nicotine's 84 and 162 m/z peaks. This extraction method yielded an average percent recovery of 89% +/- 10% RSD. Results suggest that amniotic fluid is a complex matrix for nicotine extraction and further optimization will be needed to address high relative standard deviation and low extraction efficiency.

32. **HYDROTHERMAL SYNTHESIS OF LANTHANIDE SULFITES & SULFATES***

Jakob Dovgan and Dr. Eric Villa, Department of Chemistry, Creighton University, Omaha, NE.

The sulfite anion contains a stereoactive lone-pair, which can form non-centrosymmetric structures with potentially useful properties. Here we are employing lanthanides as a metal source due to their extensive areas of application. Four new neodymium(III) compounds were hydrothermally synthesized and contained sulfite, mixed sulfate-sulfite, or sulfate as ligands.

These phases were synthesized by employing Na₂SO₃ and NaHSO₃ as anion sources and pH regulators. Different pH conditions and cooling rates yielded diverse crystals. Sulfites were more likely to form at a neutral pH and sulfates were likely to form at a more basic pH. The products obtained between these two pH's required slower cooling rates to obtain crystals. If the pH was too high then sulfite oxidized to sulfate. If the pH was too low then no crystals would form as sulfite was reduced to sulfur (S₈). Herein, we report the resulting products of these hydrothermal syntheses, which reveal that the products produced are strongly influenced by the initial pH of the solution.

33. **LAB DESIGN: PROTEIN CONCENTRATION DETERMINATION**

Henry Goppert, Department of Chemistry, Creighton University, Omaha, NE.

Purpose: The purpose of this research is to improve the accuracy, sensitivity and linear response of the Bradford Protein Assay for students in Quantitative Analysis Laboratory. Development work was also performed to design a sample preparation and analysis method of a "real life" sample for students to analyze.

Methods: Spectral data was collected on an Agilent 8453 UV-Vis spectrophotometer to determine the wavelength of maximum absorbance of both the dye and complex. Individual absorbance data were collected and calibration curves generated on a Thermo Spectronic Genesys 20 spectrophotometer.

Results: The absorbance maxima from the albumin-dye complex solutions and dye solution alone were determined to be at 595 nm and 470 nm, respectively. The analytical figures of merit of the assay were determined as a function of added acid or base and two different amounts of added dye. The data indicated that both the higher dye concentration and the addition of NaOH improve linearity, sensitivity, and accuracy. Calibration curves were also generated at the absorbance maxima of the protein dye complex, 595 nm, and at the ratio between the absorbance at 595 nm and 470 nm. The linearity was improved and extended with this method and the determination of an "unknown" protein concentration was consistently more accurate. Next, students in Quantitative Analysis Laboratory will use the method to determine the amount of protein in an unknown sample and in a protein powder.

Conclusions: A sample preparation procedure for measuring the protein content in protein powder was developed. Development work showed improvement in the accuracy, sensitivity and linearity of the method. The experiment will be implemented into the Quantitative Analysis laboratory and student data collected.

Acknowledgment: Creighton University Department of Chemistry

34. **OPTIMIZATION OF SOLID-PHASE MICROEXTRACTION WITH GAS-CHROMATOGRAPHIC MASS-SPECTROMETRIC DETECTION OF KEY VOLATILE COMPOUNDS IN RED WINES**

Ashley Guanzon, Andrew Caffrey, Katherine Jones, and David Dobberpuhl, Department of Chemistry, Creighton University, Omaha, NE.

The oxidation of compounds in wine is responsible for its spoilage after opening, but the exact mechanisms of this process have not been elucidated. Strategies for understanding, and ultimately, delaying wine spoilage after opening have been investigated in the lab using headspace solid-phase microextraction combined with gas-chromatography/mass-spectrometric analysis (HS-SPME-GCMS). The goal of this project was to optimize an SPME extraction method and GC temperature program providing the largest response and peak resolution of key components in wine. We especially wanted to focus on resolving acetaldehyde and ethanol; the

most difficult compounds to separate using this method. The oxidation of acetaldehyde to acetic acid is suspected to be a key component in wine degradation. We attempted to design a method to chromatographically resolve acetaldehyde from ethanol in a mixture to better monitor the effects of the oxidation of acetaldehyde to acetic acid. As small compounds, however, ethanol and acetaldehyde have minimal retention on the nonpolar column and tend to co-elute. Therefore, other key components that can be monitored in wine degradation are being identified and the effects of temperature on extraction and injection are being studied.

35. **STEREOSELECTIVE SYNTHESIS OF EXOCYCLIC CUMULENES BY 1,2-FOLLOWED BY 1,4- OR 1,6- DOUBLE HYDRIDE REDUCTION**

Matthew Gubbels, Department of Chemistry, Creighton University, Omaha, NE.

An allene is a unique structural motif that is found within natural compounds. The synthesis of allenes can be achieved through a 1,2-, 1,4-double hydride reduction. Under reducing conditions with lithium aluminum hydride or sodium bis(2-methoxyethoxy) aluminum hydride, 3-alkynyl-2-cycloalkenones undergo reduction to form exocyclic allenes as the major products. This double hydride reduction also proceeds in a diastereoselective manner. Using X-ray diffraction crystallography, the relative stereochemistry of 2-methyl-3-(phenylethenylidene) cyclohexanol was determined to be (1S, 2S, Ra). Extension of this reaction to 1,2-, 1,6-double hydride reduction of 3-alkynyl-2-cycloalkenones was investigated and will be described.

36. **HYDROGENOLYSIS OF 4-PHENYL-NIM-PROTECTED L-SPINACINE METHYL ESTERS.**

Rhys Ishihara and Martin Hulce, Department of Chemistry, Creighton University, Omaha, NE.

The optimization of Hydrogenolysis conditions for preparation of 4(5)-substituted histidines from 4-substituted spinacines was investigated. Using 10% Pd/C the hydrogen transfer agent was optimized. The best source was the one that is traditionally used, ammonium formate. In addition, we tried to optimize the catalyst using a variety of palladium sources, but we found that 10% palladium on carbon worked the best. After this, we sought to use these optimized conditions to hydrogenolyze Nim-protected 4-substituted spinacines. We assayed the effectiveness of a Pictet-Spengler reaction on different variations of spinacines using different protecting groups. However, we have found this approach to be very difficult and ineffective. Currently, we are working on protection of the imidazole nitrogen of spinacine with a silyl protecting groups. However, we have so far been unable to effect protection.

37. **MONITORING THE RELATIVE CONCENTRATION CHANGES OF VOLATILE ORGANIC COMPOUNDS IN WINES AFTER OPENING[‡]**

Katherine Jones and David A. Dobberpuhl, Department of Chemistry, Creighton University, Omaha, NE.

Given that taste is largely a function of smell, the perceived quality of wine is highly influenced by relative concentrations of volatile organic compounds (VOCs) in the headspace. Wine aromas are comprised of up to 800 VOCs, many with distinct organoleptic properties. Upon opening, a wine's aroma typically deteriorates over a few days to where consumption is no longer a pleasurable experience – a process that is still not well understood. This project uses headspace-solid phase microextraction (HS-SPME) with gas chromatography-mass spectrometry (GC-MS) to determine the change in relative concentrations of VOCs in wine over time, and to explore possible food-grade additives that might scavenge the oxygen that is introduced upon opening. After identifying key organoleptic molecules, red wines were adulterated with mannose or EDTA in an attempt to retard degradation. Unfortunately, degradation rates were not statistically different with either compound.

38. **THE OPTIMIZED PREPARATION OF 4(5)-BENZYL-L-HISTIDINE METHYL ESTER[†]**

Paul Lievens and D. David Smith, Department of Chemistry, Creighton University, Omaha, NE.

The potent vasodilatory neuropeptide calcitonin gene-related peptide (CGRP) contains 37-amino acid residues and is found in the central and peripheral nervous systems. The N-truncated fragment, CGRP(8-37) is the prototypical competitive antagonist of CGRP receptors. Benzylation of the α -amino group and the histidyl residue in position 10 of CGRP(8-37) increases receptor binding affinity 10 to 100-fold. As part of ongoing studies to prepare the dibenzylated-CGRP(8-37) derivative, we sought to prepare Boc- and Fmoc-protected derivatives of 4(5)-benzyl-L-histidine that are suitable for solid phase peptide synthesis. A common intermediate for the preparation of both protected derivatives is methyl ester, which was originally prepared from the free amino acid 4(5)-benzyl-L-histidine using thionyl chloride in methanol. Using RP-HPLC, this reaction was found to be complete in 3 hours using 10 molar equivalents of thionyl chloride with respect to benzyl histidine. The methyl ester was successfully recovered on a small scale; however, the method wasn't reproducible when the scale of the preparation was increased. The process leading to an optimized preparation of the 4(5)-benzyl-L-histidine methyl ester will be presented.

Acknowledgment: CURAS provided funding for the research.

39. **OPTIMIZATION OF GAS CHROMATOGRAPHY MASS SPECTROMETRY PARAMETERS FOR THE DETECTION OF NICOTINE**

Vincent Nicchi and Dr. David Dobberpuhl, Department of Chemistry Creighton University, Omaha, NE.

Gas chromatography-mass spectrometry (GC-MS) strategies were explored for the detection of nicotine, including with headspace solid-phase micro-extraction (HS-SPME). Initial research was performed using nicotine standards to maximize the signal-to-noise ratio, eventually focusing on nicotine's most abundant fragmented ions. Select-ion monitoring (SIM) settings were optimized for $m/z=84$ ion alone or in combination with the $m/z=162$ ion which yielded the highest S/N ratio. As the GC-MS method was prepared for sub-ppm concentrations, a linear calibration curve was generated for 25-ppb to 100-ppb nicotine, with a calculated limit of detection of 1.28-ppb and a limit of quantitation of 4.27-ppb. Quantitation by integration of peak area was found to yield lower RSD than peak height. Basified nicotine solutions led to more precise results than acidic nicotine solutions for this method. Using solid-phase micro-extraction, the quantitation of nicotine is being further studied, with variables including extraction time and extraction pH.

40. **REACTION DYNAMICS OF SIMPLE POLYOXOMETALATE IONS IN WATER**

Matthieu Spriet and Dr. Eric M. Villa, Department of Chemistry, Creighton University, Omaha, NE.

Polyoxometalate ions are an enormous class of metal-oxide clusters with extensive applications; however, the aqueous solution reaction dynamics of these ions are underexplored and many fundamental questions remain unanswered. Recently, we have been investigating the chemistry of the versatile Anderson-type polyoxometalate ions in solution. Here we will discuss the crystal structures and the reaction dynamics of these small molybdenum based polyoxometalates in aqueous solution.

Acknowledgments: Funding for the project was graciously provided by Creighton University's Summer Faculty Research Fund from the Center for Undergraduate Research and Scholarship (Summer 2015) and Nebraska EPSCoR First Award (EPS-1004094; January-September 2016).

41. **REACTIVE MICROCAPSULES TO IMPROVE THE FRACTURE RESISTANCE OF COMPOSITES[‡]**

Monika Satkauskas, Jennifer Hartjes, Mark A. Latta, William A. McHale, and Stephen M. Gross, Department of Chemistry, Creighton University, Omaha, NE.

Purpose: Oral health has improved over the past 50 years; however, dental caries still plague the majority of the population. The most clinical practices perform the removal of diseased hard tissues and repair the tooth through cavity filling. However, nearly half of new restorations replace previous restorations. Improvements in restorative materials are key to reducing restorations in previously restored areas. Previous research has demonstrated the potential for microencapsulating aqueous solutions of calcium, phosphate, and fluoride salts to help fight demineralization and promote remineralization in the oral environment. This project aimed to study the mechanical properties of a dental sealant with the addition of microcapsules with cariostatic properties.

Methods: Polyurethane was synthesized using diol monomers and diisocyanate functional groups under an inert atmosphere with the addition of 2-hydroxyhemamethacrylate after four hours. Microcapsules were synthesized with an oil phase, containing polyurethane and an emulsifying agent, and an aqueous solution of 5 M calcium nitrate salt. Dental sealants were prepared, incorporating the synthesized microcapsules. Fracture toughness measurements of these composites were made using the single-edge notched method.

Results: Microcapsules covalently bonded to the continuous phase require greater energy to propagate a crack through the material at the interface of the filler. The addition of 2-hydroxymethacrylate was correlated with an increase in fracture toughness. Preliminary fracture toughness measurements demonstrate the potential for microcapsules to bond with acrylic monomers of the continuous phase.

Conclusions: Dental composite toughening was demonstrated with a novel experimental approach. Microcapsules with entrapped aqueous solutions were successfully prepared with acrylic functional groups available for bonding. Future efforts will focus on optimizing mechanical property improvement by varying acrylate concentration, chemical structure of the urethane and other vinyl containing terminal groups on the polyurethane.

Acknowledgements: I would like to thank the Ferlic Summer Research Scholarship for the opportunity to conduct and present my research through CURAS.

42. **A MORPHOMETRIC ALGORITHM FOR TRACKING CHEMOTHERAPY-INDUCED ALTERATIONS IN CELL MORPHOLOGY WITH IMPLICATIONS FOR CANCER METASTASIS**

JianHao Ning, Sruti Prathivadhi², Patrick Nguyen², Carolyn Taylor², Michael Nichols², Erin Gross¹, and Andrew Ekpenyong¹, ¹ Department of Chemistry, ² Department of Physics, Creighton University, Omaha, NE.

Purpose: Although chemotherapy drugs target and kill malignant cells during cancer treatment, it is not certain whether such drugs inadvertently promote metastasis. Yet, it is metastasis, a complex multistep process that leads to death in over 90% of cancer cases. In order to unravel the role of chemotherapy on cancer metastasis, we quantify the morphological changes induced by chemotherapeutic drugs on cancer cells.

Methods and Results: Here, using standard image segmentation algorithms, we show that cancer cells treated with chemotherapeutic drugs including doxorubicin and daunorubicin, progressively become smaller in size even beyond the on-set of apoptosis and necrosis.

Moreover, in the first four hours following treatment, the reduction in size is not statistically significant.

Conclusion: Since an important step in the metastatic cascade is the deformation of cells through capillary constrictions that are smaller than the cell's diameter, our concurrent studies done using a microfluidic device that mimics the microcirculation, enables the separation of morphometric changes from mechanical changes, giving insights into the roles of both during metastasis.

43. **IN VITRO SELECTION OF AN ALLOSTERIC RIBOZYME FOR USE AS A SYNTHETIC GENETIC DEVICE**

Daniel Poston, Sam Stoupa, Shelby Lennon, Audrey Netzel, Juliane K Strauss-Soukup, and Garrett Soukup, Department of Chemistry, Creighton University, Omaha, NE.

Synthetic biology is a rapidly emerging field focused on engineering biochemical systems and cellular functions for a variety of applications, including therapies for the treatment of infectious diseases and cancer, as well as tactics for vaccine development, microbiome engineering, cell therapy, and regenerative medicine. Many of the advances so far have involved engineering synthetic constructs for use in bacteria, but it is critical that synthetic biology tools be designed for use in mammalian systems. Allosteric ribozymes offer a unique set of "devices" for achieving synthetic gene regulation. This presentation describes methodology and preliminary results of an in vitro selection for a highly active allosteric ribozyme using a rationally modified Twister ribozyme. Future studies will include continuing selection and eventual engineering into a mammalian system for further testing in vivo.

44. **EXPLORATION OF CELL WALL PERMEABILITY TO ANTIBIOTIC GLMS RIBOSWITCH ANALOGS**

Audrey Netzel and Nick Bartschat, Department of Chemistry, Creighton University, Omaha, NE.

There is an increasing prevalence of antibiotic resistant bacteria that is responsible for many human illnesses, prompting a need for continued research on new, novel targets for antibiotic development. One novel target is the glmS riboswitch found in numerous gram-positive bacteria. Riboswitches are RNA structural elements found in non-coding regions of mRNA molecules and gene expression is modulated when a metabolite binds directly to the RNA. 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. These RNA sequences have attracted the interest of many scientists, as they function in an inhibitory pathway to prevent formation of bacterial cell wall components. We have shown that non-natural ligands, such as glucosamine, target the glmS riboswitch in vitro, but it is unknown whether these compounds permeate the cell wall. In order to develop potential antibacterial drugs that target the glmS riboswitch, delivery of non-natural metabolite analogs into the bacteria is necessary. We are investigating the permeability of the bacterial cell wall to the artificial ligand, glucosamine, in *Bacillus subtilis*, *Escherichia coli*, and *Streptococcus pneumoniae*. This artificial ligand is available in a radioactive form. Results showed that despite differences in cell wall make-up, the glucosamine transport was similar among all types of bacteria. Due to low amounts of transport overall, we have investigated different methods of increasing permeability. Results of these assays will be discussed.

45. **OUTSIDE THE PERIBOLOS: MALLOURA AND THE “BUSY” COUNTRYSIDE OF LATE ROMAN CYPRUS[‡]**

Mesel Tzegai, Department of Classical and Near Eastern Studies, Creighton University, Omaha, NE.

Located at the crossroads of three continents, Cyprus during the ancient times was in contact with many surrounding cultures and was a strategic point of commerce for a number of cities, kingdoms, and empires. Although the ancient Cypriots had their own traditions, frequent cultural exchanges with other civilizations influenced its form. From the first century BCE until the seventh century CE, the island of Cyprus was under the control of the Roman and later the Byzantine Empire. My research project covers Cyprus during these periods, with a concentration on the daily life of the Cypriots living in the Malloura Valley. The Athienou Archaeological Project (AAP), a multidisciplinary project, conducts field surveys in this area in central Cyprus, where I participated in excavations as a field school student the summer of 2015. Material evidence (i.e. pottery, statuary, architecture, and coins) from the AAP excavations, surveys, and published reports help piece together the full picture of what life was like in the countryside and reveals that the Malloura Valley experienced similar trends of prosperity as the rest of the island in the Roman and Late Roman/Early Byzantine periods. Evidence of continued use of the sanctuary, expansion and construction of chamber tombs, and construction of an industrial building indicate activity and use of the valley. Roman influences spread to the ceramic style made in the valley, and Christianity was adopted later by a number of inhabitants. Unlike the larger urban centers, however, the people of the Malloura Valley were more self-sufficient even after the Romans took over the island.

Acknowledgment: This project was graciously funded by Creighton University’s College of Arts and Sciences 2015 Dean’s Summer Research Scholarship and the National Scholarship Foundation Research Experiences for Undergraduates grant and advised by Dr. Erin Walcek Averett and Dr. Jody M. Gordon (Wentworth Institute of Technology).

46. **WNT/B-CATENIN PATHWAY PROMOTES THE DIFFERENTIATION OF ADIPOSE-DERIVED MESENCHYMAL STEM CELLS STIMULATED WITH 1,25-DIHYDROXYVITAMIN D AND VEGF-CELLS TOWARD THE ENDOTHELIAL PHENOTYPE**

Yovani Llamas, Sami Almalki, and Dr. Devendra K. Agrawal, Department of Clinical and Translational Science, Creighton University, Omaha, NE.

Background: Cell-based therapy using adipose-derived mesenchymal stem cells (AMSCs) is an attractive option for re-endothelialization post-angioplasty procedures. Wnt/ β -catenin pathway in AMSC may regulate AMSC-based re-endothelialization of injured arteries. The role of Wnt/ β -catenin pathway in the differentiation of adipose-derived AMSCs into endothelial cells (ECs) is unknown. In this study, we investigated the effect of Wnt/ β -catenin pathway on AMSC treated with vitamin D and VEGF in the differentiation of MSCs into ECs.

Methods and Results: MSCs were CD11b-CD34-CD44+CD73+CD90+ and showed characteristics of MSCs. MSCs were stimulated and differentiated into ECs with endothelial growth media (EGM+50ng/ml of VEGF) and EGM media containing 10nM of calcitriol (EGM+50ng/ml of VEGF +10nM calcitriol) for 10 days. Calcitriol enhanced EGM+VEGF-induced differentiation of MSCs into ECs, as revealed by 3-fold increase in mRNA and 4-fold increase in protein expression of EC markers. Angiogenesis assay and acetylated low density lipoprotein (LDL) uptake assay were used to assess endothelial functionality that showed significant increase in capillary tube sprouting, and increased LDL uptake by differentiated cells in response to EGM +VEGF+calcitriol. Findings from Wnt Pathway array revealed a 3-fold decrease in β -catenin and 4-fold increase in KREMEN1 protein in the cells treated with EGM + VEGF+calcitriol. β -catenin

silencing showed significant increase in the expression of EC markers, formation of capillary tubes, and LDL uptake.

Conclusion: The downregulation of β -catenin and upregulation of KREMEN1 significantly enhanced the differentiation of MSCs into endothelial cells. These results provide novel insight into therapeutic strategies for patients undergoing coronary intervention to limit thrombosis and intimal hyperplasia.

47. **TRAUMATIC BRAIN INJURY: THE ROLE OF HMGB1 SIGNALING IN INFLAMMATION**

Taylor Parker, Austin Nguyen, Joshua Rabang, Arun-Angelo Patil, and Devendra K. Agrawal, Department of Clinical and Translational Science, Creighton University, Omaha, NE.

Rationale: Traumatic brain injuries (TBI) are associated with complex inflammatory pathways that lead to the development of secondary injuries such as cerebral ischemia, elevated intracranial pressure, and cognitive deficits. TBI initiates a drastic change in the biochemical environment of the brain, leading to neuronal cell death, excitotoxicity, oxidative stress and the upregulation of various anti-inflammatory factors and pro-inflammatory factors. The association between intracellular danger signaling involving high mobility group box-1 (HMGB1), a protein that propagates inflammation, and inflammatory pathways following TBI is not yet been fully understood. The pathomechanistic role of HMGB1 has clinical potential in TBI prognosis and care, and warrants further investigation.

Methods: A systematic literature review of studies using human and animal subjects was performed. A total of eight studies were included in our results. The National Library of Medicine database was systematically searched using PubMed with the following terms: traumatic brain injury combined with high mobility group box-1 or HMGB1. Included articles met the following criteria: original research articles in the English language investigating the prognostic, diagnostic, and therapeutic roles of HMGB1 in patients TBI and/or animal models of TBI. Articles were excluded if not written in English, were conference abstracts, or did not use human or animal subjects or samples.

Results: Comprehensive review of these reports demonstrated that following TBI, HMGB1 is released from damaged neurons and is elevated in patient serum and CSF. Furthermore, these studies showed the potential for HMGB1 to serve as a prognostic biomarker and therapeutic target in patients with TBI.

Conclusion: We conclude HMGB1 to be a prospective subject for future studies as it shows possible clinical use in treating and/or predicting the sequelae of TBI.

Acknowledgment: This work was supported by the Department of Clinical and Translational Science, Creighton University.

48. **IMMUNOMODULATION OF INFLAMMATION IN THE KNEE**

Vikrant Rai, Nicholas E. Dietz, Matthew F. Dilisio, Mohamed M. Radwan, and Devendra K. Agrawal, Department of Clinical and Translational Science, Creighton University, Omaha, NE.

Objective: Osteoarthritis (OA) of the knee is a degenerative process resulting in cartilage loss with subsequent pain and disability. However, osteoarthritis is not merely a disease of cartilage, but a disease of entire knee joint and inflammation plays an important role. In addition, OA has been associated with vitamin D deficiency. Vitamin D as an immune-modulator and anti-inflammatory agent may attenuate inflammation in the knee. The aim of this study was to assess the immunomodulatory effect of vitamin D status on architectural and physiological changes in the knee.

Design: In this study we included 13 micro-swine categorized in three groups of vitamin D deficient, sufficient and supplement. After 6 months, micro-swine were euthanized and the knee joint tissues were harvested. Histological and immunofluorescence studies were carried out on the tissue specimens to evaluate the effect of vitamin D status.

Results: Histological and immunofluorescence studies of the knee joint tissues demonstrated increased inflammation and fatty infiltration in muscle, tendon, ligament and synovial membrane, and chondrocyte clustering in vitamin D deficient and sufficient group compared to supplementation group. Architectural distortion of the muscle, tendon and ligament was also seen in the areas of inflammatory foci and fatty infiltration in deficient group.

Conclusion: Decreased inflammation and fatty infiltration in vitamin D supplement group suggest the potential role of vitamin D in attenuating inflammation and protecting the architecture of the tissue in the knee joint.

Key words: Osteoarthritis, Vitamin D deficiency, Cartilage loss, Inflammation, Fatty infiltration, Vitamin D supplementation, Immunomodulation

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49. **INCREASED EXPRESSION OF TREM-1 AMELIORATES ITS LIGAND HMGB1 AND STIMULATES TLRs AND RAGE IN THE OBESE POPULATIONS**

Saravanan Subramanian, Poonam Sharma, Devendra K Agrawal and Kalyana C Nandipati, Department of Clinical and Translational Science, Creighton University, Omaha, NE.

Rationale: Obesity is a major risk factor in the development of metabolic syndrome. In obesity, adipocytes derived pro-inflammatory cytokines and chemokines attract and activate pathogenic inflammatory cells that results in chronic low-grade inflammation. Obesity-related IR can arise through activation of these inflammatory cell receptors. Among them triggering receptors expressed on myeloid cells (TREM) -1, toll like receptors (TLRs) and receptors for advanced glycation end products (RAGE) play a significant role in innate immunity. TREM-1 potentially amplifies TLRs and RAGE synergistically with DNA-binding high-mobility group box 1. We propose that changes in comorbid conditions and biochemical parameters in association with chronic inflammation in obese patients may stimulate the activation of TREM-1 via DAP12 and promotes release of its ligand HMGB1 causing TLRs and RAGE stimulation in obesity-induced IR.

Design: We examined the mRNA expression by RT-PCR and protein expression by immunofluorescence for TREM-1, DAP-12, HMGB-1, RAGE, TLR-4 and TLR-2 in obese non-diabetics (n=24) and diabetics (n=22) and non-obese (n=5) in omentum, subcutaneous and liver biopsy tissues.

Results: We found a significant increase in TREM-1, DAP-12, HMGB-1, RAGE, TLR-4 and TLR-2 expression in omentum, subcutaneous and liver biopsy tissues of obese diabetic subjects compared to obese non-diabetics and the non-obese populations. Overall obese diabetics had shown high expression of TREM-1 in association with HMGB1 (100% vs 58.3%, p=0.003), RAGE (77.3% vs 41.7%, p=0.045), TLR4 (100% vs 58.3%, p=0.003) and TLR2 (100% vs 50%, p=0.003) in liver biopsy samples.

Conclusions: The high expression of TREM-1 in association with HMGB-1, RAGE, TLR-4 and TLR-2 suggest that TREM-1 ameliorates its ligand HMGB1 and stimulates TLRs and RAGE in the obese populations that may results in IR.

Keywords: Obesity; Insulin resistance, Inflammation, TREM-1

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50. **TYPE III COLLAGEN CONTENT OF THE LONG HEAD OF THE BICEPS AS AN INDICATOR OF GLENOHUMERAL ARTHRITIS**

Finosh Thankam, Matthew F. Dilisio, Nicholas Dietz and Devendra K. Agrawal, Department of Clinical and Translational Science, Creighton University, Omaha, NE.

Introduction: 95% of a normal tendon is composed of collagen I, and the alterations in the collagen composition of can be a marker for tendon injury and repair. The precise composition of collagen types in pathologic shoulder tendons has not been described. The purpose of this study is to evaluate biochemical and histological differences in the intraarticular portion of the long head of the biceps tendon in a preserved versus arthritic glenohumeral joint. Our hypothesis is that a tendon that is continuously bathed in an osteoarthritic synovial environment is likely to exhibit histomorphologic differences compared to a healthy shoulder.

Methods: 18 patients undergoing shoulder surgery were prospectively enrolled in the study. Group-1 consisted of patients with glenohumeral arthritis and Group-2 consisted of patients without glenohumeral arthritis. The long head of the biceps tendon was tenodesed and the remnant tendon tissue was fixed in formalin, embedded in paraffin, sectioned (5µm), deparaffinized and used for histology and immunofluorescence analysis.

Results: Increased collagen III was present in both groups relative to that of a normal tendon. H and E staining of Group-1 showed severe inflammation with disorganization of ECM where Group-2 displayed minimal inflammation with ECM disorganization. Trichrome staining displayed collagen derangement which was predominant in Group-1. The expression of collagen III in Group-1 was significantly higher than that of in Group-2. No considerable change in collagen I was observed between two groups. MMP-2 and MMP-9 and TIMP-1 and TIMP-2 expression were also elevated in in Group-1 which signifies extent of inflammation.

Conclusion: The expression of collagen subtypes varied markedly between patients with and without glenohumeral arthritis. The arthritic patients displayed increased expression of collagen III with reduced collagen I and the reverse trend was evident in patients with preserved glenohumeral cartilage. Increased collagen III expression in the biceps tendon expression serves as an indicator of glenohumeral arthritis. Measuring collagen type composition in shoulder tendons may serve as a useful metric in the diagnosis and treatment of musculoskeletal pathology.

51. **COEXISTENCE OF ACRANIA AND TWIN PREGNANCY WITH EXPOSURE TO LEVITERACETAM: CASE REPORT**

Shreya Agarwal, Oormila Kovilam, Sanjay Singh, Anu Kovilam, and Devendra K. Agrawal, Department of Clinical and Translational Science, Creighton University, Omaha, NE.

Introduction/Purpose: Rate of congenital malformation associated with exposure to levetiracetam monotherapy is reported to be 0.7- 2.2%. At 10 x human dose equivalent this drug was shown not to cause NTD in chick embryos demonstrating safety. We report a rare co-existence of acrania & twin demise at 10 weeks of gestation in a patient whose epilepsy was well controlled for 3 yrs. Acrania is a rare congenital disorder characterized by partial or complete absence of the calvarium. The brain development is complete but abnormal, and is uniformly lethal.

Methods: A 25yr, gravida 2, para 1 was referred to our ultrasound lab for a history of seizure disorder, well controlled with levetiracetam for the last 3 yrs. She reported to be on monotherapy currently. Her last pregnancy was 4 yrs ago with delivery of a normal child. Her seizures were not well controlled then and was on carbamazepine. Carbamazepine was continued with Levetiracetam for a period of 1-2 yrs. for control of bipolar disease. This was an unplanned pregnancy and she was started on Folic acid and prenatal vitamins as soon as she presented with amenorrhea. On transvaginal ultrasound a twin gestational sac & yolk sac with demise of one twin and acrania of the live fetus at 10 4/7 weeks were visualized. The brain was formed with complete absence of cranial bone formation & free floating brain matter exposed to the amniotic fluid cavity. The fetus was also noted to have an omphalocele, 2 vessel cords and extraneous digit on the left hand. The patient was counseled of the findings and options discussed. Isolated Acrania is very rare, however since this fetus had multiple anomalies it could be syndromic and associated with chromosomal anomalies or vitamin D deficiency, hence she was also advised serum screening and genetic amniocentesis.

Results: Ultrasound pictures were taken, which couldn't be pasted here.

Discussion/Significance: Fetal acrania is a rare congenital abnormality characterized by partial or complete absence of the skull bones surrounding the brain matter. The proposed mechanisms are failure of mesenchymal migration in the fourth week of embryological age or disruption by amniotic bands. It results from ectodermal and mesodermal aberration and occurs after neural tube closure. Exposure of the brain to amniotic fluid increases the risk of friction with uterine wall, placenta and fetal parts leading to progressive brain damage and degeneration. Although acrania associated with anencephaly is a well-known entity, in this case, anencephaly was ruled out by demonstration of abundant brain tissue. There are no identified gene mutations associated and recurrence risk is rare. If associated with holoprosencephaly and agnathia mutation in the hedgehog acyltransferase (HHAT) have been identified which plays a role in the sonic hedgehog pathway. Given the current safety profile of Levetiracetam it is unlikely to be the sole agent for the anomaly. Other confounding multifactorial environmental factors including of prior exposure to carbamazepine and chromosomal anomalies have to be entertained in the pathogenesis of this lethal anomaly. With high resolution detailed imaging technique we were able to establish an early diagnosis in the first trimester of pregnancy and provided adequate counseling.

52. **THE UNINVITED TOURISTS: EXPLORING THE ILLNESS EXPERIENCES WITH DENGUE AND CHIKUNGUNYA FEVERS IN PISTÉ, YUCATÁN, MÉXICO[‡]**

Angela Eastlund, Department of Cultural and Social Studies, Creighton University, Omaha, NE.

This exploratory study presents the illness narratives of patients and caretakers of Dengue and Chikungunya fevers within the community of Pisté, Yucatán, México. Using ethnographic research methodology of in-depth interviews and participant observation, this study provides qualitative data on the local conceptualization of the role of the mosquito vector in illness, resident's illness risk perception, and observation of prevention and care-taking behaviors to inform current public health efforts at the local level. As a result of the findings of this research, recommendations for improvements in public health education efforts for Chikungunya and Dengue fevers, encouragement of household participation in mosquito vector control, and indications for further research to be done are also included.

Acknowledgment: This project was funded through the CURAS Jesuit Mission Summer Research Scholarship and guided through the Open School for Anthropology and Ethnography (OSEA) in Pisté, Mexico.

53. **COLLEGE READINESS: INVESTIGATING THE MERITS OF THE IB DIPLOMA PROGRAM THROUGH THE FRAMEWORK FOR SUCCESS IN POSTSECONDARY WRITING[†]**

Krysta Larson, Department of English, Creighton University, Omaha, NE.

Purpose: My research investigates whether the International Baccalaureate Diploma Program (IBDP) succeeds at preparing students for postsecondary education according to the standards of the Framework for Success in Postsecondary Writing. The Framework identifies eight habits of mind in which students should be proficient to succeed with college writing. The purpose of this research is to increase awareness of the IBDP as a college preparatory program among postsecondary institutions that feel they lack proper knowledge about the program's benefits. This research can also help IBDP educators improve their teaching styles to provide further benefits to students and to educate students who are considering enrollment in the IBDP.

Methods: I interviewed thirteen IBDP graduates and identified narratives where these students discussed learning experiences in the program. Eight volunteers and I coded these narratives according to the two habits of mind they most clearly demonstrated. I used the online analytics tool Dedoose to identify which habits of mind the IBDP teaches the most effectively and which habits of mind are lacking in an IBDP education.

Results: My research found that all eight habits of mind were present in the learning narratives, with metacognition, openness, and engagement playing key roles in student learning.

Conclusion/Significance: The IBDP's international mission allows students to grow as writers by teaching them to consider perspectives outside of their accustomed worldview. By assigning writing projects which challenge students to think beyond their cultural borders and consider new ideas and traditions, the IBDP fosters students who strive to use their education for the betterment of international communities.

Acknowledgments: I would like to thank Dr. Faith Kurtyka for inspiring the project and for her guidance throughout this process and the Center for Undergraduate Research and Scholarship for providing a generous summer grant to fund this research.

54. **ORANGE SULPHUR BUTTERFLIES, COLIAS EURYTHEME, ACQUIRE SUBSTANTIAL AMOUNTS OF POLLEN WHEN VISITING PRAIRIE FLOWERS[§]**

Hannah Mullally, Dr. Theodore Burk, and Dr. Mackenzie Taylor, Department of Environmental Science, Creighton University, Omaha, NE.

Purpose: Relatively little is known about the importance of butterflies as pollinators. While undoubtedly less important than bees overall as significant pollinators, more knowledge is needed to assess the role of butterflies in the pollinator community. This study focused on pollen acquisition by the Orange Sulphur butterfly (*Colias eurytheme*) at Glacier Creek Preserve in Eastern Nebraska. Previous research suggested that Orange Sulphur butterflies are flower constant, a necessity for effective pollination. The goal of this research was to determine if flower-visiting butterflies actually pick up pollen and if the type of pollen picked up is consistent on individual and population levels.

Methods: We measured and characterized the morphs of a total of 459 pollen grains collected from the proboscis and legs of 27 individual Orange Sulphur butterflies.

Results: The majority of pollen carried on most individual butterflies was of an echinate sphere morph, and of similar size. The majority of butterflies in the population carried the echinate sphere morph, also of similar size.

Significance: These findings suggest that butterflies could be important pollinators in prairie ecosystems and should be taken into account in the management or restoration of prairies.

Acknowledgment: This project was funded by the Clare Boothe Luce Research Award.

55. **THE ROLE OF LITTER IN PLANT INVASION: SMOOTH BROME IN TALLGRASS PRAIRIE**

Elizabeth Walsh and Mary Ann Vinton, Department of Environmental Science, Creighton University, Omaha, NE.

Purpose: Tallgrass prairies once covered over 170 million acres of North America, but largely due to row-crop agriculture, less than 2.4% remains today. (Samson and Knopf 1994). With so few prairies left, it is of the utmost importance to biodiversity to conserve and restore tallgrass prairie. However, the conservation and restoration of tallgrass prairies has been inhibited by the invasion of non-native species. In particular, *Bromus inermis* (smooth brome) has become dominant in the tallgrass prairies in central portions of North America. In order to best manage prairies, we must understand smooth brome's invasion. Smooth brome tends to exist in monocultures where it dominates plant cover and deters native species. My research is centered on the role that litter (senescent leaves and stems that fall to the soil surface) may play in allowing smooth brome to thrive in these monocultures.

Methods: Specifically, I tested whether or not smooth brome litter suppresses germination of native species. I examined germination rates of the native grass, *Panicum virgatum* (switchgrass) and the common horticultural variety of collard green, *Brassica* in both a field and greenhouse experiment in plots that were either covered with smooth brome litter or plots that were left bare, with no litter.

Results: In these experiments, more *Brassica* seedlings initially germinated in litter plots than in bare plots. On the other hand, switchgrass germination was negatively affected by litter. For both species, seedlings that eventually germinated in the bare plots had higher rates of survival and enhanced growth. Ultimately, the litter altered the light and moisture conditions available to the seeds and seedlings which may have increased initial germination but suppressed growth over time.

Conclusions: Thus, litter may play an important role in smooth brome's invasion of tallgrass prairies through its suppression of native seedlings.

56. **DESCRIPTION AND COMPARISON OF SCALING PROCEDURES IN COMPUTER DESIGN PROGRAMS (BLENDER AND FUSION 360) FOR 3D PRINTED PROSTHESES**

Alexandra Maliha and Elizabeth Kosanke, Department of Exercise Science, Creighton University, Omaha, NE.

Advancements in computer-aided design (CAD) programs offer the possibility of fitting transitional 3D printed prostheses at a distance. Blender, a computer design program, has been used to scale and fit prostheses. Newer CAD programs, such as Fusion 360, may improve and simplify the distance fitting procedure. The goal of this project is to describe and compare the fitting abilities of Blender and Fusion 360. Prostheses will be scaled for at least ten human subjects using both programs, and all the scaled devices will be measured within Fusion 360. The measurements of the devices will be analyzed for differences. Analysis will yield a comparison of the scaling abilities of the two programs, and may validate Fusion 360's ability to scale just as

well or better than Blender's ability. Positive and negative qualities of the programs will be observed, and patient satisfaction of devices may be included.

Acknowledgment: Thank you to the NASA Nebraska Space Grant Research Fellowship program for funding this project.

57. **ACCURACY OF THE ASA24® DIETARY RECALL SYSTEM FOR ASSESSING ACTUAL DIETARY INTAKE IN NORMAL WEIGHT COLLEGE-AGE WOMEN**

Kiley Lavanger, Molly M. Krause, Nina O. Allen, Allison E. Lieb, Katie A. Mullen, and Joan M. Eckerson, Department of Exercise Science and Pre Health Professions Creighton University, Omaha, NE.

Purpose: Determine the accuracy of the ASA24® by comparing participant reported intakes to actual intakes for two different breakfast meals.

Methods: Thirty-one normal weight women (20 ± 1 yr, $BMI = 22.9 \pm 2.1$ kg·m²; weight = 62.1 ± 7.4 kg) volunteered to participate in this randomized, crossover study. Prior to data collection, subjects were screened for unusual eating behavior, and were given instruction and a demonstration on how to use the ASA24®. In a free-living environment, participants randomly received two isocaloric breakfast meals for 5 d: Egg whites (EW; Egg Beaters Original®) and two pieces of toast with spread (350 kcals) or 2 low-fat strawberry toaster pastries (TP; 360 kcals). The study breakfasts were pre-measured and weighed at an independent laboratory and any uneaten food was returned to determine how much was consumed (actual intake). Self-reported breakfast intake was assessed via three 24 hr dietary recalls (ASA24®) during each breakfast condition. The nutrient intake for the actual breakfast intakes for the three recall days was analyzed using Eat Right® Dietary Analysis software. Agreement between the reported and actual intakes for total energy, and selected nutrients examined by calculating the mean differences and percent differences (actual – reported/actual) for each breakfast. Dependent t-tests were also used to compare the actual energy intake for each breakfast to the self-reported values and differences were considered significant at $p \leq 0.05$.

Results: For energy and selected nutrients, the percent differences between the actual and self-reported intakes for both breakfast conditions were $< 10\%$. Results for the t-tests showed that there was no significant difference in energy intake between the actual (261 ± 72 kcal) and reported (251 ± 105 kcal) values for the EW breakfast. However, the energy intake between actual and reported values for the TP breakfast was significantly different (355 ± 22 kcal vs. 383 ± 14 kcal, respectively). When corrections for energy intake were applied to the results for the ASA24® for the TP breakfast (360 kcal vs. 383 kcal), the differences between the mean values was no longer significant ($p=0.22$).

Conclusions: The ASA24® database appears to be a relatively accurate and inexpensive tool for assessing dietary intakes in large samples of subjects.

Acknowledgment: Supported by ConAgra Foods, Inc.

58. **THE EFFECT OF FATIGUE ON TIBIAL ACCELERATION AND SHOCK ATTENUATION SYMMETRY DURING INCREMENTAL RUN**

Takashi Sado, Brittney Mikkelsen, Lauren Nun, Varun Gupta, and Dimitrios Katsavelis, Department of Exercise Science and Pre-Health Professions, Creighton University, Omaha, NE.

Background: Total tibial acceleration (TTA) and shock attenuation (SA) are essential mechanical factors associated with higher risk of overuse injuries and other related musculoskeletal pathologies. Increased TTA is linked to increased bone-to-bone stress that, if combined with

prolonged fatigued runs, may exceed the repair and remodeling process of the bone over time. Purpose: To investigate the changes in mechanics of running symmetry as compensation for increased speed before and after fatigue.

Methods: Four male college students (age = 22.8 ± 4 yr; weight = 80.2 ± 5 kg; height = 187.3 ± 3 cm) visited the Creighton University Biomechanics laboratory on two occasions. During the first visit, blood samples were collected every 3 minutes in an incremental test to determine the lactate threshold speed (LTS = 7.8 ± 0.3 mph). During the second visit, subjects underwent incremental runs of seven 30-second stages at speeds that ranged from 20% below to 40% above their LTS. Subsequently, they performed a 20-minute run at their LTS followed by another incremental run. Three triaxial accelerometers were placed at each subject's right and left tibial plateau and above sacrum. Primary outcome measures were symmetry in TTA and SA during the 30-second intervals, stride frequency and stride length.

Results: A two-way repeated ANOVA (2 states x 7 speeds) showed a main effect of speed in stride length and stride frequency ($p < 0.01$). A two-way repeated ANOVA (2 states x 2 legs) showed that there was a main effect of legs in the TTA, with the dominant side to have 10% less TTA than the non-dominant side.

Conclusion: The findings showed that stride length and frequency increased as a function of speed, while fatigue had no effect on change in stride characteristics. In terms of leg symmetry, TTA was higher in the non-dominant side for both control and fatigue conditions, while shock attenuation between tibia and sacrum was similar across conditions and legs.

59. **EFFECT OF THREE DIFFERENT BREAKFAST MEALS ON ENERGY INTAKE AND NUTRITIONAL STATUS IN COLLEGE-AGE WOMEN**

Molly Krause, Kiley A. Lavanger, Nina O. Allen, Allison E. Lieb, Katie A. Mullen, and Joan M. Eckerson, Department of Exercise Science and Pre-Health Professions, Creighton University, Omaha, NE.

Purpose: The purpose of the current study was to compare the effect of an egg white (EW) BF to an isocaloric toaster pastry (TP) and habitual BF on energy intake and nutritional status in college-age women.

Methods: Using a randomized, crossover design, 31 women (X age \pm SD = 20 ± 1 yr; BMI 22.9 ± 2.1 kg/m²; weight = 62.1 ± 7.4 kg) who regularly ate BF low in protein (< 16 g) consumed two test BF and their habitual BF for 5 days: EW (Egg Beaters® Original) and two pieces of toast with spread (350 kcal), 2 low-fat Toaster Pastries (TP) (360 kcal), or their usual self-selected breakfast (SS). Participants completed a 24 hr dietary recall (ASA24®) for 3 of the 5 days during each BF trial to determine nutrient and energy intakes. Differences ($p < 0.05$) between BF treatments were analyzed using repeated measures ANOVA and compared to the 2015 Dietary Guidelines for Americans (DGA).

Results: There were no significant differences in total energy intake between the three BF treatments (SS = 1742 ± 69 kcal; TP = 1735 ± 63 kcal; EW = 1572 ± 63 kcal); however, there were differences in nutritional status. Carbohydrate (CHO) and sugar intake were significantly ($p < 0.05$) lower during the EW BF compared to both SS and TP BF conditions. Compared to the TP BF, the EW BF resulted in significantly greater intakes of protein, calcium, and cholesterol, while the SS BF was higher in calcium, fiber, potassium and folate.

Conclusion: Although there were no significant differences in total energy intake between the three BF treatments, subjects consumed fewer calories during the EW BF (170 kcal) compared to the SS and TP BF, which may have long-term benefits for weight loss. For each BF condition, subjects did not meet dietary recommendations for several shortfall nutrients including folate, calcium, iron, potassium, fiber, and vitamins A, C, D, and E. During the TP BF, subjects

consumed lower intakes of the nutrients of public health concern and higher amounts of added sugar and, therefore, a BF high in CHO is not recommended over a SS or EW BF. These results also suggest that additional strategies are needed to help college-age women achieve dietary recommendations established by the DGA.

Acknowledgment: Supported by ConAgra Foods, Inc.

60. **CUSHIONED INSOLES CAN REDUCE IMPACTS DURING FATIGUED RUNNING**

Natalie Turner, Jake Glazer, Anisa Rohilla, Will Herron, Matt Noguchi, Meghan Shea, Patick Reinschmidt and Dimitrios Katsavelis, Department of Exercise Science and Pre-Health Professions, Creighton University, Omaha, NE.

Background: Running through fatigue has been found to place an excessive amount of stress to lower extremities that may increase the risk of overuse injuries. Cushioned insoles are suggested to help attenuate shock and reduce impact forces caused by running.

Purpose: To investigate the effect of implementing cushioned insoles on subjects before and after a fatigue protocol run to determine whether the insoles significantly lessened impacts.

Methods: Four male college students (age = 22.8 ± 4 yr; weight = 80.2 ± 5 kg; height = 187.3 ± 3 cm) participated in the study. The participants were tested three times over a period of three weeks. During the first visit, lactate threshold speed (LTS) was assessed via blood samples (7.8 ± 5 mph). During the second and third visits participants were randomly assigned to undergo incremental treadmill tests with and without insoles. The incremental runs included two rounds of seven 30-second bouts at stages -20% below to +40% above the LTS, with a 20 minute run at LTS in between the two trials. A triaxial accelerometer that was placed at each subject's dominant tibial plateau recorded acceleration before and after the 20m run. Tibial acceleration (TA), stride length and frequency were calculated through Matlab.

Results: A two way repeated ANOVA (2 fatigue states by 2 insoles conditions) showed that there was a main effect of state ($p=0.003$) and a main effect of insole condition ($p<0.001$), as well as an interaction ($p=0.044$). Post hoc analysis revealed that TA was significantly lower during the non-fatigue control run with insoles when compared to the other conditions. Over the course of both pre- and post-fatigue incremental tests, stride length and frequency did not change.

Conclusion: The findings indicate that insoles are an effective way to reduce tibial acceleration during running, but to a greater extent in the absence of fatigue (22% vs. 13%).

61. **ASSESSMENT OF HEALTH-RELATED QUALITY OF LIFE IN WOMEN DIAGNOSED WITH BREAST CANCER: OUTCOMES OF PROSPECTIVE SURVEILLANCE**

Tessa Leytem, and Shane E Harrington, Departments of Exercise Science and Physical Therapy, Creighton University, Omaha, NE.

Purpose/Rationale: Health related quality of life (HRQOL) is a broad multidimensional concept that has been extensively studied in the breast cancer population and shown to be diminished in women who receive treatment for breast cancer. The prospective surveillance model (PSM) is a new comprehensive model of survivorship care that supports rehabilitation examination prior to surgery along with ongoing surveillance. Little is known about the effectiveness of the PSM. The purpose of this study was to assess the HRQOL in women diagnosed with breast cancer who were receiving care within a PSM.

Methods: Health-related quality of life was assessed using the Functional Assessment of Cancer Therapy – Breast, (FACT-B). Assessment occurred prior to surgery, 1 month and 1 year later. Women were divided into 2 groups: those who received physical therapy (PT) and those who did

not receive PT. One-way ANOVA's were conducted to evaluate differences between the FACT-B subscales (emotional well-being, functional well-being, physical well-being, social/family well-being, additional concerns) and the total score at 1 month and 1 year between those women that did and did not receive PT. Effect sizes (ES) were also calculated between groups.

Results: Eight women received PT with an average of 4.6 visits. All PT was completed by the 1st year follow-up. A significant difference was found for the functional well-being subscale of the FACT-B ($p=0.48$) at 1 month between groups. Women who received PT reported lower functional well-being compared to those who did not receive PT. No other significant differences were found for the remaining variables. A moderate ES was found for physical well-being subscale (1 month= 0.72) and a large ES was found for functional well-being subscale (1 month= 0.95).

Conclusion/Significance: The PSM was able to identify women who needed PT based on deficits on the FACT-B. ES suggest possible benefits of using the PSM to improve HRQOL.

Acknowledgment: This study was funded by the National Center for Medical Rehabilitation Research (NICHD), National Institutes of Health Rehabilitation Research Career Development Program and the University of North Florida Dean's Research Grant.

62. **THE EFFECT OF FATIGUE ON SHOCK ATTENUATION DURING INCREMENTAL RUNNING**

Ryan Smith, Eric Knight, Alex Sikora, and Dimitrios Katsavelis, Department of Exercise Science and Pre-Health Professions, Creighton University, Omaha, NE.

Background: Tibial acceleration (TA) is one of the most important mechanical factors associated with high risk of injuries. Increased TA is linked to increased mechanical stress that if combined with prolonged runs may exceed the repair and remodeling process of bones. Running through fatigue can exacerbate this process. Shock attenuation (SA) is a phenomenon accomplished by passive structures absorbing forces and by activities such as knee and hip flexion.

Purpose: To investigate the effect of a high-intensity fatiguing run on TA and SA while running at various speeds in an attempt to identify a change in speed-acceleration relationship.

Methods: Four male college students (age= 22.8 ± 3.5 yr; weight= 80.1 ± 4.9 kg; height= 187.3 ± 2.9 cm) visited the laboratory on two occasions. First, subjects underwent an incremental test of 3-min stages to determine their lactate threshold speed (LTS) by collecting blood samples (LTS= 7.8 ± 0.3 mph). During the second visit, subjects completed an incremental run of seven 30-second stages at speeds that ranged from 20% below to 40% above the LTS. Subsequently, they performed a 20-minute run at their LTS followed by another incremental run. A wireless accelerometer secured at each subject's dominant tibial plateau recorded acceleration before and after the 5k run. An additional accelerometer was secured at the sacrum to measure SA from the tibia to the sacrum.

Results: A two-way repeated ANOVA (2 states x 7 speeds) showed a main effect of speed in TA and SA.

Conclusion: Current findings showed that tibial acceleration – a previously identified risk factor for impact-related injuries – is affected by speed. A 10% increase in running speed was associated with higher TA values that were accompanied by a 5-12% increase in stride length and 1-3% increase in stride frequency. Therefore, it is important that recreational runners should be cautious when running at speeds much faster than their LTS to avoid increasing their risk of injury due to reduced tolerance for impact.

63. **PRION STRAIN INTERACTION**

Thomas Eckland, Ronald A. Shikiya, and Jason C. Bartz, Department of Medical Microbiology and Immunology, Creighton University, Omaha, NE.

Prion diseases are a group of inevitably fatal neurodegenerative diseases, affecting mammals including humans. The misfolding of the cellular protein, PrPC, generates the disease-causing agent, PrPSc. Several prion strains exist and their properties are hypothesized to be encoded by the conformation of PrPSc. Prion strains can interfere with each other when one strain (the blocking strain) inhibits the replication of another (non-blocking strain). Prion strain interference can occur following natural routes of inoculation and has been observed with every strain combination used to date. In natural prion disease, strains exist as a mixture, therefore, an understanding of the parameters and mechanisms of prion interference is of importance. Prion strain interference is recapitulated in vitro with protein misfolding cyclic amplification (PMCA_{si}). In PMCA_{si}, known amounts of the blocking and non-blocking strain are combined and amplified. Western blot analysis can distinguish between the blocking and non-blocking strain's specific migration properties of PrPSc. Strain interference is measured as the inhibition of the amplification of one strain by another strain. Strain interference is measured by the number of PMCA_{si} rounds until the strain specific migration of PrPSc shifts from the blocking strain to the non-blocking strain. I have adapted PMCA strain interference to determine if interference occurs between DY TME (DY) and 139H Scrapie (139H) strains. We found a PrPSc migration pattern consistent with a mixture of both strains, suggesting that strain interference is not occurring. Animal bioassays are ongoing to confirm these findings. This is the first example of prion strains that do not interfere with each other in vitro. This observation changes the paradigm of the interactions of prion strains in a mixture. This has implication for interspecies transmission and emergence of prion strains from a mixture.

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64. **EARLY EXPOSURE TO PEDIATRICS THROUGH CREIGHTON UNIVERSITY SCHOOL OF MEDICINE M1 PEDIATRIC ACADEMY PARTICIPATION.**

Chloe Wood and Megan Wingfield, School of Medicine, Creighton University, Omaha, NE.

The purpose of this study is to evaluate the Creighton University Pediatric Academy, a 4 week long preclinical experience for M1 students. The goal is to provide information for improving the program while also investigating the benefits of preclinical experience for M1 students. The study design is an anonymous survey through surveymonkey.com. This was emailed to all past participants of the program. The email went out to 55 participants; we received responses from 35 of them. The Pediatric Academy has recently completed its 5th year, and the first group of alumni are medical residents. We found that out of the 8 current residents who responded 2 went into pediatrics and cited the Creighton Pediatric Academy as their first experience in pediatrics. Out of the 35 responders 26 had never had experience with pediatrics prior to this program. The majority of the responders agreed that the program improved their clinical skills, helped them rule in pediatrics as a career option, and improved their confidence in interacting with the pediatric population. We also received feedback about improvements for the program. The top three items noted for improvement were to; increase the length of the program, have more options for subspecialty shadowing, and increase the amount of hands on experience. Medical schools are beginning to develop more preclinical programs, and evaluations of the current programs are critical for the growth and development of medical education. This information is valuable for educators at Creighton and other institutions looking to develop preclinical experiences. It shows that these medical students benefited from their preclinical experience and gives evidence that the development of more programs should be investigated.

65. **CREATINE ACTS AS AN IMMUNOMODULATOR IN ADULT MALES**

Lisa Riesberg, Kyle Serreyn, Jennifer Yee, Dimitrios Katsavelis, Eric Bredahl, Joan M. Eckerson, Thomas L. McDonald, and Kristen M. Drescher, Departments of Medical Microbiology and Immunology and Exercise Science, Creighton University, Omaha, NE.

Purpose: To analyze the effects of creatine monohydrate (CR) on upper body strength and immune system parameters in 44 adult males (19-25 yr). We hypothesized that CR supplementation would increase upper body strength and body weight (BW), while decreasing levels of the proinflammatory mediator, tumor necrosis factor- α (TNF- α), compared to placebo (PL) supplementation.

Methods: A double-blinded study was performed and subjects received either PL (maltodextrin;n=22) or CR (n=22). Participants underwent physical testing and blood draws before (baseline) and after a 5 d loading phase, where subjects consumed 20 g of supplement daily (5g x 4 /d). BW and one repetition maximum bench press (1RM BP) were measured. A 3 d dietary record was kept to analyze energy intake and percentage of kcals from carbohydrate (CHO), protein (PRO), and fat. Lymphocytes and sera were obtained to analyze TNF- α mRNA expression by RT-PCR and creatinine concentration by a colorimetric assay.

Results: A significant increase in BW and 1RM BP was observed comparing the baseline and loading phase within the CR group. There were no differences in CHO, PRO, or energy intake between groups. The CR group ingested a greater percentage of kcal from fat versus the PL group. The CR group had significantly reduced TNF- α mRNA levels and increased serum creatinine concentrations after the loading phase compared to the PL group.

Conclusion: Consistent with previous research, an increase in BW, 1RM BP, and serum creatinine was observed in the CR group following the loading phase. No previous studies have examined the impact of CR supplementation on immune parameters in the absence of physical activity, and these data showing that CR supplemented individuals have decreased TNF- α mRNA levels is novel. Future investigations will define the mechanism by which CR alters immune parameters.

Acknowledgment: Supported by LB692 (KMD) and MusclePharm® (supplement donation).

66. **HIGH RESOLUTION MELT-CURVE ANALYSIS TO IDENTIFY ST131 E. COLI**

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Purpose: Sequence type 131 E. coli (ST131) have been associated with the global distribution of ESBL resistance genes, particularly the CTX-Ms. Multi Locus Sequence Typing (MLST) of 7 genes is currently the gold standard for ST131 identification, however this methodology can require multiple days for results. One alternative to sequence analysis is High Resolution Melting (HRM) analysis. The purpose of this study was to design a HRM methodology to rapidly differentiate ST131 from non-ST131 E. coli.

Methods: Three isolates were used to optimize the multiplexed HRM methodology. DNA was extracted using the Qiagen DNeasy Blood and Tissue Mini-Prep. Singleplex PCR was performed using 10 ng of DNA, Type-iT HRM buffer and MLST primers (adk, fumC, gyrB, icd, mdh, purA and recA) and amplicon sizes ranged from 452 to 1152bp. Melting profiles for both singleplex and multiplex reactions were determined by HRM analysis on a Rotor-Gene Q 5-Plex HRM system and melt profiles were analyzed using Screenclust software. To validate the optimized assay, a blinded study using 100 E. coli of unknown sequence type were evaluated.

Results: Primers used in this assay amplified single products and were multiplexed into two master mixes: mix 1=adk, gyrB, mdh,recA and mix 2=fumC, icd, purA. HRM analysis of the multiplex was performed between 80-95°C. A blind validation of this methodology returned a specificity of 98.3%(TN=59, FP=1) and sensitivity of 100%(TP=40, FN=0).

Conclusions: This multiplexed HRM analysis of the seven MLST genes differentiates ST131 from non-ST131 E. coli without the need for sequence analysis and can identify ST131 E. coli in ≤ 94 minutes. Therefore, this assay is a fast and inexpensive alternative to sequence-based identification of ST131 E. coli and can be performed in any lab with a HRM-capable instrument.

Acknowledgments: Funding was provided by STRECK, Inc.

67. **TRENDS IN THE USE OF RADIATION THERAPY FOR STAGE IIA PROSTATE CANCER BY POPULATION SIZE**

Timothy Malouff¹, Sydney Marsh¹, and Peter Silberstein², ¹School of Medicine, Creighton University, ²Department of Medicine, Creighton University Medical Center, Omaha, NE.

Purpose/Objectives: Patients living in rural communities may require longer travel times, limiting the use of some modalities. We aim to determine if there are differences in usage of external beam radiation therapy (EBRT), brachytherapy, and combination (EBRT and brachytherapy) radiotherapy based on the population size.

Materials/Methods: We analyzed 270,447 stage IIA prostate cancer patients diagnosed from 2004-2013 using the National Cancer Data Base (NCDB), a joint project of the American College of Surgeons and the American Cancer Society. Metropolitan counties were defined as 250,000 people or more. Urban areas had between 2,500 and 20,000 people. Rural counties had populations of less than 2,500. Proportions were calculated by comparing patients receiving the modality with the total number of patients receiving radiation in a given community. Significance was determined using Pearson's test.

Results: There was a significant increase in the percentage of patients receiving EBRT in metro areas compared to urban (p<0.001) and rural (p<0.001) areas. Patients were more likely to receive brachytherapy in rural as compared to metro (p<0.001) or urban (p=0.001) communities. More patients underwent combination radiotherapy in metro than urban (p<0.001) or rural (p<0.001).

	Number of patients	Proportion of patients	Average Age	Average PSA
Metro EBRT	132,998	59.4%	69	11.3
Urban EBRT	23,154	56.2%	69	12.4
Rural EBRT	2,987	54.0%	69	12.1
Metro Brachytherapy	67,167	30.0%	66	8.3
Urban Brachytherapy	14,576	35.4%	67	8.9
Rural Brachytherapy	2,081	37.6%	68	8.9
Metro Combination	23,562	10.5%	66	8.2
Urban Combination	3,459	8.4%	67	11.0
Rural Combination	463	8.4%	68	11.5

Conclusions: The population size has an influence on the modality chosen. EBRT and combination therapy are used more often in metropolitan communities, as they require patients to

travel to clinic multiple times a week. For patients living in rural communities, brachytherapy provides a treatment option that decreases the need to travel to clinic.

68. **VAGINAL DELIVERY OF TRIPLETS**

Nicole Roby, and Dr. Terence Zach MD, School of Medicine, Creighton University, Omaha, NE.

Triplets occur in approximately 1:7900 pregnancies. Triplets account for 0.14% of live births in North America. In the last twenty years, the vast majority of triplet pregnancies in the United States were delivered by cesarean section. Cesarean section delivery of triplets was considered the safest route of delivery for both mother and infants. We report a case of premature triplets born at 34 and 5/7 weeks gestation who were successfully delivered vaginally. Review of the current literature and research in regards to triplet delivery and the question of safety in the different methods of delivery. Finding there to be inconsistent evidence for strong support of either technique over the other, it seems circumstances play a large role in the determination of route. More research needs to be conducted in the field of safety for multiple births.

69. **VITAMIN D AND ITS EFFECTS ON ARTICULAR CARTILAGE AND OSTEOARTHRITIS**

Rachel Garfinkel, Matthew F. Dilisio, MD., and Devendra K. Agrawal, Ph.D., School of Medicine, Creighton University, Omaha, NE.

Purpose: The purpose of this study was to review all of the relevant published research regarding the effect of the vitamin D on osteoarthritis, articular cartilage injury, and articular cartilage repair.

Methods and Materials: A review of the literature was performed to identify all studies that investigate the relationship between vitamin D and articular cartilage pathophysiology and its mechanism of action in this pathway. The data was then analyzed in order to summarize what is currently known about vitamin D, articular cartilage repair, and osteoarthritis.

Results: On the molecular level, it has been shown that $1\alpha,25(\text{OH})_2\text{D}_3$, the activated form of Vitamin D, plays a role in articular cartilage degeneration. Vitamin D binds to Vitamin D receptors (VDRs) triggering a signaling cascade that leads to chondrocyte hypertrophy. In clinical trials, it has been shown that Vitamin D deficiency poses a risk factor for OA and that those with decreased cartilage thickness are more likely to be Vitamin D insufficient; however, the role of Vitamin D supplementation in the treatment or prevention of patients with OA with remains uncertain.

Clinical Significance: Finding an association between vitamin D and osteoarthritis will help us better understand the etiology and mechanism of debilitating osteoarthritis. Optimizing vitamin D levels may lead to improved treatments for osteoarthritis and may play a role in reducing osteoarthritis in an aging population.

Conclusion: Vitamin D influences articular cartilage growth. Additional research is needed to determine the mechanism of action of vitamin D in articular cartilage repair and growth and ultimately its effect on the progression of osteoarthritis.

70. **EFFICACY OF PROXIMAL COLECTOMY IN THE MANAGEMENT OF FIRST RIGHT CRC IN LYNCH SYNDROME MUTATION CARRIERS**

Molly Hiatt, Murray J. Casey, Henry Lynch, Carrie Snyder, and Chris Wichman, School of Medicine, Creighton University, Omaha, NE.

Purpose: Lynch Syndrome (LS), an inheritable disease linked to adverse mutations in mismatch repair genes, conveys up to a 75% life-time risk for colorectal cancer (CRC) with predilection to the right colon. Because metachronous cancers are common in LS, there is a trend to manage 1st CRC with total colectomy (TC) or subtotal colectomy (STC). Removal of the entire colon is often followed by adverse effects that are less frequent in patients who undergo a more limited proximal colectomy (PC). Our aim was to document the ages of LS mutation carriers with 1st CRC confined to the right colon, the intervals after initial surgery and any subsequent CRC, as well as the characteristics of the 1st CRC in subjects treated by TC or STC compared with PC. Demographics and tumor characteristics of subjects treated with PC who were diagnosed with subsequent CRC were compared with those who were not.

Methods: Sixty-three mutation carriers with 1st CRC confined to the right colon were identified from the Creighton Hereditary Cancer Registry. Chart review extracted subjects' gender, ages at times of initial surgery for CRC and 2nd CRC, interval from 1st CRC to 2nd CRC, stage of cancers, and surgical operations.

Results: Preliminarily, 1/16 (6.3%) subjects initially treated with TC or STC were diagnosed with CRC during follow-up compared with 12/47 (25.5%) of subjects treated with PC ($p=0.16$). After initial surgery, 4/16 (25.0%) subjects treated with TC or STC had died compared with 10/47 (21.3%) treated with PC ($p=0.74$).

Conclusion: Higher, but non-significant, rate of subsequent CRC after PC compared with TC and STC is not unexpected. However, finding no significant difference in overall mortality between the two surgical methods is encouraging. This data may be used by LS patients diagnosed with a proximal colon cancer to make decisions regarding surgical treatment options.

71. **PREVALENCE OF ENDOMETRIOSIS ASSOCIATED WITH PELVIC CANCERS IN HEREDITARY BREAST CANCER SYNDROME AND LYNCH SYNDROME MUTATION CARRIERS**

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Purpose: Endometriosis is a gynecological condition characterized by the presence and growth of functioning endometrial tissue in places other than the uterine cavity. There is accumulating evidence that in some cases endometrioid and clear cell carcinomas involving pelvic organs may arise from endometriosis. The purpose of our study is to identify the prevalence of endometriosis and the associated histotypes of gynecological cancers in mutation carriers linked to Lynch syndrome and HBOC syndrome.

Methods: The Creighton University Hereditary Cancer Registry was searched for cases of gynecologic and/or peritoneal cancer, including the serosa of bladder and/or rectum in Lynch syndrome family members who are carriers of cancer-associated germ cell mutations in MLH1, MSH2, MSH6 and EPCAM and for HBOC syndrome family members who are carriers of cancer-associated germ cell mutations in BRCA1 or BRCA2 accrued to the Cancer Family Study (IRB #12264) from January 1, 1959 through January 21, 2015 (IRB #707948-1). Data from the clinical records are being extracted and anonymously tabulated onto a coded electronic spread sheet. Cumulative data from MMR gene mutation carriers and from BRCA1 and BRCA2 mutation carriers will be analyzed using appropriate methods to determine whether there may be

significant differences ($P < 0.05$) in the prevalence of endometriosis and/or associations with specific carcinoma histotypes and/or organ involvement in Lynch syndrome compared with HBOC syndrome mutation carriers.

Results: From 251 mutation carriers with gynecologic cancers accrued on or before December 31, 2014. 244 cases have been identified with current signed HIPAA consent forms and diagnostic pathology reports, including 143 BRCA1 and BRCA2 mutation carriers, and 101 MMR gene mutation carriers. Preliminary examination finds that endometriosis is recorded in 13/143 (9.1%) of BRCA1 and BRCA2 mutation carriers and in 14/101 (13.86%) of MMR gene mutation carriers.

72. **COMPARISON OF AMINOGLYCOSIDE-INDUCED CHANGES IN MITOCHONDRIAL METABOLISM OF COCHLEAR AND VESTIBULAR ORGANS**

Erinn Riley and Heather Jensen-Smith, PhD, School of Medicine, Creighton University, Omaha, NE.

Purpose: Aminoglycosides are commonly prescribed antibiotic agents but are known to be both cochleotoxic and vestibulotoxic.

Methods: In this research project, 3 aminoglycosides (gentamicin, streptomycin and amikacin) were exposed to murine cochlear and vestibular explants. Metabolic changes, particularly NADH concentrations and fluorescent lifetimes, were measured over 12-hour aminoglycoside exposure for each previously mentioned aminoglycoside.

Results: Investigators found that aminoglycosides had larger effects on the cellular metabolism of cochlear cells than vestibular cells. Each aminoglycoside caused similar shifts in metabolic profile but to a different degree. Streptomycin elicited the largest increase in NADH concentration change and the largest decrease in NADH fluorescent lifetime in outer hair cells, followed by gentamicin and finally amikacin. Vestibular organs did not demonstrate significant changes in NADH concentration or NADH Fluorescent lifetime after 12 hours of exposure. This points toward larger amounts of NADH in its unbound form accumulating in cochlear cells upon exposure to aminoglycosides.

Conclusion: Aminoglycosides elicit changes in mitochondrial metabolism of sensory cells of vestibular and cochlear organs. These permanent damages cause deafness and vertigo.

Acknowledgement: Creighton University School of Medicine Summer Research Scholarship

73. **THE EFFECT OF ALCOHOL CONSUMPTION ON FRACTURE HEALING TIMES**

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Rationale: Excessive alcohol consumption seems to cause altered bone remodeling through reduced bone formation. Animal studies have shown that excessive ethanol interferes with fracture healing. In addition, alcoholics are at higher risk for fracture occurrence as well as complications such as infection. As such, patients in this study were assessed for any possible correlation between alcohol use and increased incidence of delayed union or non-union. Using three populations (non-drinkers, moderate drinkers and heavy drinkers), it is our hypothesis that heavy drinkers will have increased fracture healing times compared to non-drinkers and moderate drinkers.

Methods: This retrospective study utilized the CUMC Trauma Registry for patient data in regards to fracture healing times, alcohol use, delayed union and/or non-union. Alcohol use was determined using the Audit-C scoring scale. The data was analyzed for potential association

between alcohol consumption and fracture healing times as well as incidence rate of delayed union and non-union.

Results: The mean fracture healing times increased in correlation with alcohol consumption. A negative binomial count model was utilized. However, post-hoc t-tests were applied and demonstrated no significant association between alcohol use and fracture healing times. Other non-parametric tests were used, but yielded the same result as the post-hoc t-tests. Upon investigation of incidence rate with alcohol use and delayed union, chi-square testing showed no significance.

Conclusion: Using the prescribed three patient populations, there was found to be no significant association between alcohol consumption and fracture healing times despite a noticeable upward trend in mean times. Additionally, there was no significant increased rate of delayed union and non-union in the heavy drinking population or moderate drinking population when compared to non-drinkers. Several limitations existed within the data including extreme outliers in each group and smaller patient population due to incomplete record keeping and lack of patient follow-up.

74. **CLOSTRIDIUM DIFFICILE INFECTION FOLLOWING THERAPY WITH AMOXICILLIN AND CEFDINIR**

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Background: Clostridium difficile is an obligate anaerobic, spore-forming, Gram-positive bacillus. Because its spores are metabolically dormant and resistant to heat, acid, and most disinfectants, it is widely distributed in the environment and can be isolated from water, soil, food products, farm animals, and households. Contamination occurs by the fecal-oral route: the spores are able to resist the acidity of the stomach and are transformed into vegetative cells due to the influence of bile salts once they reach the intestine. These vegetative cells are able to colonize the intestinal mucosa when the barrier function created by the normal flora of the intestine has been disrupted by antibiotic therapy, particularly third generation cephalosporins such as cefdinir.

Case: A 3 year-old Caucasian female is brought to the outpatient clinic by her mother with a chief complaint of diarrhea for the past two days. During this time period, she has experienced 3 to 6 stools per day. She has also had abdominal pain, gas, and a maximum temperature of 100.6° F. She has been sleeping poorly and has decreased appetite. Within the last six weeks, she has been treated with two courses of amoxicillin and one course of cefdinir for streptococcal pharyngitis. Her most recent course of cefdinir was completed yesterday. She has had no contact with anyone with similar symptoms, no recent travel history, no contact with reptiles, and her family has a dog at home who is not sick. Vital signs are currently within normal limits. Physical exam reveals a Tanner stage 1 female who is alert, non-toxic, and in no acute distress. HEENT, integument, heart, and lungs are unremarkable. Her abdomen is soft with mild diffuse tenderness. There is no focal tenderness, rebound, or guarding. No masses or organomegaly are present.

75. **EFFECTS OF ROFLUMILAST AND ALBUTEROL ON AIRWAY HYPERRESPONSIVENESS (AHR) IN NAÏVE MICE AND INDUCED BY IL-13.**

Swati Agrawal, M. R. Hanna, Jodi Hallgren, Bryston Chang, P. Oldenburg, and R. G. Townley, Departments of Medicine and Pharmacology, Creighton University, Omaha, NE.

Rationale: Bronchial asthma involves 300 million people worldwide. COPD is now the 3rd leading cause of death and is induced by smoking tobacco and by air pollution. Roflumilast has been used to treat COPD via its function of inhibiting phosphodiesterase 4 (PDE-4). Its effect on airway hyperresponsiveness (AHR) and inflammation remains to be poorly elucidated. We hypothesize that combination of roflumilast and albuterol does inhibit AHR.

Methods: Whole body plethysmography (Penh) data and airway resistance were collected. For each experiment mice was exposed to room air, roflumilast at a dose 5mg/kg by gavage, albuterol by inhalation, IL-13 intranasally, or a combination of them before they were exposed to increasing concentrations of methacholine (MCh) in vivo and ex vivo using lung slices. This allowed us to measure the extent of airway hyperresponsiveness (AHR) under each condition.

Results: Physiological effects were represented using percent dose increase (PDI) showing the increase in penh values during MCh challenge. Our average PDI for our control mice was at 402.94%. PDI values begin increasing at 3 days following IL-13 administration. PDI increased, to 1219.71% at 7 days, and decreased to 472.68% after administering roflumilast and albuterol. Roflumilast and albuterol inhibited the PDI value to a greater extent than albuterol alone. Specific resistance of airways provided evidence supporting the protective effect of roflumilast. Additionally, ex vivo experiments on PCLS supported our findings.

Conclusion: IL-13 intranasally induced AHR. Roflumilast alone does not significantly affect AHR however the combination of roflumilast and albuterol does inhibit AHR and is greater than the effect of albuterol alone.

76. **CONTINUING STUDY OF CLINICAL-PATHOLOGICAL CHARACTERIZATION AND CLASSIFICATION OF INTRAUTERINE POLYPOID LESIONS**

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Purpose: Intrauterine “polyps” are among the most common anatomical aberrances diagnosed within the uterine cavity. While many lesions are likely benign and readily amenable to treatment, some may be malignant precursors, have malignant components or be associated with other benign and/or malignant uterine neoplasms. A longitudinal study correlating clinical data with histological review and description will be useful to characterize and classify these lesions, providing information for medical and/or surgical management.

Methods: This study involves retrospective review of cases accrued to the Creighton University Department of Pathology before October 20, 2014. Cases were identified serially by pathology numbers from electronic records using the identifiers “polyps” or “polyp...” Clinical data including date of birth, chief complaint(s), past medical/surgical history, height, weight, BMI, last menstrual period, gravidity, parity, ultrasound findings, hormone treatment(s), tobacco use, and diagnosis were extracted and tabulated to a coded spreadsheet. Blinded to this data and primary pathological diagnosis, each case was matched with the results of this study’s histological review and description of the polypoid lesion and associated tissues.

Results: Thus far, clinical data from 115 cases have been extracted and tabulated. Of these 115 cases, 110 have been classified histopathologically. Most common histologic sub-classifications include hyperplastic or functional with 3/110 (2.7%) specimens were carcinoma (Figure 1.) Most women were postmenopausal. Most common presenting symptoms include “postmenopausal bleeding” and “menorrhagia.” In contrast to 2015 findings, where no patients were identified with BMI <20 and 33/48 (68.8%) had BMI > 30, further exploration yielded 4 cases BMI <20 and 63/115 (54.7%) with BMI > 30 (Figure 2).

Conclusions: Continued examination of data found malignancies present in the setting of clinically diagnosed endometrial polyps. Presence of non-hyperplastic histopathologic sub-typing and current trends in patient demographics provide opportunity for future correlation and significance. This exploratory study found current methods feasible to continue collection of demographic and clinical data and histologically review diagnostic tissues.

77. **THE EFFECT OF IL-13 AND IL-33 ON THE EFFICACY OF ALBUTEROL ON AIRWAY HYPERRESPONSIVENESS (AHR) IN A MOUSE MODEL OF ASTHMA**

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Rationale: Globally people with asthma and COPD have difficulty breathing and AHR; however this is more severe on days of high air pollution for example in China where 350,000 to 500,000 people died prematurely because of smog. We plan to compare the effect of IL-13 versus IL-33 plus allergen on the protection against AHR by albuterol. IL-13 is increased in the airway of asthmatics. Airway epithelium integrity is important in pulmonary function. Asthma is also linked to IL-33 and airway epithelium. IL-33 acts on type2 innate lymphoid cells (ILC2) to modulate TH2 immunity.

Methods: Whole body plethysmography (Penh) data was determined in wild balb/c mice and compared with mice treated with IL-13, IL-33 and IL-33 plus ova. In each experiment 10 mice was either pre-exposed to room air, albuterol, IL-13, IL-33 or a combination of IL-33 plus ova before they were exposed to methacholine (MCh). We developed a dose response curve (DRC) quantifying the extent of AHR.

Results: IL-13 alone induced AHR at 48 hours and persisted for 17 days. IL-33 plus ova induced AHR at 72 hours and persisted for at least 30 days. IL-33 alone did not induce AHR. Ova alone did induce AHR but to a lesser degree than IL-13 or IL-33 plus ova. Albuterol was effective in inhibiting AHR in ova sensitized and challenged mice but in IL-13 treated mice or in mice treated with IL-33 plus ova the effect of albuterol was significantly diminished. As the effect of IL-13 was diminishing with time the effect of albuterol increased.

Conclusions: Albuterol is effective in protecting against AHR in naïve mice however the protective effect is diminished by IL-33 plus allergen or by IL-13.

78. **THE EFFECTS OF THE BALANCED BODY BANDS PROGRAM ON HABIT FORMATION: A PILOT STUDY**

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Purpose: To implement a school based program (Alex Chan and His Balanced Body Bands) aimed at developing healthy habits in elementary aged students. Specific aims included: increase daily servings of fruits, vegetables, protein, and dairy, increase physical activity, decrease screen time, and increase daily kind gestures.

Background: The prevalence of childhood obesity continues to increase. Current estimates show that in the U.S. 8% of children 2-5 years of age, 18% of children 6-11 years of age, and 21% of adolescents 12-19 years of age are obese (Center for Disease Control and Prevention, 2014b). Studies validate that school programs are successful in creating and sustaining healthy habits while decreasing rates of obesity (DeMattia, Lemont, & Leurer, 2006, Sharma, 2006).

Sample/Setting: A midwestern parochial school with children from kindergarten to fifth grade. All students were invited. Although 515 children received the intervention; 82 children completed one month, and 30 children completed three months.

Methods: A pre and post survey design was used. Intervention bundle included: storybook, wristbands, a sticker shield, access to the mobile application, and four educational rallies. Surveys were administered one and three months post implementation.

Results: Statistically significant results were seen after one month with increases in the participant's daily servings of vegetables (p=0.0146), protein (p=0.0161), and dairy (p=0.0194). There was a statistically significant decrease in screen time; after three months, participants were engaging in 20.9 minutes (p=0.0000) less. Overall, 82% of parents were satisfied and 86% believed this helped their child(ren) develop healthier habits.

Conclusions: This program was effective in establishing healthier habits. Participating families were provided with educational materials to maintain a healthy lifestyle. By providing the school with resources, they can continue to promote health as an integral component in their curriculum.

Acknowledgments: Children's Hospital and Medical Center and the Preventing Childhood Obesity Community Grant award.

79. **IDENTIFYING SPIRITUAL NEEDS FOR BACCALAUREATE NURSING STUDENTS IN MULTI-CAMPUS JESUIT UNIVERSITY**

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Purpose: The purpose of this project was to identify the spiritual needs of baccalaureate level nursing students. This study was the first step in developing an assessment tool to evaluate spiritual needs and growth of nursing students' throughout the educational experience.

Methods: The design of the study was qualitative through 1 hour focus groups and open-end question surveys on the internet. Additionally, all participants completed a demographic and spiritual practice survey addressing spiritual beliefs, practices, and resources.

Results: Focus group recordings and results of online survey were reviewed, analyzed and themes were identified. Twenty three students participated with overall themes identified as spirituality was relevant and evident within clinical settings, personal connections and formal spiritual direction. Students identified beliefs and practices as important. Resource availability of programs/services and student involvement in campus ministry was not a priority.

Conclusions: Spiritual assessment surveys revealed spiritual beliefs gave meaning to life and a relationship between spiritual beliefs and what they do. Most attended worship service regularly, based their helping of other on their spiritual beliefs and were not afraid to express spiritual beliefs to other. Participants identified spirituality readily in clinical settings and desired more spiritual application in classroom and post-conference setting through group reflection, discussion of difficult ethical situations in clinical needed guidance in effective prayer and identified journaling as effective method to express spiritual development. The presence of spirituality in the campus was somewhat important to the group, and was met through individual spiritual counseling, group reflection and or bible study, visibility of active chaplain, and daily chapel accessibility.

Acknowledgment: Funding was provided by the Office of Academic Excellence and Assessment.

80. **STUDENT PERCEPTIONS OF LEARNING IN A NEWLY DEVELOPED OCCUPATIONAL THERAPY PROGRAM HYBRID PATHWAY**

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The purpose of this study was to evaluate student perceptions of quality educational experiences over time while enrolled in a hybrid entry-level occupational therapy doctorate (OTD) program. This study used a mixed method design to gain insight on the perspectives of OTD Class of 2018

students enrolled in the newly developed Regis cohort in Denver, Colorado. From August 2015 to March 2016, eighteen graduate students participated in three focus groups and online surveys to convey their perceptions of quality education in the categories of academic challenge, learning with peers, experience with faculty, and the campus environment. Multiple data sets were collected and investigators analyzed qualitative and quantitative data themes relevant to these categories. The results indicated that students anticipate high quality provisions in all categories assessed and they recognize the personal responsibility required to succeed in a hybrid online curriculum. Recurring themes included connecting with faculty and peers and receiving equitable experiences. The benefits of this study provide opportunities to enhance the newly developed Regis hybrid program and to provide data to other occupational therapy academic programs with insights on hybrid program development and assessment.

81. **A LITERATURE REVIEW ON THE EFFECT OF SMOKING ON TERTIARY DENTIN FORMATION**

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Purpose: The tooth is a complex structure composed of two anatomical regions, a crown and a root. Each region is comprised of two, highly mineralized tissue layers that surround and protect the vital pulp chamber. The crown is visible in the oral cavity and covered externally with enamel. The outer layer of the root is covered in cementum. Dentin is the hard tissue that makes up the bulk of the tooth and gives structural support to the overlying enamel and cementum. Dentin also provides protection to the cellular and neurovascular elements in the pulp chamber. Dental trauma and carious lesions can induce the deposition of tertiary dentin as a protective response to localized sites of injury. The extent of injury and the cellular response of the pulp determines whether a reparative or reactionary type of tertiary dentin will be deposited. Smoking is considered a contributing factor to several oral diseases; however, little is known about the effect of smoking on the reparative process of the pulp chamber. The purpose of this review is to investigate the impact of smoking on tertiary dentin formation.

Methods: A literature review on tertiary dentin and the effect of smoking was performed. Peer reviewed research articles, published between 1994 through 2016, were obtained through PubMed.

Results: This review includes information on tertiary dentin formation and the proposed mechanisms that initiate this process. The effect of smoking on teeth and gingiva is also discussed to demonstrate the impact of smoking on the formation of tertiary dentin.

Significance: Demonstrating a relationship between smoking and tertiary dentin formation could have a significant impact on the treatment of patients. Documentation of the effect of smoking on the inhibition of tertiary dentin formation could lead to the development of new treatment plans and ultimately preventive measures resulting in improved oral health.

82. **LOSS OF PERIOSTIN RESULTS IN MANDIBULAR DISMORPHOLOGY IN A MOUSE MODEL OF HUMAN PERIODONTITIS[†]**

Robert Wollschlager, Avey T. Corbin, Umesh Pyakurel, Shikha Tarang, Tim F. Walker, Mohammed P. Akhter, and Michael D. Weston, Department of Oral Biology, Creighton University, Omaha, NE.

Introduction: Periodontal disease and permanent tooth loss are rampant worldwide. Periostin, a "matricellular" protein within the periodontal ligament (PDL) of humans and mice, conveys change in mechanical loading to influence cell function, cell-matrix interactions, and periodontal tissue homeostasis. Unlike humans, mice have continually growing incisors. We hypothesized

that growing incisor sheer stress and molar occlusal force mandate differential expression of Periostin isoforms to account for functional differences in cell-matrix communication in the PDL of these unique tooth domains.

Methods: Using a model of human periodontal disease, we evaluated dental tissue and alveolar bone changes in Postntm1Jmol homozygous mice using micro-CT scanning, photo-radiography, histology and scanning electron microscopy. Using reverse transcriptase and the polymerase chain reaction (RT-PCR), differential expression of Periostin isoforms in wild-type soft tissue surrounding the molar and incisor teeth was assessed.

Summary: Anatomical evaluation of mandibles from 4-7 month-old Periostin mutant and wild-type mice revealed a previously undefined space between the molars and the underlying incisor (n=4, U=0) in homozygous mutant mice. RT-PCR showed that the mouse (C57Bl/6J) only expresses a single isoform lacking 2 exons ($\Delta b\Delta e$), unlike the 5 isoforms expressed in human PDL.

Conclusions: We quantified an increase in the distance between mandibular molars and the underlying incisor in Postntm1Jmol homozygous mutants. This is most likely the result of a functional/structural degradation of the periodontium and supporting bone suggesting a functional niche for Periostin exists, that is distinct from that found in the PDL. While we expected to find multiple PDL isoforms of Periostin that would correlate with functionally unique PDLs, our evidence suggests that only one isoform ($\Delta b\Delta e$) of Periostin exists in adult mouse PDL.

Acknowledgment: Sponsored by Creighton University through the Center for Undergraduate Research and Scholarship-CURAS, and the Creighton Dental School's Oral Biology Graduate Program.

83. PHARMACOKINETIC AND MICROBIOLOGICAL ASSESSMENT OF ANTI-MYCOBACTERIAL INDOLECARBOXAMIDE COMPOUNDS

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Purpose and Rationale: The genus Mycobacterium, most commonly associated with tuberculosis (TB), is the cause of a variety of lung and systemic disease states, especially in patients with preexisting lung or immune disorders. Our current treatment options for both Mycobacterium tuberculosis (M. tb.) and other mycobacterial infections have small therapeutic windows and are not ideally suited for eradication of these particular pathogens. As the rates of TB, particularly drug resistant strains, and non-tuberculosis mycobacteria infections (NTM) increase, the need for new therapies that are safer and more efficacious are needed. Our studied indolecarboxamide (IC) compounds have shown strong efficacy against a panel of mycobacteria in vitro, but pharmacokinetic characterization is necessary to determine the potential viability of these compounds as anti-mycobacterial agents in humans.

Methods: A series of 15 IC-based compounds were designed, synthesized and studied for anti-mycobacterial activity, solubility, permeability and protein binding properties. Solubility, permeability and protein binding assays were performed according to established literature protocols in physiologically relevant conditions. Analysis was performed using UV spectrometry and UPLC methods to quantify compound concentrations.

Results: Lead IC compounds showed highly potent anti-mycobacterial potency across a panel of mycobacteria. IC compounds, as bulky, lipophilic compounds, show expected results with poor solubility and moderate permeability. This in vitro analysis indicates that these compounds may have similar properties to current anti-mycobacterial agents.

Conclusions and Future Directions: Lipophilic IC compounds demonstrate poor solubility, any increases in permeability and solubility can have a substantial impact on viability as an in vivo product. With the current scaffold completed, comparison of MIC data, solubility and permeability across the scaffolds helped determine the structure-activity relationship and develop new generations of compounds with better pharmacologic properties.

Acknowledgments: Creighton University, St. Jude Children's Research Hospital and Colorado State University

84. **THE EFFECTS OF A PPARGAMMA AGONIST ON THE STEREOLOGICAL ASSESSMENT OF THE HIPPOCAMPUS AND HYPOTHALAMUS IN AN EPILEPTIC MODEL[§]**

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Rationale: Epilepsy affects approximately 3 million people in the United States. Approximately 30% of cases are pharmaco-resistant. The ketogenic diet (KD), is a high fat, low carbohydrate and protein diet effective in treating refractory seizures. However, the KD is unpalatable. The goal of our research is to uncover the KD's mechanism(s) to identify a novel therapeutic target for refractory epilepsy. We have found that the nutritionally-regulated nuclear transcription factor PPAR γ plays a critical role in the anti-seizure effects of the KD. We hypothesize that a PPAR γ agonist will have neuro-protective effects on the hippocampus and hypothalamus which resemble the KD. Sleep problems are a common comorbidity in people with epilepsy. Poor sleep lowers the seizure threshold, perpetuating the cycle. We hypothesized that differences in cell number in certain regions contribute to dysregulated sleep circuitry in Temporal Lobe Epilepsy (TLE). Research has shown that severe seizures can result in cytoarchitectural remodeling. This project examined the seizure-generating hippocampus and sleep-regulating hypothalamic regions in a model of TLE. Past experiments showed a decreased seizure burden following pioglitazone injection. This project's goal was to determine the cellular effects of pioglitazone treatment.

Methods: We used hemotoxylin and eosin and GFAP staining to determine cell number and astrogliosis in the hippocampus, Suprachiasmatic Nucleus, and Periventricular Nucleus using unbiased stereology.

Results: We found no statistical differences among groups in the hippocampus in cell number or extent of astrogliosis. The hypothalamic regions also showed no statistical significance.

Conclusion: Our colony exhibits decreased cell death compared to other colonies of the same strain. This suggests the potential for a unique genetic variation in our animals. Our results from the hypothalamic regions suggest that sleep problems do not stem from a simple change in cell number in these areas.

Acknowledgment: This work was supported by the Clare Boothe Luce Program.

85. **REGULATION OF K⁺-INDUCED [3H]D-ASPARTATE RELEASE FROM BOVINE ISOLATED RETINA BY THE DHA-METABOLITE, 4(S)-F4T-NEUROPROSTANE: ROLE OF ARACHIDONIC ACID METABOLITES**

Jamal Jamil, Emily Kawesa-Bass, Catherine A. Opere, Thierry Durand, Alexandre Guy, Jean-Marie Galano, Ya Fatour Njie-Mbye, Jenaye Robinson, Sunny E. Ohia, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: There is evidence that the free radical-derived, EPA metabolite, 5-epi-5-F3t-isoprostane regulates the release of excitatory neurotransmitters in isolated bovine retina (Jamil

et al., 2014 *Neurochem. Res.* 39:2360-2369). However, the pharmacological role of analogous DHA metabolites on retinal neurons has not been fully elucidated. In the present study, we investigated the role of arachidonic acid metabolites in the regulation of K⁺-induced glutamate release (using [³H]D-aspartate as a marker) by 4(S)-F4t-neuroprostane (4(S)-F4t-NeuroP) in isolated bovine retina.

Methods: Freshly isolated bovine retina were incubated for 60 mins in carbogen-gassed Krebs buffer solution (pH 7.45; 37 °C) containing 200nM of [³H]D-aspartate. Retinal tissues were placed in thermostatically controlled superfusion chambers and the release of [³H]D-aspartate was evoked by iso-osmotic concentration of K⁺ (50mM)-stimuli applied at 80-88 mins (S1) and 116-124 mins (S2) after the onset of superfusion. The DHA-metabolite, 4(S)-F4t-NeuroP was added to the buffer solution 15 mins before S2. When used, antagonists were added 10 mins before S2.

Results: 4(S)-F4t-NeuroP (1 nM to 1 μM) enhanced K⁺-induced [³H]D-aspartate release from bovine retina, achieving a maximum response of 17%±1.01 (n=4; p<0.05) at 0.1 μM. Pretreatment with flurbiprofen (3 μM) unmasked a concentration-dependent inhibitory action of 4(S)-F4t-NeuroP, achieving an inhibition of 45.7%±3.7 (n=3; p<0.05) at the 1 μM concentration. Although the prostanoid antagonists, BAY-u3406 (ramatroban; DP2/TP; 10 μM), SQ 29548 (TP/DP; 10 μM), SC 51322 (EP1; 10 μM) and SC 19220 (EP1; 1 μM) had no effect on basal and K⁺-induced [³H]D-aspartate release, they completely reversed the inhibitory effect elicited by 4(S)-F4t-NeuroP (0.1 μM).

Conclusions: 4(S)-F4t-NeuroP can exert both excitatory and inhibitory actions on K⁺-depolarization -induced release of [³H]D-aspartate from the bovine isolated retina. The excitatory effects of this neuroP is mediated, at least in part, by arachidonic acid metabolites.

86. **IN VITRO RELEASE OF HYDROGEN SULFIDE FROM AN ORGANOSULFUR COMPOUND FOUND IN GARLIC**

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Purpose: Glaucoma is an ocular neuropathy that is characterized by progressive degeneration of retinal ganglion cells and elevation in intraocular pressure (IOP). The current therapies for glaucoma target reduction in IOP only, therefore, there is an unmet need of a clinically effective treatment that exerts both ocular hypotensive and retinal neuroprotective actions. There is evidence that hydrogen sulfide (HS) attenuates IOP in normotensive rabbits and also exerts neuroprotection. However, the full clinical potential of HS cannot be realized without an efficient method for its delivery into ocular tissues. Therefore, this project investigated the release profile of HS from its donor diallyl disulfide (DADS).

Methods: A specified amount of diallyl disulfide (DADS) was added in a polymer solution (PLA/PLGA in a mixture of benzyl benzoate and benzyl alcohol) was injected into STF (simulated tear fluid) which resulted into the formation of an in situ gel. DADS released from this gel resulted into evolution of HS which was determined spectrophotometrically to evaluate burst and rate of release.

Results: One of the significant observations was the absolute necessity of glutathione (GSH) for the production of HS from its donor DDS. This involved a different mechanism for evolution of HS than observed with other HS donors. The presence of GSH significantly (p<0.05) improved the release of HS from its parent compound. The percentage cumulative release of HS in deoxygenated media (simulated tear fluid) was determined to be 5-60 times greater than in oxygenated media.

Conclusion: The phase-sensitive smart polymer-based delivery system can extend the release of HS from its donor which should be further investigated to extend the period of sustained release up to 3-4 weeks to make it a clinically viable option.

Acknowledgment: I want to thank SPAHP, Summer Pharm.D. Student research program for giving me this opportunity and financial support.

87. **IMPACT OF AN INTERPROFESSIONAL CITY-WIDE DIABETES SPECIALTY CLINIC FOR UNINSURED PATIENTS**

Scott Brauer, Katie Packard, Kathy Hoebelhenirich, Anita King RN, Emily Mannschrek, Kris Saunders, Andrea Haberman, Teresa Harms, Shirley Foster, and Yongyue Qi, Department of Pharmacy Practice, Creighton University, Omaha, NE.

Purpose: From 1980-2011, the number of diabetics in the US has more than tripled. Costs have risen from \$174 to \$245 billion from 2007-2012. Approximately 13,790 individuals in Lancaster County have diabetes and approximately 15% are living in poverty. Uninsured diabetic patients require high levels of care. Collaborative care may improve education and increase empowerment, which may improve outcomes. In May 2014 an interprofessional diabetes clinic was integrated into the Clinic with a Heart infrastructure, in partnership with stakeholders. The clinic occurs once monthly and serves uninsured diabetics. It is staffed by a nurse practitioner, certified diabetes educator, pharmacist, public health nurse/referral coordinator and ancillary support.

Methods: Data were collected on 45 patients seen between June 2014 and November 2015. Data collected included baseline demographics, medications, hemoglobin A1c (A1c), and blood pressure (BP). Investigators tracked establishment in a medical home and the first A1c and BP in the new medical home (3-6 months later). Student's paired t test was used to determine the change in A1c and BP while McNemar's test was used to compare the proportion of patients with controlled outcomes pre and post intervention. A p value less than 0.05 was considered statistically significant.

Results: In the 45 patients seen, the mean age was 50.0+11.3 years, 58% (26) were women, and 89% (40) were type II diabetics. All patients were provided a free glucometer, test strips and free medications. All were referred to a medical home. After 6 months, 75% (34) of patients established a medical home. A1c was reduced from 10.6+2.6 to 8.1+1.9 (p=0.002) and SBP was reduced from 133.3+20.1 to 126.2+13.0 (p=0.047). The proportion of patients at goal BP increased from 61% to 83% (p=NS).

Conclusion: A city-wide interprofessional diabetes clinic was effective in significantly reducing A1c, BP, and establishing a medical home for uninsured patients.

88. **DESIGN AND SYNTHESIS OF NON-COUMARIN BASED ANALOGS WITH ANTI-TUBERCULOSIS ACTIVITY TARGETING THE ESSENTIAL LIGASE, FADD32**

Kyle Graham and Dr. Jeffrey North, Department of Pharmacy Sciences, Creighton University, Omaha, NE.

Purpose and Rationale: Mycobacterium tuberculosis is the causative pathogen responsible for tuberculosis and remains a global disease that affects many people. According to the WHO, tuberculosis (TB) ranks alongside HIV as a leading cause of death globally with 1.5 million deaths in 2014 alone. With the emergence of multidrug-resistant (MDR) and extensively drug-resistant (XDR) TB, the development of new anti-TB antibiotics is strongly needed. Mycobacteria are unique in cell wall structure with mycolic acids as the major lipid component of the cell wall. FadD32 is an essential ligase required for the synthesis of mycolic acids and can be targeted for

rational drug design. Towards these efforts, the design and synthesis of putative FadD32 inhibitors were developed as novel anti-TB agents.

Methods: The design of novel potential FadD32 inhibitors was accomplished using computational scaffold hopping methodologies. Ligand-based drug design was performed with subsequent flexible alignment studies to ensure novel scaffolds maintained the desired pharmacophore. In silico ADME assessments were used in designing lead compounds with optimal pharmacokinetic properties. Synthetic schemes of these compounds with optimal theoretical pharmacokinetic profiles were designed and are currently underway.

Results: Lead compounds were determined using computational algorithms as listed in the methods section. Current synthetic design where key intermediates have been synthesized, purified and characterized has been completed.

Conclusions and Future Directions: Computational analysis of designed non-coumarin based anti-TB inhibitors have been performed to ensure highly potent anti-TB compounds with improved pharmacokinetic properties. Synthetic schemes of computationally designed lead compounds have been generated with key intermediates isolated and characterized. Current efforts are focused on synthesis of 2-3 mini-series of novel non-coumarin compounds.

Acknowledgments: AACP New Investigator Award, Creighton University, St. Jude Children's Research Hospital and Colorado State University

89. UNSUBSTITUTED INDOLECARBOXAMIDES AS NOVEL BROAD SPECTRUM ANTI-MYCOBACTERIAL AGENTS

Michael Kaminski, Vinicius D.C. de Moura, Wei Li, Louis Dunn, Amit Pandya, Robin Lee, Richard E. Lee, Mary Jackson, and E. Jeffrey North, Department of Pharmacy Sciences, Creighton University, Omaha, NE.

Purpose and Rationale: Tuberculosis (TB), regarded worldwide as one of the most serious pulmonary infections, is caused by the pathogen *Mycobacterium tuberculosis* (M. tb). TB is one of the most common opportunistic infections seen in HIV/AIDS patients and is actually the leading cause of death in this patient population. M. tb, however, is only one of many different strains of mycobacteria and recent literature indicates a significant increase in mycobacterial infections in the United States over the past 30 years. The increasing prevalence of mycobacterial infections along with the emergence of multidrug-resistant (MDR) and extensively drug resistant (XDR) cases of TB indicates a strong need for the development of novel anti-mycobacterial antibiotics. To this aim, synthesis and analysis of unsubstituted indolecarboxamide (IC) analogs has yielded a series of structures showing broad spectrum anti-mycobacterial activity. Further evaluation of these structures along with synthesis of additional IC derivatives may lead to the development of new effective, potent agents to treat these widespread infections.

Methods: A series of 15 unsubstituted IC analogs was designed, synthesized and tested against a panel of mycobacteria, including *M. tuberculosis*, *M. smegmatis*, *M. abscessus*, *M. massiliense*, *M. boletii*, and *M. chelonae*. Pharmacokinetic profiles using in vitro solubility and PAMPA permeability assays were conducted in physiologically relevant conditions using ultra-performance liquid chromatography (UPLC) for quantification.

Results: IC compounds demonstrated potent anti-mycobacterial activity against multiple mycobacterial strains. IC compounds have shown poor to moderate solubility, however, permeability of these compounds was reasonable.

Conclusions and Future Directions: Unsubstituted IC compounds are potent inhibitors of a panel of mycobacteria, establishing them as broad spectrum anti-mycobacterial agents. Future

studies include further pharmacokinetic assessment, which will influence the design of future IC compounds.

Acknowledgments: Creighton University, St. Jude Children's Research Hospital and Colorado State University

90. **EVALUATING POLYMER SYSTEMS FOR EVENTUAL CNS DISTRIBUTION FOLLOWING INTRANASAL ADMINISTRATION**

Linh Nguyen, Rishabh Tukra, Harsh Chauhan, Anthony E. Kincaid, Justin A. Tolman, Department of Pharmacy Sciences, Creighton University, Omaha, NE.

Purpose: Previous *in vivo* hamster studies determined that rapid transepithelial transport of prion infected brain homogenate occurred following intranasal delivery. This rapid transport led to substantial amounts of prions identified in both the blood and brains of infected hamsters. Additionally, the transport mechanisms appear to occur paracellularly across large sections of the nasal epithelia. No studies to date have conclusively determined the mechanisms by which intranasally administered substances achieve rapid concentrations in brain tissue. This preliminary study evaluates the physical properties of a limited number of pharmaceutically acceptable alternatives of a model drug formulation to facilitate the development of drug delivery systems to the central nervous system. These model formulations are intended to replace brain homogenate and eventually help determine the mechanisms for drug absorption and distribution following intranasal delivery.

Methods: Polymer solutions were made using various concentrations of hydroxypropyl cellulose (HPC), poloxamer 407 (P407), and mixtures of both polymers. The viscosities of polymer solutions were determined as functions of polymer concentration. Solutions with viscosities similar to brain homogenate were selected to investigate the particle size distribution of a suspended model drug, curcumin. Visual fluorescent microscopic analysis was determined to evaluate the particle size distribution of curcumin.

Results/Conclusions: It was concluded that curcumin-loaded polymer solutions can be prepared to have similar viscosities and particle size distributions to that of curcumin-loaded brain homogenate. This study provides preliminary formulations of possible drug-loaded polymer suspensions for the eventual delivery of drug to the CNS following intranasal administration. Further studies are needed to determine the mechanisms of intranasal absorption and efficacy of CNS delivery of a model drug suspended in these polymer solutions.

91. **IMPLEMENTATION OF AN ALARM SYSTEM FOR HARDWARE CONTROLS AT THE STAR EXPERIMENT**

Sam Ruiz, Department of Physics, Creighton University, Omaha, NE.

The STAR (Solenoidal Tracker At RHIC) experiment at Brookhaven National Laboratory is a detector system used for studying nuclear interactions at the Relativistic Heavy Ion Collider (RHIC). The experiment uses EPICS (Experimental Physics and Industrial Control System) as its computer-based monitoring and controls system for the experiment's 60,000 process variables. The system currently uses the Alarm Handler (ALH) for providing operators with the system status. ALH is being replaced by a different alarm system, known as BEAST (Best Ever Alarm System Toolkit). Background on the STAR experiment and a progress report on this software project will be presented.

92. **EVIDENCE FOR THE EXISTENCE OF DARK MATTER**

Kian Maleki, Department of Physics, Creighton University, Omaha, NE.

Dark matter is a mysterious substance which makes up five-sixths of the matter in the universe. There are many hypotheses for dark matter ranging from higher dimensions to supersymmetry(SUSY) but none of them are able to thoroughly explain all the evidence for the existence of dark matter. The best way to understand dark matter is to look at the evidence which cannot be explained without assuming the existence of non-baryonic matter (baryonic matter is the ordinary matter which is made of electron, neutron, proton, and other similar particles). Dark matter only has gravitational effects and surprisingly does not interact with baryonic matter. It has not been detected directly and little is known about it. All we know, is that the gravity which exists among the galaxies and clusters (group of galaxies) is much more than the mass we can see and detect. This means that the mass we can see and detect cannot create such a gravitational force. A very simple explanation could have been to modify Newton's gravitational law to explain some of the evidence for dark matter but any modification has already been ruled out by other evidence. This poster reviews the evidence for the existence of dark matter ranging from its early detection which was not believed by the scientific community to the most recent evidence which has convinced all cosmologists. Any suggested explanation must be able to justify all the phenomenon explained in this poster. The phenomenon are: 1. speed of stars which are far from the center of the galaxies; 2. Galaxies collision and Bullet cluster; 3. Formation of galaxies in early universe; and 4. Relic density.

93. **PHYSICS OF CANCER METASTASIS: DOES CHEMOTHERAPY ALTER THE RATE OF MIGRATION OF CANCER CELLS? †**

Michael Mimitz, Sruti Prathivadhi, and Andrew Ekpenyong, Department of Physics Creighton University, Omaha, NE.

Rationale: Cancer metastasis is the spread of cancer cells from a primary tumor to other sites in the body, leading to the formation of secondary tumors. Since metastasis is the cause of over 90% of deaths related to cancer, recent research efforts are focused on developing anti-metastatic therapies. Such efforts largely rely on targeting biochemical features including specific genes and signaling pathways. However, a new and complementary approach, the physics of cancer, has emerged, owing to the realization that the biophysical properties of cells are implicated in the metastatic cascade. For instance, the mechanical properties of cancer cells influence their interaction with the microenvironment during migration, intravasation and extravasation. Having found that chemotherapeutic drugs alter the mechanical properties of cancer cells, using our microfluidic microcirculation mimetic (MMM), we are now testing whether such alterations affect cancer cell migration, a key step in the metastatic cascade.

Methods: In our studies, we used a CytoSelect™ 24-Well Cell Migration Assay made of polycarbonate membranes with pores that are 5 μm in diameter, to monitor the rate of migration of HL-60 cells following treatment with typical chemotherapeutic drugs, namely, Doxorubicin and Daunorubicin.

Results: Preliminary results of migration experiments suggest that the Doxorubicin-treated cells show a higher rate of migration, compared to untreated cancer cells.

Conclusion/Significance: Our results may help to clarify the pro- or anti-metastatic effects of existing cancer drugs, thereby paving way for the development of effective therapies against cancer metastasis.

Acknowledgment: Funding was provided by CURAS.

94. **ANALYSIS OF ELECTRON-POSITRON PAIR PRODUCTION IN ULTRA-PERIPHERAL AUAU COLLISIONS**

Matthew Rehbein, Department of Physics, Creighton University, Omaha, NE.

The Relativistic Heavy Ion Collider (RHIC) accelerates beams of gold ions to near-light speeds (200 GeV/nucleon) before directing them into head-on collisions with one another, producing particles which are then detected by the Solenoidal Tracker at RHIC (STAR). Not all ions impact each other directly; ultra-peripheral collisions occur when ions pass very near each other without making direct physical contact. Although hadronic interactions are suppressed in this case, these events are still considered to be collisions because the gold ions do interact with each other via electromagnetic fields. These interactions can produce a variety of particles, including electron-positron pairs. Studying these ultra-peripheral collisions can improve our understanding of electromagnetic interaction in intense non-perturbative fields. In order to study these electron-positron pairs, we must first develop a system of detector triggers so that collisions can be recorded. Then, we must find a way to filter the signal from the detector such that ultra-peripheral collisions can be distinguished from other collisions. Finally, we must further filter the data to select only those ultra-peripheral collisions which yield electron-positron pairs. This presentation will describe these selection techniques and provide an example of such techniques applied to STAR data.

95. **BACKGROUND STUDIES FOR FOUR-TRACK EVENTS WITH CHARM AT ALICE**

Jordan Roth and Dr. Michael Cherney, Department of Physics, Creighton University, Omaha, NE.

A Monte Carlo study of four-track events in the ALICE (A Large Ion Collider Experiment) detector at CERN has been carried out. Background processes to the photoproduction of the η_c meson in $\sqrt{s_{NN}}=5.12$ TeV ultraperipheral Pb-Pb collisions have been studied, taking into account the acceptance and efficiency of the detector. A comparison of the meson's predicted signal in the $K^* (892)^0 K^- \pi^+ \rightarrow K^+ \pi^- K^- \pi^+$ decay channel is made with the composite background. It is found that the η_c should produce an observable signal in data from the second run of the Large Hadron Collider.

Acknowledgment: The United States Department of Energy, Office of Science, for support through award DE-FG02-96ER40991.

96. **A HIGH-Q RF CIRCUIT FOR ULTRA-COLD ATOMS[‡]**

Alex Tarter, Department of Physics, Creighton University, Omaha, NE.

Experiments involving Bose-Einstein condensates (BEC's), a state of matter at nanokelvin temperatures, provide opportunities for physicists to manipulate and study quantum systems at the macroscopic scale. An area of concern in making a BEC is the ability to manipulate the magnetic interactions between cooled atoms. We report on the progress made toward the creation of a high-Q radio frequency circuit that creates a stable magnetic field with strength on the order of 2 gauss. In particular we describe the work done towards building a parallel-plate capacitor that locks in the resonance frequency of the circuit at precisely 120MHz.

97. **INTER-ANNUAL VARIABILITY OF NOCTURNAL LOW-LEVEL CLOUDS AND LOW-LEVEL JETS OVER NORTHERN AUSTRALIA AND INDONESIA IN THE PRESENCE OF ENSO EVENTS FROM 1999 TO 2014**

C. Bayu Rianto and Dr. Jon. M. Schrage, Department of Physics Creighton University, Omaha, NE.

Over the last decade, there were four warm ENSO events. These events shift the convection process from the western tropical Pacific to the central and eastern Pacific causing decreased precipitation and severe droughts to the most part of Indonesia and northern Australia. An anomalously cold sea surface temperature (SST) plays a significant role in changing the convection process in the atmosphere during ENSO events. Wood (2012) has shown that a negative SST anomaly is closely associated with the development of nocturnal low-level clouds (NLLC), and Schrage and Fink (2012) have shown that there is a connection between the formation of NLLC and nocturnal low-level jet (NLLJ) in West Africa. This research tries to understand the change of NLLC occurrence during warm ENSO events and how it is different from that during cold ENSO events. The goals of this study are to find out if the relationship found by Schrage and Fink (2012) is also true in this domain and to see if there is interannual variability in this relationship especially in the presence of warm and cold ENSO events. The spatiotemporal frame of this research is the Indonesian Archipelago and northern Australia (5.50N – 23.50S and 95.00E – 150.00E) from 1999 to 2014. This study uses three data sets, namely Integrated Surface Data (ISD) from the Archive of Global Synoptic Observation Data at the World Data Center for Meteorology, Radiosonde Observation (RAOB) data from the NOAA/ESRL Radiosonde Database at the National Climatic Data Center, and Sea Surface Temperature (SST) data from Met Office Marine Data Bank. The NLLC occurrence is defined as the ratio of the number of NLLC observations to the number of cloudy observations. The occurrence of NLLJ is defined as the ratio of the number of NLLJ observations to the number of observations. To find whether the occurrence is increasing or decreasing during the ENSO years, the research applies Mann-Whitney U Test, a non-parametric statistic test at 95% confidence level.

98. **THE ROLE OF ULTRA-FAST SOLVENT EVAPORATION ON THE DIRECTED SELF-ASSEMBLY OF BLOCK POLYMER THIN FILMS[§]**

Chloe Drapes, Gunnar Nelson, Meagan Grant, Jeffrey Wong, and Andrew Baruth, Department of Physics, Creighton University, Omaha, NE.

The directed self-assembly of nano-structures in block polymer thin films via solvent vapor annealing is complicated by several factors, including evaporation rate. Solvent vapor annealing exposes a disordered film to solvent(s) in the vapor phase, increasing mobility and tuning surface energy, with the intention of producing an ordered structure. Recent theoretical predictions reveal the solvent evaporation affects the resultant nano-structuring. In a competition between phase separation and kinetic trapping during drying, faster solvent removal can enhance the propagation of a given morphology into the bulk of the thin film down to the substrate. Recent construction of a computer controlled solvent vapor annealing chamber provides control over evaporation down to 15 ms. Furthermore, in situ spectral reflectance, with 10 ms temporal resolution, monitors the swelling and evaporation. Presently, cylinder-forming polystyrene-block-poly lactide thin films were swollen with 40% (by volume) tetrahydrofuran, followed by immediate evaporation under a variety of conditions. This includes various times, ranging from 15 ms to several seconds, and four unique rate trajectories, including linear, exponential, logarithmic and combinations. Atomic force microscopy reveals specific surface morphologies of the resultant films, dependent on specific evaporation conditions.

Acknowledgment: Funded by the Clare Boothe Luce Foundation and Nebraska EPSCoR.

99. **SOLVENT VAPOR ANNEALING: TRANSITIONING TO PS-PDMS**

Meagan Grant, Dr. Andrew Baruth, Chloe Drapes, Gunnar Nelson, and Jeffrey Wong, Department of Physics, Creighton University, Omaha, NE.

The directed self-assembly of block polymer thin films is an area of great interest due to the potential production of life-easing and industry changing commodities. For example, the sub-twenty nanometer dimensions accessible could be applied to ultrafiltration applications. Traditionally, the organization of polymer thin films was achieved using thermal annealing, through enhancement of the mobility of the polymer structures. Exploration into the use of solvent vapors to achieve similar goals at faster rates have recently emerged. Of practical importance, a goal of creating hexagonally-packed, perpendicularly-aligned morphologies with a low anneal time, low defect density, and high reproducibility is paramount. We have successfully demonstrated such ultra-fast ordering in polystyrene-block-poly(lactide) (PS-PLA) thin films, where ordered perpendicular cylinders were achieved through solvent vapor annealing in tetrahydrofuran. However, issues with reproducibility and exact parameterization remain. Building on our acquired knowledge of PS-PLA, PS-PDMS (polystyrene-block-polydimethylsiloxane) has potential for creating smaller feature sizes than PS-PLA and serves to confirm the generality of our results on PS-PLA on a distinctly different polymer system. In this talk, I will discuss our transition to PS-PDMS and the associated challenges, including thin film synthesis, annealing, post-annealing treatments and imaging. In practice, many of our standardized protocols require some level of modification. In particular, I will focus on the role of O₂ reactive ion etching to systematically remove the organic constituents of the polymer film and oxidize the silicon within the PDMS structures. This is a necessary precursor to our imaging process with non-contact atomic force microscopy. Thus, identifying etching protocols is critical for successful imaging of final thin film morphologies.

100. **COMPARATIVE CONFORMATIONAL DYNAMICS OF CELLULAR PRION PROTEINS TOWARDS ELUCIDATING THE SPECIES BARRIER****

Robyn Hamada, Dr. Ronald Shikiya, and Dr. Patricia Soto, Department of Physics, Creighton University, Omaha, NE.

Prion proteins are responsible for a series of fatal, transmissible neurodegenerative diseases. The infectious agents in prion diseases, PrP^{Sc}, result from the misfolding of the properly folded isomer, PrP^C. Prion diseases are capable of crossing the species barrier, but the factors that influence the species barrier are not yet fully understood. Our goal is to determine the extent by which the native conformation of PrP^C correlates with the species barrier. We will report on our structural bioinformatics study that analyzes the PrP^C ensemble from a number of species for which experimental evidence suggests distinct species barrier tendencies. Our observations suggest that the secondary and tertiary structure of the protein contribute more to the transmission barrier than the specificity of the primary sequence.

Acknowledgments: INBRE Grant and Presidential Haddix Funding from Creighton University

101. **TOWARDS ULTRA-FAST SOLVENT EVAPORATION, THE DEVELOPMENT OF A COMPUTER CONTROLLED SOLVENT VAPOR ANNEALING CHAMBER[‡]**

Gunnar Nelson, Jeffrey Wong, Meagan Grant, Chloe Drapes, and Dr. Andrew Baruth, Department of Physics, Creighton University, Omaha, NE.

Despite the promise of cheap and fast nanoscale ordering of block polymer thin films via solvent vapor annealing, a standardized, scalable production scheme remains elusive. Solvent vapor annealing exposes a nano-thin film to the vapors of one or more solvents with the goal of forming a swollen and mobile state to direct the self-assembly process by tuning surface energies and

mediating unfavorable chain interactions. We have shown that optimized annealing conditions, where kinetic and thermal properties for crystal growth are extremely fast ($< 1\text{s}$), exist at solvent concentrations just below the order-disorder transition of the film. However, when investigating the propagation of a given morphology into the bulk of a film during drying, the role of solvent evaporation comes under great scrutiny. During this process, the film undergoes a competition between two fronts; phase separation and kinetic trapping. Recent results in both theory and experiment point toward this critical element in controlling the resultant morphologies; however, no current method includes a controllable solvent evaporation rate at ultra-fast time scales. We report on a computer-controlled, pneumatically actuated chamber that provides control over solvent evaporation down to 15 ms. Furthermore, in situ spectral reflectance monitors solvent concentration with 10 ms temporal resolution and reveals several possible evaporation trajectories, ranging from linear to exponential to logarithmic.

Acknowledgment: Funded by Dr. Randolph Ferlic Summer Research Scholarship and NASA Nebraska Space Grant.

102. **EFFECTS OF CHEMOTHERAPY-INDUCED ALTERATIONS IN CELL MECHANICAL PROPERTIES ON CANCER METASTASIS**

Sruti Prathivadhi, Department of Physics, Creighton University, Omaha, NE.

Biological cells can modulate their mechanical properties to suit their functions and in response to changes in their environment. Thus, mechanical phenotyping of cells has been employed for tracking stem cell differentiation, bacterial infection, cell death, etc. Malignant transformation of cells also involves changes in mechanical properties. However, the extent to which mechanical properties of cancer cells contribute to metastasis is not well understood. Yet, more than 90% of all cancer deaths are directly related to metastasis. Transit of cells through the microcirculation is one of the key features of metastasis. We hypothesize that cancer treatment regimens do inadvertently alter cell mechanical properties in ways that might promote cancer metastasis. We use a microfluidic microcirculation mimetic (MMM) platform which mimics the capillary constrictions of the pulmonary and peripheral microcirculation to determine if *in-vivo*-like mechanical stimuli can evoke different responses from cells subjected to various cancer drugs. In particular, we show that cancer cells treated with chemotherapeutic drugs such as daunorubicin, become more deformable at short timescales (0.1 s) and transit faster through the device. Our results are first steps in evaluating the pro- or anti-metastatic effects of chemotherapeutic drugs based on their induced alterations in cell mechanical properties.

103. **OTOTOXIC AMINOGLYCOSIDES INHIBIT NADH METABOLISM AND INCREASE REACTIVE OXYGEN SPECIES FORMATION IN COCHLEAR CELLS^{§†}**

Danielle Desa, Erinn Riley, Michael Nichols, Heather Jensen Smith, Department of Physics, Creighton University, Omaha, NE.

Purpose: Despite causing permanent hearing loss by damaging inner ear sensory cells, aminoglycosides (AGs) remain one of the most widely used classes of antibiotics in the world. Although the mechanisms of cochlear sensory cell damage are not fully known, reactive oxygen species (ROS) may be involved.

Methods: Mitochondrial-specific ROS formation was evaluated in acutely-cultured murine cochlear explants exposed to gentamicin (GM), a representative ototoxic AG antibiotic. Superoxide (O_2^-) and hydrogen peroxide (H_2O_2) ROS were measured using MitoSox Red and Dihydrorhodamine 123, respectively.

Results: Acute GM did not significantly increase O_2^- formation but did increase H_2O_2 formation in all cell types within one hour of exposure. At the same point, GM significantly increased

manganese superoxide dismutase (mnSOD) levels while significantly decreasing copper/zinc superoxide dismutase (cuznSOD) in cochlear sensory cells. This suggests 1) a rapid conversion of highly reactive O₂⁻ to H₂O₂ during the acute stage of ototoxic antibiotic exposure and 2) that the endogenous antioxidant system is significantly altered by ototoxic antibiotics. Fluorescence intensity-based measurements of nicotinamide adenine dinucleotide (NADH) were used to determine if increased ROS production was correlated with acute GM-induced changes in mitochondrial metabolism. Acute exposure also triggered a redistribution of NADH in the seven distinct NADH lifetime pools identified in cochlear cells.

Conclusion: This project provides a base for understanding the mechanisms of mitochondrial ROS production in cochlear cells exposed to ototoxic antibiotics. Understanding the nature of ototoxic antibiotic-induced changes in mitochondrial metabolism are critical for developing hearing loss treatment and prevention strategies.

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104. **THE ROLE OF NANOSCALE ROUGHNESS ON CELL ATTACHMENT FOLLOWING TITANIUM-BASED INSTRUMENTATION OF TITANIUM, TITANIUM-ZIRCONIUM, AND ZIRCONIA SURFACES**

Nicholas Fischer, Ryan Gnabasik¹, Melissa S. Lang², D. Roselyn Cerutis², and A. Baruth¹
¹Department of Physics; ²School of Dentistry, Creighton University, Omaha, NE.

Purpose: The aim of this study was to evaluate adhesion of human gingival fibroblasts (GF) to dental implant and healing abutment surfaces following repeated (100x) instrumentation with a titanium (Ti) curette, as commonly used in dental implant surface cleaning, using atomic force microscopy (AFM).

Methods and Results: Sterile Ti, Zirconia (ZrO₂) and Ti-zirconium (Ti-Zr, Roxolid®) disks (Straumann®, Andover, MA, USA) with a machined surface were used in this study. The standard technique of optical laser profilometry (1–5µm lateral resolution) revealed a statistical increase (over control) in average roughness for Ti and Ti-Zr, but not for ZrO₂. The disks were then seeded with a GF suspension. The units were fixed by immersion in ethanol for 5min, and air-dried. Scanning electron microscopy (SEM) revealed gingival fibroblast adhesion was statistically higher (over control) for Ti, Ti-Zr, but not for ZrO₂. We employed AFM (5–10nm lateral resolution) to explicate the role of nanoscale roughness on cellular attachment; in particular, whether the nanoscale roughness played a dominant role in adhesion. Images taken at size scales of 2 to 100 µm revealed the instrumented surface of Ti, Ti-Zr, and ZrO₂. Critically, these nanoscale features would have been difficult, if not impossible, to identify using traditional optical profilometry methods. Following cell plating, AFM clearly shows protruding cells on the control surface and a “planarizing” of the nanoscopically rough surfaces of instrumented Ti and Ti-Zr. This “planarizing” likely occurs by filling of the pits and fissures with extracellular matrix during attachment. Alternatively, on ZrO₂, the GF protruded from the surface for both the control and instrumented surface.

Conclusion: In conclusion, the increase in nanoscale roughness following instrumentation, along with macroscale roughness, may play a significant role in GF attachment and adhesion for dental and healing implant materials, as it is more consistent with cellular size scales.

105. **ANALYSIS OF QUASAR OUTFLOW ABSORPTION LINES**

Sean Lindgren and Dr. Jack Gabel, Department of Physics, Creighton University, Omaha, NE.

Outflows from quasars can be detected from absorption lines in their ultraviolet spectra. Outflows might contain very large amounts of energy that could affect the galaxy's evolution. I will detail our analysis techniques, demonstrating how we determine the physical characteristics of an outflow from a UV spectrum of a quasar. I will present a sample analysis of a spectrum from the Hubble Space Telescope, demonstrating how we measure the column densities and covering factor from the absorption lines. Photoionization models are then used to determine ionization states and the total energy of the outflow.

106. **SIMULATIONS OF ELECTRON-POSITRON PAIR PRODUCTION IN ULTRA-PERIPHERAL COLLISIONS AT STAR**

Jacob Shearer, Department of Physics, Creighton University, Omaha, NE.

The Relativistic Heavy Ion Collider (RHIC) accelerates fully stripped gold nuclei to nearly the speed of light, later allowing these ion beams to collide head on in six different locations around the accelerator ring. The Solenoidal Tracker at RHIC (STAR) detects and studies collisions of the nuclei in the beams. These collisions can vary in their overlap, with everything from head on collisions, all the way to ultra-peripheral collisions. In ultra-peripheral collisions, the impact parameters are greater than twice the nuclear radius, thus the interactions are electromagnetic, and not hadronic. In these ultra-peripheral collisions intense electromagnetic interactions can produce, among other things, electron-positron pairs, thus providing us with an insight to quantum electro-dynamics. The data collected must be compared to models to interpret the underlying physics. To do this, we use STARlight, a Monte Carlo implementation of one current model of ultra-peripheral collisions. In experimental results, the electron positron pairs we observe can be produced through many channels. With STARlight we can predict what might be seen if each channel of electron positron pair production were isolated. We can combine these isolated predictions to model what we would expect to see in experimental data. I will present the results of this combined prediction of electron positron pair production through the use of the STARlight Monte Carlo.

Acknowledgment: This work supported in part by the US Department of Energy.

107. **ACCELERATING SUSTAINABLE TRANSPORT: EXPLAINING STATE-LEVEL VARIANCE IN THE GROWTH OF ELECTRIC VEHICLES**

Robert Cronkleton and Stephanie Le, Department of Political Science Creighton University, Omaha, NE.

Twenty-seven percent of greenhouse gas emissions in the U.S. come from the transportation sector. If one can accelerate the adoption of electric vehicles (EVs), then one can reduce emissions from cars using fossil fuels. From 2012 to 2015, the national average of number of EVs grew; however, there was much variability within that growth, with some states having upwards of 60% growth and some as low as .1%. The question then becomes, what explains the variance in state-level growth of electric vehicles? My research examines the role of federal and state policies, the dominant political party, local utility companies, metropolitan planning organizations (MPOs), population density, and personal income plays in EV growth. To analyze these variables, I employ an ordinary least squares (OLS) regression analysis. I find that population density, the activities of state legislatures, and personal income do not play a statistically significant role; and of all the significant variables, utility companies have the most influence on the growth of a state's EV market. From policymakers to participants in grassroots movements, efforts to influence local utilities in favor of electric vehicles should be prioritized over other efforts.

108. **EXPLORATION OF PATIENT SATISFACTION BASED ON INSURANCE PROVIDED BY THE AFFORDABLE CARE ACT**

Arianna Dalamaggas, Department of Political Science, Creighton University, Omaha, NE.

The purpose of this study is to explore patient satisfaction among those with insurance obtained from the Health Insurance Marketplace as created by the Affordable Care Act. Data from a 2014 study conducted by The Associated Press – NORC Center for Public Affairs Research at the University of Chicago was used and obtained from ICPSR. T tests and multivariate regression analyses were employed to test the difference in satisfaction means by insurance type, exchanges or employer based and then to test effects of other variables that are believed to contribute to the level of satisfaction. It was found that there is no significant difference in satisfaction between those with employer or exchanges based insurance. Additionally, it was found that when including independent variables such as gender, age, and marital status in the regression, the type of insurance was no longer significant in determining satisfaction. The results of this study show that while right now, having insurance through the Marketplace or through an employer shows no significant difference in satisfaction with the quality of care received, this study can serve as a foundation for expanded research in the future if looking at a longitudinal time series study. This may yield different results with more cases through more years. Additionally, the penalty associated with the individual mandate would have begun, effects of which would be observable in the collected data could also contribute to potential differences. The results of the study are important as a quantitative way to show that level of satisfaction can be more accurately predicted by factors other than having insurance through the ACA.

109. **WHY INTERVENE: INFLUENCES ON**

Elizabeth Kafer, Department of Political Science, Creighton University, Omaha, NE.

This study examines influences on both the likelihood and magnitude of US military intervention in internal conflicts. Using data from the Major Episodes of Political Violence database, a series of logistic and ordered logistic regressions are employed to test influences at the domestic level, those concerning the relationship between the United States and a conflict state, and conflict characteristics. As accurate information for the number of refugees was not available before 1960, two categories of models are employed from 1945-2007 and from 1960-2007 to include this measure. Some domestic level influences, particularly presidential election year and divided government, prove influential on the likelihood of intervention. Conflict characteristics prove significant across all models on both the decision to intervene and the magnitude of intervention, most notably the intensity of violence and regime type of the conflict country.

110. **IMMIGRANT REMOVAL RATES: FACTORS OF DECISION-MAKING**

Erin Kurvers, Department of Political Science, Creighton University, Omaha, NE.

This paper seeks to explain the variation in United States' immigrant removal rates across countries of origin. I theorize that immigration judges hold certain political, economic, and social biases for each country, which impact the country's corresponding immigrant removal ratio. I run an OLS regression model testing the effects of country freedom score, U.S military assistance, political terror, GDP per capita, distance from the United States, region and religion on the immigrant removal rate. I find that political and regional variables impact a country's immigrant removal rate, but economic considerations have no significant effect.

111. **FREEDOM FROM CORRUPTION AND ITS MITIGATING FACTORS**

Joseph Martin , Political Science Creighton University, Omaha, NE.

This research project tests which factors either mitigate or aggravate corruption to cause more or less damage to the economies of states. In order to discern which factors are most important in mitigating or aggravating the damage done by corruption multiple regression using interaction terms are used. The analysis suggests there is a trend among the most corrupt countries to sometimes increase their GDP and FDI when acting in ways that aid and abet corruption. Further more as there is an increase in transparency, the models tend to show a decrease in GDP growth when there is statistical significance. It is important to note that in many of the results, a trend emerges where the ability of the model to predict results becomes less reliable as the state becomes less corrupt and calls for more data based on time observations.

112. **STUDYING FOREIGN LANGUAGE EDUCATION AS A HIGH SCHOOL GRADUATION REQUIREMENT**

Harrison Biggs, Department of Political Science, Creighton University, Omaha, NE.

This paper tests why some US states have foreign language education as a high school graduation requirement. Using political, economic, and social factors, the research examines 49 states from 2009-2014 to determine what impacts a state's decision to require foreign language education. A negative relationship is found between the average number of citizens per operating school district and a state's foreign language education policy, with larger school districts being less likely to have the policy. The findings suggest that the higher a state's education spending per pupil, the more likely the state is to require foreign language education.

113. **WHAT FACTORS OF A COUNTRY'S GOVERNMENT AFFECT ITS CITIZENS OVERALL HAPPINESS?**

Jonathan Hendrzak, Department of Political Science, Creighton University, Omaha, NE.

The question being considered is what factors of a country's government affect its overall happiness. The field of happiness research resulting from political actions has recently become a more prominent topic due to increased curiosity on what makes humans happy. There were 10 independent variables examined to determine if they affected the dependent variable, happiness. Other variables found to be significant were the corruption index (Freedom from Corruption), Unemployment, and GDP Per Capita. Density and Prostitution legality was found to be significant in half of the models. The key to happiness would be a country that has many civil rights, legal prostitution, high GDP, and corruption being absent.

114. **RETROSPECTIVE EVALUATION OF PATIENT SATISFACTION IN TELEPHONE AND IN-PERSON DISCLOSURE METHODS OF BRCA 1/2**

Christina Rei, Carrie Snyder, Chris Wichman, and Henry Lynch, Department of Preventive Medicine, Creighton University, Omaha, NE.

Purpose: To compare patient satisfaction between telephone and in-person BRCA1/2 genetic test disclosure methods.

Methods: 1356 questionnaires were mailed to patients from the Creighton University Hereditary Cancer Center's registry with in-person and telephone BRCA 1/2 genetic test disclosure between 1992 and 2015

1. Patient satisfaction retrospectively measured on a four point scale (strongly disagree, disagree, agree, strongly agree)

2. Other information gathered: (a.) return for clinical follow-up (b.) preference of disclosure method (c.) distance from genetic counselor/clinic
3. Statistical analysis using odds ratio with 95% confidence interval

Results: 289 of 1356 questionnaires returned (21.3% response rate); 153 in-person and 136 telephone disclosures:

Assessment of patient satisfaction:

“I felt a connection to my counselor” Estimated odds that a person contacted in-person agreed is 3.3 times greater (OR = .3039, CI 95% .1602-.5766)

“I felt I could talk about my reaction to my test results” Estimated odds that a person contacted in-person agreed is 2.7 times greater (OR = .3619, CI 95% .1587-.8251)

“I found it easy to communicate with my genetic counselor” Estimated odds that a person contacted in-person agreed is 2.4 times greater (OR = .4248, CI 95% .1900-.9500)

“Getting my test results was convenient” Estimated odds that a person contacted by phone agreed is 2.2 times greater (OR = 2.2115, CI 95% 1.0118-4.8338)

“I was satisfied overall with the way my results were delivered” The difference between methods was not statistically significant

Assessment of delivery method preference:

Telephone disclosure patients: 88.0% would not have preferred in-person delivery.

In-person disclosure patients : 90.2% would not have preferred telephone delivery.

Conclusion: Overall, patients exhibited no difference in overall satisfaction between telephone and in-person disclosure methods. It may still be necessary to apply clinical judgment in selecting patients for alternative disclosure methods when considering emotional circumstances accompanied by in-person disclosure methods.

115. **EVALUATING EMPLOYEE PERFORMANCE IN THE CONTEXT OF RACE AND TIME PRESSURE[‡]**

Rachel Heinen and Joshua Fairchild, PhD, Department of Psychology, Creighton University, Omaha, NE.

In an effort to perform in a stressful or time-limited situation, participants may also resort to automatically processing information to make decisions efficiently, such as resorting to stereotypes. Therefore, although participants are not being explicitly asked whether they have racial prejudice, racial bias may be exhibited in the ratings of employees with different races if this racial bias is embedded unconsciously and provoked by time pressure. We hypothesized that employee race will influence evaluations of employee performance, such that participants making performance evaluations will rate Hispanic and African American employees lower than Caucasian employees. Secondly, we hypothesized that time pressure will be correlated with System 1 thinking and the degree of bias, with greater discrepancies between evaluations of Caucasian and minority employees. 544 participants participated in an online study with a 2 (Time Pressure) x 3 (Employee Race) x 3 (Performance Level) mixed factorial design. Participants were randomly assigned to either the time pressure condition of two minutes maximum or the no time pressure condition. Participants were shown a prompt that instructed them to assume the role of a manager to evaluate each hypothetical employee. Each employee performance profile included a picture of Hispanic, African American, or Caucasian male accompanied with a description of high, moderate, or low performance. A significant effect on race and performance level was found. Variability in ratings were most significant in the ratings of moderate performance, where Caucasian men were rated significantly higher than both Hispanic and African American men. The moderate performance profiles included more ambiguous descriptions of performance and where the employees' performance ratings should lie on the scale. Supplemental analyses also revealed a 3-way interaction between race, performance level,

and college education. When participants had at least some college education, there was significantly less variation in ratings due to employee race.

Acknowledgment: CURAS Dean's Summer Research Fellowship

116. **PERCEIVED PSYCHOLOGICAL MOMENTUM AND RISKY DECISION MAKING[‡]**

Christopher Kokotajlo and Corey Guenther, Department of Psychology, Creighton University, Omaha, NE.

Psychological Momentum (PM) is perceived as an extra-individual force capable of impacting thoughts and behaviors in achievement contexts. Although positive PM is generally construed as beneficial and capable of elevating performance (Lerner et al., 2004), the present study tested whether positive PM may also elevate risky decision-making tendencies. Participants first completed a memory task on the computer in which they were given false feedback in order to imbue them with PM. Participants gave self-reported ratings of their PM and confidence in their memory abilities. After, they then completed another memory task to measure risky behaviors. Results supported the prediction that increased PM leads to greater risky decisions. Implications extend to clinicians in the mental health field, stock investors, and athletes.

Acknowledgment: I would like to thank CURAS for the funding this research project.

117. **ATTENTION TRAINING EXERTS THERAPEUTIC EFFECTS ON PTSD SYMPTOMS IN ONLY FOUR SESSIONS**

Shannon Toalson, Amy Badura-Brack, and Rachel Fernandez, Department of Psychology, Creighton University, Omaha, NE.

We recently published the results of two clinical trials of attention bias modification (ABMT) and attention control training (ACT) for combat-related PTSD.¹ Both treatments resulted in significant symptom improvement, and ACT was more efficacious than ABMT for PTSD. Here, we evaluate previously unreported data to explore the time course of symptom improvement. Forty-six male U.S. military veterans serving in Iraq or Afghanistan consented to participate and were randomly assigned to ACT or ABMT; both utilizing a faces-based dot-probe task.⁶ We delivered eight training sessions, and veterans completing all assessments were included in the current analyses ($n = 31$). Here, we report PTSD Checklist – Military version (PCL-M) scores obtained during a pre-treatment phone screen, after receiving four sessions of treatment, and after receiving all eight training sessions. The repeated measures ANCOVA with three within subjects levels for time and two between subjects levels for treatment, in which we included pretreatment depression scores as a covariate, revealed a significant main effect for time, a significant time by depression interaction, but no time by treatment interaction emerged. Follow-up pairwise comparisons revealed significant differences from phone screen to 4th session PCL-M ($p < .001$), but no effect from 4th session to 8th session PCL-M. Results showed that the first four sessions of both ACT and ABMT had significant symptom reductions, but no significant improvement occurred during the last four sessions. These findings raise questions, as the eight-session U.S. trial had stronger effects than the four-session Israeli trial. We originally concluded that the additional training sessions in the U.S. trial likely accounted for those effects; however, this study calls for future investigation into an optimal dosing schedule for attention training in PTSD and whether the faces-based variant of the dot-probe task used in the U.S. trial might be the significant component.

Acknowledgment: Research funded by: At Ease USA

118. **EMOTION REGULATION DIFFICULTIES MODERATE INDUCED NEGATIVE AFFECT AND DRINKING URGES[†]**

Pallavi Aurora, Alicia Klanecky, Paige Rainforth, Haley Pethick, & Serenity McAndrews, Department of Psychology, Creighton University, Omaha, NE.

Purpose: Several findings have indicated that experiences of negative affect, including those elicited via mood induction procedures, are related to alcohol use variables (Grant & Stewart, 2007; Hartwell & Ray, 2013; Treloar & McCarthy, 2012). These reports may be particularly descriptive of students who have emotion regulation difficulties. Previous research has identified a positive relationship between emotion regulation difficulties and increased alcohol consumption (Dvorak et al., 2014; Veilleux et al., 2014). The current study sought to examine preliminary results from a mood induction study, as well as how emotion regulation reports function during the experience of experimentally-induced negative affect. It was hypothesized that emotion regulation difficulties would moderate the relationship between affective experience and drinking urges.

Method: College students (N=71) were randomly assigned to an experimentally-induced negative or neutral mood induction condition. Questionnaire batteries were completed pre- and post-induction.

Results: Manipulation checks confirmed that participants in the negative mood condition experienced significantly increased negative ($t(69)=-4.07, p<.01$) and decreased positive affect ($t(69)=3.29, p<.01$) compared to those in the neutral condition. After accounting for baseline drinking urges, results indicated that participants in the negative condition experienced significantly greater urges to drink compared to the neutral condition ($F(1,67)=7.04, p=.01$). Emotion regulation difficulties reported at baseline moderated this effect at a trend level ($\Delta R^2=.02, \Delta F(1,65)=3.53, p=.07$). Exploratory analyses examined individual facets of emotion regulation with findings that impulse-control difficulties significantly moderated the relationship between mood condition and drinking urges ($\Delta R^2=.03, \Delta F(1,65)=6.20, p=.02$).

Conclusion: Data collection is ongoing; however, preliminary findings support the current mood induction procedures. Results also support the relationship between negative affect and drinking urges particularly for students who experience negative emotions as overwhelming, and subsequently, have difficulties controlling their behaviors.

119. **DEVELOPMENT AND VALIDATION OF A SURVEY TOOL TO MEASURE HEALTHCARE PROVIDER BIAS IN PROVIDING SERVICES TO DIVERSE PATIENT POPULATIONS**

Greg Jarding, PharmD Candidate; Amy A Abbott², RN, PhD; Naser Z Alsharif¹, PharmD, PhD; Shirley A Blanchard¹, PhD, OTR/L; Thomas L. Budesheim³, PhD; Karen A Paschal¹, DPT, MS; Mark V Siracuse¹, PharmD, PhD; Ted Kaufman¹, ¹School of Pharmacy and Health Professions, ²College of Nursing, and ³Department of Psychology, Creighton University, Omaha, NE.

Purpose: The purpose of this study was to develop “comparable” multidisciplinary surveys to identify provider bias which may contribute to disparities in healthcare delivery by pharmacists, nurses, occupational therapists, and physical therapists.

Methods: Survey items were developed from themes extrapolated from literature reviews. Questions addressed attitudes and behaviors associated with the cultural proficiency continuum, cultural competency, factors impacting patient care, and causes of health care disparities. Questions representing demographics, factual knowledge, attitude, behavior/practice, and patient population were modified following feedback collected during interviews with individuals from the

respective professions. Each profession conducted two focus groups and one-on-one phone interviews. Data were collected on the clarity and relevance of the survey design through verbal and written feedback following completion of the survey. Interviews were audio recorded, transcribed, and analyzed by the researchers. Data from participants was compiled and analyzed using factor analysis and determination of scale reliability to decide which questions will be included in the final survey for each profession.

Results: Focus groups and one-on-one interviews have been conducted where each profession contributed observations about survey instructions, organization, wording and content of questions about provider bias. Quantitative analysis of survey results indicate statistically significant differences in medians for 11 items out of 37 when comparing responses across the four professions. Qualitative analysis of focus group and individual interviews will help to better understand differences and similarities in responses.

Conclusions: Recent research has shown that there may be disparities in healthcare services provided to patients from diverse populations. This survey has been developed to measure differences between professions and to sensitize providers to become more culturally aware. The interview responses will be useful to enhance the survey prior to further administration to larger numbers of health care professionals.

Acknowledgement: Funding was provided by a Haddix Research Grant.

120. **INTRANASAL DELIVERY OF SYNERGISTICALLY ACTIVE CURCUMIN-RESERVATROL FOR HIGH BIOAVAILABILITY**

Zalak Patel, Harsh Chauhan, and Anthony Kincaid, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

As we see an increasing number of cancer chemotherapy agents, one of our biggest challenges with oral drugs are bioavailability. To increase the bioavailability, delivery through the intranasal route can be a practical and non-invasive alternative route for administration. The nasal route is one of the most permeable and highly vascularized routes for drug administration in comparison to the gastrointestinal tract and liver, resulting in rapid absorption and onset of therapeutic action. The hypothesis of our project is that high bioavailability of curcumin-resveratrol amorphous delivery systems can be achieved by intranasal route, which can be translated into enhanced anti-proliferative activity. Specific Aim 1 of the project is to prepare and characterize a novel concentrated amorphous curcumin-resveratrol system for intranasal delivery. In specific aim 2, we will carry out histological studies to establish the mechanism(s) of curcumin-resveratrol transepithelial transport. The proposed research is a first-time attempt to deliver combinations of potent synergistically acting drug via intranasal route. Various different preparation techniques have been done using different polymers for the amorphous solid dispersion of curcumin and resveratrol.

Methods: a) Nitrogen evaporation of 25:25:50 w/w/w dispersions of curcumin:resveratrol: polymer (PVP, EPO, HPMC/PEG) were prepared. b) Solvent evaporation by rotavapor, 25:25:50 w/w/w of curcumin: resveratrol: polymer dispersions were prepared and characterized by X-ray diffraction. IR and Raman were used to study interactions between drug and polymer.

Results: Nitrogen evaporation does not yield amorphous formulation of drugs at the concentration we would like. Solvent evaporation decreased crystallinity of drugs at 25:25:50 ratios. The most effective polymer for formulation based on our studies was EPO. Internal funding and external funding will be applied to carry out specific aim 2.

Conclusion: Further research and studies will be done with animal model testing with the intranasal route, and also histological studies to establish the curcumin-resveratrol transepithelial transport. The stability of these dispersions and characteristics will further be studied.

121. **EVALUATION OF THE DIABETIC KETOACIDOSIS PROTOCOL WITHIN A COMMUNITY HEALTHCARE SYSTEM**

Kathleen Calkins, Pharm.D. Student; Stacey K. Dull, Pharm.D., BCPS; Ryan B. Dull, Pharm.D., BCPS; Erin K.G. Santiago, Pharm.D., School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: Diabetic ketoacidosis (DKA) is an acute, potentially life-threatening hyperglycemic emergency in patients with diabetes mellitus which increases morbidity and mortality if not treated appropriately. In our community healthcare system, treatment of DKA is protocol-based and reportedly based on the current American Diabetes Association (ADA) guidelines; however, many health care professionals feel the protocol is inadequate and may not achieve its goals. The primary objective of this study was to determine if our community healthcare system's DKA protocol achieves the glycemic targets established by the ADA guidelines for hyperglycemic crises.

Methods: We performed a retrospective chart review of adult patients admitted to a CHI Health legacy hospital from January 1, 2015 through April 30, 2015 with a diagnosis of DKA. Patients were excluded if they received subcutaneous insulin without intravenous insulin, the DKA protocol was not used to order insulin or they were pregnant. Descriptive data was collected including patient demographics, laboratory values including point of care blood glucose tests (POCT), DKA severity, hospital and ICU length of stay, and in-hospital mortality.

Results: Of 147 DKA cases reviewed, 24 were included in our analysis. The median age was 32 years, 62.5% were female, and 29.2% presented with severe DKA. A total of 172 POCT were performed during the acute phase and 335 POCT were obtained during the maintenance phase. Eleven percent of POCT during the acute phase achieved an appropriate rate of blood glucose decline while 23.3% of POCT during the maintenance phase sustained target blood glucose.

Conclusion: Our community healthcare system's DKA protocol does not adequately achieve the glycemic targets established by the ADA guidelines for hyperglycemic crises. The results of this analysis are being used to make evidence-based revisions to our DKA protocol which will enhance achievement of ADA established glycemic targets.

122. **RETROSPECTIVE EVALUATION OF TRIGLYCERIDE MONITORING WITH PROPOFOL USE IN CRITICAL CARE PATIENTS AT AN ACADEMIC MEDICAL CENTER**

Hoang K. Pham, Jacky Lee, Wendy J Weber, and Mark A Malesker, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: Propofol (Diprivan) is a hypnotic agent for induction and maintenance of general anesthesia and sedation. Reports suggest that prolonged use of propofol in the intensive care unit (ICU) is associated with increased risk of hypertriglyceridemia, pancreatitis, hepatomegaly, and metabolic acidosis. Clinical practice guidelines recommend assessing triglyceride levels at baseline and every 72 hours with propofol use. The primary objective of this study was to evaluate compliance with triglyceride (TG) monitoring in ICU patients receiving propofol at an academic medical center.

Methods: This was a retrospective, observational single center cohort study. This project was approved by the University's Institutional Review Committee. Inclusion criteria included adult patients (age greater than 19 years) admitted to CHI Health Creighton University Medical Center (CUMC) from January 1, 2013 to December 31, 2014 that received propofol in the intensive care

unit for more than 24 hours. Exclusion criteria include age less than 19 years, propofol use for less than 24 hours, and propofol administered for surgical procedures.

Results: A total of 100 included patients met the inclusion criteria. The sample size was 63% male with an average age of 55 years. Propofol was dosed for an average of 3.2 days (range 2-16). The median propofol dose was 30 mcg/kg/min. Seventeen patients (17%) had the preprinted sedation order set utilized. Twenty five patients (25%) had triglyceride (TG) levels obtained at baseline. The average baseline TG level was 143 mg/dL (range 50-958 mg/dL). Overall, 18 patients had the TG levels monitored after 72 hours.

Conclusion: These data suggest TG monitoring was suboptimal in this patient sample. The results of this project were presented at the P&T Committee. Opportunities for improvement were recognized and discussed in an interprofessional forum. Limitations of this study include the single center data analysis and those limitations inherent to the retrospective design.

123. **AN EXAMINATION OF OCCUPATIONAL THERAPY PRACTICE AND CRITICAL PATHWAYS IN ACUTE ORTHOPEDIC CARE**

Kate Stoffer, Vanessa Jewell, PhD, OTR/L; and Helene Lohman, OTD, OTR/L, FAOTA, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Critical pathways (CP) are designed to prescribe ideal timing and ordering of interventions to manage healthcare costs and are typically based on evidence-based practice. As hospitals utilize CPs, occupational therapists may find that discipline-specific models focusing on client-centered care more challenging and feel limited in their role as a therapist (Andrews et al., 1998). The purpose of this study is to identify the provision of specific occupational therapy interventions, the frequency with which they are provided, and the frequency of the provision of client-centered interventions; within a structured healthcare model, with clients who have acute orthopedic conditions. A prospective, observational descriptive design was employed in order to provide an in-depth and accurate description of the occupational therapy interventions. This pilot study consisted of a convenience sample of two occupational therapists who treated clients with acute orthopedic conditions. Observations occurred over a three week period by a blinded research assistant. Overall, a focus on basic self-care interventions (e.g. toileting, dressing) were frequently completed due to the short length of stay and structured healthcare environment. Acute care is a fast-paced clinical environment, with short patient hospital stays, that frequently led to patients discharged to receive postacute care for additional rehabilitation.

Acknowledgment: This project was funded by the SPAHP Student Research Fellowship Program.

124. **CULTURAL AND LINGUISTIC CONSIDERATIONS FOR OPTIMAL PATIENT CARE FOR HISPANIC PATIENTS WITH NON-NATIVE SPANISH SPEAKING CLINICIANS[‡]**

LiseAnne Gregoire and José McClanahan, Ph.D., Department of Spanish and Hispanic Studies, Creighton University, Omaha, NE.

Purpose: The recent growth of Hispanic population has presented challenges in the United States. This increase is expected to surpass 30% of the national population. The healthcare system is particularly susceptible to the changes in the nation's residents. Even more concerning is the specialty fields that need to be aware of the new needs that their changing populations have. In particular, the field of Physical Therapy has been slower than the general medical field to adopt an awareness of the unique needs of Hispanic patients. Therefore, this presentation addresses this concern.

Methods: Through a comprehensive literature review, it has been revealed that there is a woeful lack of research into this Spanish-speaking population and their care as it relates to Physical Therapy practice. As such, my presentation focuses on five different areas of interest: 1) gender, 2) generations, 3) regional differences, 4) relationships to work, and 5) social structures.

Conclusion: Here, my work focuses on how physical therapists can better understand the barriers to quality care while taking into account the outlined areas. As such, this work provides present and future physical therapists with important information about this expanding and important sector of the United States population. However, further investigation of this topic is needed within this area.

Acknowledgement: Funding was provided by the Center for Undergraduate Research and Scholarship- College of Arts and Sciences Dean's Summer Research Fellowship.

125. **STRUCTURAL CHARACTERIZATION OF A SPERMINE-BINDING MAMMALIAN RIBOSWITCH[‡]**

Daniel Kresock, Department of Chemistry, Creighton University, Omaha, NE.

Riboswitches are regulatory sequences found within messenger RNA. Upon the binding of a ligand to the riboswitch, the RNA molecule undergoes a conformational change, resulting in down regulation of gene expression via early termination of transcription or translation. While the vast majority of known riboswitches are present only in bacteria, this project focuses on a putative mammalian riboswitch. The riboswitch has been shown to selectively bind the ligand spermine and modify polyamine biosynthesis through regulation of ornithine decarboxylase antizyme from the OAZ1 gene. The antizyme protein inhibits a key enzyme involved in polyamine synthesis, ornithine decarboxylase (ODC), by binding ODC and targeting it for degradation by the proteasome. Polyamines are essential to many cellular processes, namely cellular growth and reproduction. Halting the production of polyamines prevents cell growth. Because of its unique regulatory function, the spermine riboswitch has potential medicinal applications, including anticancer pharmaceuticals. To investigate spermine-RNA binding, a biophysical approach has been taken. Isothermal Titration Calorimetry (ITC) accurately measures the heat absorbed or evolved during interaction between biomolecules in order to determine the stoichiometry of binding, as well as the equilibrium association constant for the RNA-ligand reaction. ITC experiments can support a variety of macromolecules, allowing for a large range of natural and synthetic spermine analogs to be tested and compared. Preliminary results from ITC, and in-line probing, indicate a binding affinity in the ~100 μ M range. These studies and future work will render a better understanding of the binding properties between metabolite and RNA and may aid in development of synthetic ligands/metabolites for use as cancer therapies.

126. **THE INFLUENCE OF WOMEN'S SOCIAL MOVEMENTS ON THE CREATION OF LAWS AGAINST GENDER VIOLENCE IN BUENOS AIRES, ARGENTINA**

Katie McClave, Department of Anthropology, Sociology and Social Work, Creighton University, Omaha, NE

This research investigated the influence of women's social movements in Argentina on the creation and implementation of laws against violence against women in Buenos Aires. This study examined the human rights issue of violence against women through the lens of social movements and the law in Argentina and its broader application to a worldwide discussion of gender violence in today's world. This investigation focused on the laws 26.485, Protection of Women, and 14.407, the declaration of a state of emergency regarding gender violence. This study was qualitative, employing the use and analysis of three semi-structured interviews conducted with prominent women who have worked with these laws and are feminist activists in Buenos Aires. An analysis of the Argentinean laws regarding violence against women and existing literature provided a theoretical framework. The findings of this study were organized into five themes: the concept of violence, the movements of women and their influence on the law, the law of emergency, the faults of the law, and the next steps of women's movements regarding the law. These findings suggest that historically, women's social movements greatly influenced the creation of laws regarding violence against women, without these movements, Law 26.485 might never have been written. The laws are well written but are rarely enforced. Implementation of the laws is the next step for women's social movements fighting gender violence. This study shows both the history and the future of this human rights battle, the progress already made, and what is yet to be done.

* Summer Faculty Fellow Recipient

** Haddix Grant Recipient

† CURAS Faculty Research Fund Recipient

‡ CURAS Undergraduate Research Awardee

§ Clare Boothe Luce Research Award Recipient

STUDENT ORAL PRESENTATION ABSTRACTS

1. CHARACTERIZATION OF A THIRD TRANSKETOLASE IN SALMONELLA ENTERICA

9:15 AM – Harper Center Room 3028A

Jeff Shaw, and Travis J. Bourret, Department of Medical Microbiology and Immunology, Creighton University, Omaha NE.

Purpose: The *S. Typhimurium* genome encodes two transketolases of the Pentose Phosphate Pathway that have been characterized (TktA and TktB). Two genes (STM2340 and STM2341) are hypothesized to encode a third transketolase (TktC). This study aims to explore the functionality of TktC in *S. Typhimurium*.

Methods: A library of *S. Typhimurium* strains with mutations in *tktA*, *tktB*, and/or STM2340-41 (*tktC*) was generated. Growth kinetics were monitored in LB media, or M9 salts supplemented with either 0.2% glucose or ribose. Additionally, the expression of STM2340 and STM2341 was determined by qRT-PCR. Lastly, a transketolase enzymatic activity assay was used to measure transketolase kinetics in each of the strains.

Results: *S. Typhimurium* transketolase mutant strains had comparable growth patterns to wild-type when grown in LB. In M9 salts, all strains grew using 0.2% glucose as the sole carbon source. When 0.2% ribose was the sole carbon source, all strains grew except the $\Delta tktA\Delta tktB\Delta tktC$ strain. The expression of STM2340 and STM2341 was higher in the $\Delta tktA\Delta tktB$ strain compared to the basal levels observed in wild-type cells. Moreover, transketolase activity was detected in the $\Delta tktA\Delta tktB$ strain, while transketolase activity was absent in the $\Delta tktA\Delta tktB\Delta tktC$ strain.

Conclusions: These data suggest that TktC is capable of performing the transketolase reaction. This was supported by observations that 1) the transketolase-deficient strain grew in minimal media with glucose as the sole carbon source but failed to grow with ribose as the sole carbon source, 2) expression of STM2340 and STM2341 is induced in strains lacking *tktA* and *tktB*, and 3) transketolase activity was observed in $\Delta tktA\Delta tktB$ but absent in the strain lacking all three transketolases. Taken together, these data support the hypothesis that STM2340 and STM2341 produce a functional transketolase in *S. Typhimurium*.

Acknowledgment: This work was supported by Creighton University startup funds.

2. ROLE OF TREMS AND VITAMIN D IN MALIGNANT MELANOMA

9:30 AM – Harper Center Room 3028A

Austin Nguyen, Sheila Bhavsar, and Devendra K Agrawal, Department of Clinical and Translational Science, Creighton University, Omaha NE.

Rationale: Malignant melanoma is the prototypical immunogenic malignancy, with progression depending on cytokine signaling and interactions between tumor cells and inflammatory cells. The triggering receptor expressed on myeloid cells (TREM) is associated with the innate immune and inflammatory response with implications of tumor promotion. Vitamin D has a vast immunomodulatory and generally anti-inflammatory role. The vitamin D receptor (VDR) has been

shown to be inversely associated with melanoma progression. While these molecules are diverse in function and nature, their joint role has not been investigated in melanoma.

Methods: Sections of consecutive archival tissue of malignant melanoma cases obtained from the Creighton University Medical Center Department of Pathology were immunohistochemically (IHC) evaluated using antibodies against TREM-1, TREM-2, and VDR. Additionally, A2058 metastatic melanoma cells were treated with vitamin D3 at 0, 1, 10, and 50 nM. Immunoblotting was performed on protein isolate. In situ fluorescent immunocytochemistry was performed on sections of treated cells embedded into formalin cell microarrays. Cell migratory ability was assessed using scratch and transwell assays.

Results: Immunostains of melanoma cases demonstrated the TREM-1 to TREM-2 ratio to have possible involvement in malignant state. Additionally, VDR appears to be associated with tumor staging and have some interaction with TREM-1 levels. Cell culture demonstrated vitamin D treatment to induce TREM-1 and VDR expression.

Conclusion: Considering its immunomodulatory functions, decreased expression of VDR in metastatic melanoma could be of prognostic value. In addition, decreased expression VDR could play a role in cancer progression by facilitating an inflammatory tumor microenvironment. There has been little investigation of the TREM ratio in neoplastic disease. Imbalance favoring pro-inflammatory TREM-1 expression could mediate a protumoral microenvironment in melanoma. Interplay among these molecules requires further investigation.

Acknowledgment: The Department of Clinical and Translational Science, Creighton University School of Medicine supported this work.

3. **EXAMINING THE DUAL-ROUTE CASCADED READING MODEL IN GERMAN LANGUAGE ACQUISITION[‡]**

9:45 AM – Harper Center Room 3028A

Kailey Preston and Dr. Maya Khanna, Departments of Psychology and Modern Languages & Literatures, Creighton University, Omaha NE.

The purpose of the study was to examine how language learners process words and determine the phonology of new words in English and in the language they are learning. Reading models of English speakers are widely researched and documented, but there is a gap in the literature regarding the reading models used by German speakers. Thus, one goal of the study is to determine what kind of reading model is favored by German speakers, and how that model may differ from those designed to explain English pronunciations. Another goal for the study is to see if the model used for reading aloud, in English or German, changes as a person becomes more proficient in German. Nonwords in both English and German (e.g., blark or hahlt) were presented to L1 and L2 speakers of German to read aloud and their pronunciations were recorded. Based on the participants' responses, it is possible to discern which type of reading model best explains their pronunciation behavior. It was hypothesized that participants will show a significant progression towards a rules-based model of pronunciation as their proficiency in German increases, in both the English-based and German-based nonwords. This would be a departure from the dual-route reading model utilized by English speakers and would provide further insight into language processing and language acquisition.

4. **INTERPLAY BETWEEN RNA EXPRESSION AND PROTEIN PRODUCTION OF OMPC AND OMPF PORINS IN CTX-M-PRODUCING ESCHERICHIA COLI**

10:00 AM – Harper Center Room 3028A

Corey Suelter and Nancy D. Hanson, Department of Medical Microbiology and Immunology, Creighton University, Omaha NE.

Background: Porins are the primary route of entry for β -lactam antibiotics in Gram-negative organisms. Alterations in porin production can decrease permeability across the outer membrane, limiting antibiotic entry and resulting in a carbapenem-resistant phenotype when complemented with an extended-spectrum β -lactamase (ESBL). CTX-Ms are the most prevalent ESBLs and confer resistance to cephalosporins but not carbapenems. The objectives of this study were to evaluate RNA expression and protein production of OmpC and OmpF in 9 clinical isolates expressing either CTX-M-14 or CTX-M-15 and evaluate carbapenem susceptibility.

Methods: RNA expression was analyzed by qRT-PCR, and relative fold-change was calculated using the $2^{-\Delta(\Delta CT)}$ method. Protein was evaluated by Western blot, and relative fold-change was quantified using Stain-Free™ technology. Carbapenem minimum inhibitory concentrations (MICs) were measured by Etest® and interpreted using CLSI guidelines.

Results: Increased ompC expression was observed in all isolates (2 to >15,000-fold), but surprisingly, OmpC production was decreased 3-12-fold. 3/8 isolates showed decreased ompF expression (2-5-fold) with similar levels of protein production. 1 isolate had 20- and 27-fold increases in OmpF RNA and protein production, respectively, with a concomitant 12-fold decrease in OmpC production. All isolates were susceptible to carbapenems, but a 2- and 11-fold decrease in doripenem and ertapenem MICs were observed for the OmpF overproducing isolate, respectively.

Conclusions: Decreased porin production with ESBL production has been associated with carbapenem resistance. However, these data suggest that an interplay between the production of OmpC and OmpF may contribute to carbapenem susceptibility in ESBL-producing isolates. Our data also suggests that the level of porin production is critical and requires a specific threshold not met in these isolates for the emergence of carbapenem resistance. The discordant production of OmpC RNA and protein indicates the complex regulation of OmpC production and its role in β -lactam resistance.

Acknowledgment: This research was funded by Streck Inc.

5. **THE EFFECT OF CARDIORESPIRATORY FITNESS ON THE ASSESSMENT OF THE PHYSICAL WORKING CAPACITY AT THE FATIGUE THRESHOLD**

10:15 AM – Harper Center Room 3028A

Brittney Mikkelsen, Jorge Zuniga, William Herron, Frances Frausto, and Anne Pulliam, Department of Exercise Science, Creighton University, Omaha NE.

Purpose: The purpose of this study was to determine if different cardiorespiratory fitness levels (maximal oxygen uptake or VO₂ max) affect neuromuscular fatigue as measured by the physical working capacity at the fatigue threshold (PWCFT).

Methods: Fourteen adults (14 male; mean \pm SD; age = 20.79 ± 0.89 years; body weight = 80.7 ± 10.91 kg; height = 178.4 ± 5.29 cm) volunteered to participate in the investigation. Each subject performed an incremental cycle ergometry test to fatigue while electromyographic (EMG) signals were measured from the vastus lateralis (VL) muscle. Mean, standard deviation, and range values were calculated for the power outputs determined by the PWCFT. The relationships for

EMG amplitude and power output for each subject were examined using linear regression (SPSS software program, Chicago, IL). An alpha level of $p \leq 0.05$ was considered significant for all statistical analyses.

Results: Subjects were divided in a low and high fitness levels according to their VO₂ max values. A paired dependent t-test was used to determine if there were significant mean differences in power outputs associated to the PWCFT test for the low (Mean \pm SD 162.5 \pm 90.14 W) and high (173.21 \pm 49.70 W) VO₂ max groups. The results of the dependent t-test indicated that there were no significant mean differences ($p > 0.05$) between the high and low VO₂ max groups. The zero-order correlation for the power outputs between groups were not significantly correlated ($r = 0.23$).

Conclusion: The results of the present investigation indicated that the cardiorespiratory fitness does not affect neuromuscular fatigue assessment during cycling.

6. **OPEN MOUTHS, OPEN EARS, OPEN MINDS: USING SPOKEN WORD POETRY AS HISTORY[‡]**

10:30 AM – Harper Center Room 3028A

Alessandra Pañares, Department of History, Creighton University, Omaha NE.

Poetry slams, much like page poetry readings, are events where people gather to enjoy and perform original poetry. However, unlike page poetry readings, poetry slams make use of a unique genre of poetry with many names: performance poetry, slam poetry, and, most commonly, spoken word poetry. In recent decades, spoken word has become increasingly popular around the world, and with good reason. Spoken word poets write about relatable issues such as love and loss, but they also discuss culture, identity, and the past in ways that permit marginalized people to speak and be heard. Its origins, its accessibility, and the relationship between trauma, memory, and creativity allow spoken word poetry to provide alternative historical narratives that historians can use as a historical source.

7. **TIME FLIES: REMNANTS OF AUSCHWITZ IN ART SPIEGELMAN'S MAUS[‡]**

10:45 AM – Harper Center Room 3028A

Hailey Austin, Department of English, Spanish, History, Creighton University, Omaha NE.

Art Spiegelman's *Maus* is counted among the leading works in the graphic novel medium that, ostensibly, portray the intergenerational effects of the Holocaust on children born after the event. The comics depict a cartoon-version of Spiegelman interviewing his father, Vladek, about his experiences in Auschwitz. Spiegelman portrays what he envisions of Vladek's trauma from his time in Auschwitz, as well as his own trauma as the child of a survivor. Namely, his passage entitled "Time Flies" depicts Artie discussing the success of *Maus I* seated at his desk, which sits atop the emaciated bodies of dead mice that represent the Jewish people murdered in Auschwitz. Many historians and critics, such as Dominick LaCapra, have argued against the validity of Spiegelman as a true witness to the Holocaust, on the basis of his status as a second-generation, or indirect, sufferer. However, LaCapra and his fellow critics have only focused on a narrow understanding of intergenerational trauma and its implications in their suggestion that, "Those born later should neither appropriate (or belatedly act out) the experiences of victims nor restrict their activities to the necessary role of secondary witness and guardian of memory." Giorgio Agamben, by contrast, resists focusing on how individuals fit into established social categories and types of relationships. Instead, Agamben charts the dynamics of the tumultuous relationship between Vladek and Artie, whose complexities come from their individual traumas, their struggles

with painful memories, and their subsequent expectations of one another (which are frequently unmet and, in their circumstances, impossible to meet.) Reading Maus through the lens of Agamben moves the discussion beyond questions of qualifications for "witnessing" and moves instead to understanding the complexities and limitations of witnessing trauma, which is not a question of where one is located, but where one is situated within their relationships to the ultimate witnesses to such things as genocide--the dead themselves.

8. **QUADRICEPS RATE OF TORQUE DEVELOPMENT DEFICITS FOLLOWING ACL RECONSTRUCTION**

11:00 AM – Harper Center Room 3028A

Marcus Palimenio, Matthew Franco, Joseph B. Lesnak, Dimitrios Katsavelis, Jennifer Bagwell, and Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE.

Purpose: In addition to peak quadriceps strength deficits following ACL reconstruction, the rate at which force is developed is diminished to a greater degree. The purpose of this study is to compare quadriceps torque-generating capacity (torque, resting twitch; RT) and rate of torque development (RTD) between individuals within 2 years of return to sport/activity following ACL reconstruction and individuals without a history of knee injury.

Methods: Twenty healthy participants (age=21.7±1.7 years, height=172.5±16.0 cm, mass=76.0±15.5 kg) and twenty-seven participants with a history of ACL reconstruction (age=19.7±5.5 years, height=175.7±10.6 cm, mass=71.6±15.3 kg) volunteered for this study. Quadriceps torque-generating capacity was quantified by examining maximum torque during a maximal voluntary isometric contraction (MVIC), rate of torque development (RTD) at different time intervals (50, 150, and 250ms) and maximal twitch potentiation following an electrical stimulation (RT) with the muscle in a relaxed state. Differences between limbs were expressed as a percentage using the limb symmetry index (LSI; involved/uninvolved ACL; nondominant/dominant healthy). An ANOVA was used to determine differences between groups for the outcome variables.

Results: Individuals with a history of ACL reconstruction demonstrated greater asymmetries for quadriceps strength ($P < .001$), resting twitch ($P = .008$) and RTD250 ($P = .05$). There were no significant difference between groups for RTD50 ($P = .86$), RTD150 ($P = .65$), and percent activation ($P = .22$).

Conclusion: Decreased strength was due to peripheral factors (RTD250 and RT) and less due to neural (RTD50, RTD150, and percent activation). Rehabilitation efforts should focus on improving both maximum strength and explosive strength.

Acknowledgments: Study was made possible by SPAHP Student Research Fellowship Program (Marcus Palimenio, DPT 2017). Faculty mentorship provided by Dr. Terry Grindstaff, PT, PhD, ATC, SCS, CSCS.

9. **OPTIMIZING BETWEEN SESSION RELIABILITY FOR QUADRICEPS RATE OF TORQUE DEVELOPMENT MEASURES**

11:15 AM – Harper Center Room 3028A

Matthew Franco, Marcus Palimenio, Dillon Anderson, Meredith Chaput, Joseph B. Lesnak, Allison K. White, Dimitrios Katsavelis, Jennifer Bagwell, and Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE.

Purpose: Quadriceps rate of torque development (RTD) has relevance for athletic performance and recovery following knee injury. Previous studies have used the trial with the greatest torque for analysis, but have not adequately described the between session reliability of these measures. The purpose of this study was to determine the number of trials necessary to optimize the between session reliability.

Methods: Twenty participants (age=21.7±1.7 years, height=172.5±16.0 cm, mass=76.0±15.5 kg, Tegner=7.1±1.2) volunteered for this study. Quadriceps torque-generating capacity and RTD were measured using an isokinetic dynamometer (Biodex System 3; Computer Sports Medicine Inc.). RTD was determined at different time intervals (50, 100, 150, 200, and 250ms and maximum torque) from the onset of muscle contraction. Participants performed four isometric contractions as “hard and fast as possible” with 30 seconds rest between contractions. Follow up testing occurred 3-7 days after the first session. Repeated measures ANOVA was used to determine differences across the four repetitions during the first session. Reliability was determined using intraclass correlation coefficients (ICC3,k).

Results: There were no significant ($P > .24$) differences in quadriceps torque-generating capacity or RTD at any of the time intervals across the four isometric contractions. Reliability was maximized by using the average of the top two trials (ICC3,3= .78-.98, 95% CI .58-.99).

Discussion: The results of this study indicate that between session reliability is good for all measures. Reliability was maximized by identifying the two trials with the highest isometric torque and using the average values for data analysis. The results can be used to inform future trials which may investigate changes between sessions.

10. **EVALUATION OF ENAMEL SELF-ETCH ADHESIVES USING SURFACE AND BONDING CHARACTERIZATION**

9:15 AM – Harper Center Room 3028B

Nicholas Fischer and Andrew Baruth, Department of Physics; Wayne W. Barkmeier, School of Dentistry, Creighton University, Omaha, NE; and Toshiki Takamizawa, School of Dentistry, Nihon University, Tokyo, Japan

Purpose: Traditionally, adhesive dentistry has utilized 35% phosphoric acid etchants to prepare and roughen enamel surfaces for bonding. Recently introduced self-etch adhesives prepare enamel and bond simultaneously. This is in contrast to the traditional method of preparing and then bonding. While the ultimate goal of using etching agents is to promote a strong bond between enamel and restorations, we show self-etch adhesives create weaker bonds than 35% phosphoric acid etchants.

Methods: Three self-etch adhesives, a 35% phosphoric acid etchant, and an unetched control were utilized. Simulating the oral environment's mechanical forces, we show the aforementioned reduced bonding using both shear bond strength (SBS) and shear fatigue strength (SFS) testing using a one-way analysis of variance with a Tukey's post hoc analysis ($\alpha=0.050$) with a Bonferroni correction. To visualize effects of each etching agent on enamel, and link surface roughness to bond performance, we examined the surface of enamel after etching. The enamel surface topography has been reconstructed with atomic force microscopy (AFM) and optical profilometry (OP), common techniques in dental materials research, and roughness values (Ra) gathered. We analyzed Ra of the surfaces using a one-way analysis of variance with a Tukey's post hoc analysis ($\alpha=0.050$).

Results: Significant differences were found within self-etchants in SBS, SFS, OP Ra, but not AFM Ra. However, all self-etchants showed significant increases in SBS, SFS, OP Ra and AFM

Ra when compared to the control. The phosphoric acid etchant showed significant increases in SBS, SFS, OP Ra, and AFM Ra compared to all groups.

Conclusions: Phosphoric acid etchants should be recommended instead of self-etchant adhesives in the clinical setting because of their superior SBS and SFS. By combining two measurement techniques, two lateral scales of features can be analyzed. This combining of techniques ensures the topographical characterization is robust and clinically relevant.

11. **ROLE OF OTOLIN-1B DURING OTOLITH NUCLEATION IN ZEBRAFISH**

9:30 AM – Harper Center Room 3028B

Kevin Thiessen and Kenneth L. Kramer, Department of Biomedical Sciences, Creighton University, Omaha NE.

Rationale: Bio-mineralized crystals normally attach to vestibular hair cells, but dislodgment or degradation of these otoconial crystals in Benign Paroxysmal Positional Vertigo (BPPV) results in dizziness. While the genetic and molecular defects in BPPV patients are still unknown, elevated plasma levels of the otoconial protein Otolin-1 (Otol1) appears to be an early clinical marker for BPPV susceptibility. To better understand the cause(s) of otoconia degradation and dislodgment, we are investigating the mechanisms of otoconia nucleation. In mammals, otoconia nucleate when Otol1 binds to Otoconin-90 (Oc90), forming a scaffold for calcium carbonate deposition and subsequent growth. While many genes required for mammalian otoconial development have homologs that are similarly necessary for zebrafish otolith development, previous studies demonstrated that otolin-1a (otol1a) is not required for or expressed during zebrafish otolith nucleation. We hypothesized that a similar otoconin, otolin-1b (otol1b), has a conserved role in mediating early zebrafish nucleation.

Methods: Multiple approaches were used to determine if otol1b is present and has a role in early otolith formation. Expression of otolin1b was assessed by both RT-PCR and immunofluorescence. The role of otol1b in otolith formation was assayed by injecting either a morpholino designed to block expression of otol1b or by injecting a Cas9-gRNA designed to mutate the otol1b locus.

Results: Using whole embryo extracts, otolin1b was detected by RT-PCR at 18 hours post fertilization (hpf), at least an hour before otoliths are first visible. Additionally, Otolin1b protein was detected by immunofluorescence in the early otolith. Embryos in which otolin1b was targeted by morpholino-knockdown or gRNA-mutagenesis both had aberrantly small and fragmented otoliths that were not firmly attached to tether cells.

Conclusions: These results together suggest that Otolin1b mediates early zebrafish otolith formation by helping anchor the nucleating otolith to the tether cell kinocilium.

Acknowledgments: LB-692, 5P20RR018788-09, 8 P20 GM103471-09

12. **THE EFFECT OF DIFFERENT REGRESSION BASED ALGORITHMS ON THE ASSESSMENT OF FREQUENCY-BASED EMG FATIGUE THRESHOLD**

9:45 AM – Harper Center Room 3028B

Maddie Ivy, Alex Sikora, Gabe Aguerro, Erin Ino, and Esther Cho, Department of Exercise Science, Creighton University, Omaha NE.

The purpose of this study was to determine if there were significant differences between the electromyographic (EMG) mean power frequency at the fatigue threshold (MPFFT) and D-max

methods when assessing neuromuscular fatigue (NMF). Twenty-two adults (17 male, 5 female; mean \pm SD; age = 21.14 ± 2.8 years; body weight = 78.03 ± 12.7 kg; height = 177.36 ± 9.62 cm) volunteered to participate in the investigation. Each subject performed an incremental cycle ergometry test to fatigue while EMG signals were measured from the vastus lateralis (VL) muscle. Mean, standard deviation, and range values were calculated for the power outputs determined by the MPFFT and D-max methods. The relationships for EMG frequency and power output for each subject were examined using linear regression (SPSS software program, Chicago, IL). An alpha level of $p \leq 0.05$ was considered significant for all statistical analyses. A paired dependent t-test was used to determine if there were significant mean differences in power outputs determined by the MPFFT method (Mean \pm SD; 161.88 ± 44.84 W) and D-max method (168.92 ± 36.62 W). The results of the dependent t-test indicated that there were not significant mean differences ($p > 0.05$) between the MPFFT and D-max values ($p = 0.29$). The zero-order correlation for the power outputs determined by the MPFFT and D-max methods showed that the two methods were moderately correlated ($r = 0.69$). The result of the present investigation suggests that the two regression based algorithms can be used to calculate neuromuscular fatigue.

13. **OBESITY AFFECTS FUNCTION IN THE HEART'S PACEMAKER CELLS**

10:00 AM – Harper Center Room 3028B

Grace Rants, Emma Harwood, Mary Luckasen, and Nina Thakur, Department of Mathematics, Creighton University, Omaha NE.

According to the Journal of the American Medical Association, more than one-third (34.9% or 78.6 million) of U.S. adults are obese. The goal of this investigation is to learn and understand the impact of obesity on the heart, specifically at the sinoatrial node. The sinoatrial (SA) node is known as the heart's natural pacemaker, and the accumulation of fat cells around this area affects its ability to function properly. In obese subjects some of the SA cells are actually replaced by fat cells. We aim to find out precisely how obesity affects SA node function by incorporating the experimental results from relevant studies into the DiFrancesco and Noble SA node model. We would like to adjust the parameters of the model so that the effects of obesity on SA node may be simulated. It appears that membrane capacitance, pacemaker current, and slow inward current are the parameters most affected in this disease. Furthermore, there is experimental evidence that fat cell accumulation around the SA node affects the action potential duration (APD), so another goal is discern which parameters of the model account for the change in APD in order to simulate the change. By modelling the changes in SA cells, we will gain a greater understanding of how obesity affects the heart's natural pacemaker and the physiological repercussions.

Acknowledgment: This investigation was supported and made possible by the CURAS center at Creighton University.

14. **THE BB0168-ENCODED DNAK SUPPRESSOR PROTEIN GOVERNS BORRELIA BURGENDORFERI INFECTIVITY**

10:15 AM – Harper Center Room 3028B

William Boyle, Jeff A. Shaw, Ashley Groshong, Jon S. Blevins, Frank C. Gherardini and Travis J. Bourret, Department of Medical Microbiology and Immunology, Creighton University, Omaha NE.

Purpose: *Borrelia burgdorferi*, the causative agent of Lyme disease, must sense and respond to diverse environmental challenges throughout its natural infectious cycle in *Ixodes* spp. ticks and various mammalian hosts including shifts in temperature, pH, osmolarity, nutrient availability, as well as oxidative and nitrosative stresses. In this study, we set out to characterize the role of the

bb0168-encoded DnaK suppressor protein (DksA) on *B. burgdorferi* gene expression and infectivity.

Methods: Wild-type *B. burgdorferi* strain and a *dksA*-deficient mutant were grown under microaerobic conditions at 34 degrees C in BSK medium or subjected to nutrient limitation by shifting the cultures to RPMI medium lacking serum, then cells were harvested for transcriptomic analysis by microarray comparison or qRT-PCR. Subsequent immunoblotting were performed upon shifting cultures from pH 7.6 to pH 6.8 to induce virulence gene expression. Infectivity of the *dksA*-deficient mutant was evaluated in Swiss Webster mice following subcutaneous injection with inoculums of 103 or 105 spirochetes/mouse.

Results: The transcriptomic analysis *B. burgdorferi* strain and the *dksA*-deficient mutant revealed DksA impacts the expression of more than 500 genes accompanied by reduced expression of genes required for infectivity in the murine model including *ospC* (30-fold), *dbpA* (52-fold), and *dbpB* (31-fold). Surprisingly, the expression of the alternative sigma factor *rpoS*, which helps coordinate the expression of *ospC*, *dbpA*, and *dbpB*, was unaffected by the loss of *dksA*. Subsequent immunoblot of the cell lysates showed reduced production of *OspC* in the *dksA*-deficient mutants compared to wild-type controls. The reduced expression of virulence-associated genes corresponded to the inability of the *dksA*-deficient *B. burgdorferi* strain to cause infection.

Conclusion: Collectively, the results indicate that DksA is a global regulator of gene expression in *B. burgdorferi*, and is required for infectivity in a murine model of infection.

Acknowledgments: Special thanks to the genomics core at RML, NIAID, NIH..

15. **THE DANGERS OF THE SAFE CAMPUS ACT: AN ANALYSIS THROUGH IDEOLOGICAL CRITICISM**

10:30 AM – Harper Center Room 3028B

Madeline Ziomek, Department of Communication Studies, Creighton University, Omaha NE.

Sexual assault on college campuses continues to be an issue of great concern. Although many legislative and institutional efforts have been proposed and put in place to address sexual assault, the crime continues, and unfortunately, there is a growing tendency in society to accept sexual assault as something that just happens on college campuses. The recently proposed Safe Campus Act of 2015 purports to address sexual assault in an effective manner and protect victims of sexual assault, however, it falls extremely short in doing so and rather perpetuates rape culture. Through the lens of ideological criticism, I argue that the Safe Campus Act ultimately seeks to protect the accused rather than the victim of sexual assault and promotes the harmful ideology of rape culture by using language and an ideological tone based on victim-blaming, the normalization and trivialization of sexual assault on college campuses, and an unjustified belief that sexual assault claims are primarily false accusations. Rape culture facilitates sexual assault by normalizing sexual assault and incorporating harmful and salient myths regarding victims and their motives for reporting. The Safe Campus Act's ultimate function is to continue the ideology of rape culture, where the persecutor is free from punishment and the victim is left unprotected by its institution and government. While the act declares its intent to help victims of sexual assault, clearly through the regulations required, it does the exact opposite.

16. **ASSESSING FUNCTIONAL DEFICITS IN A POST-STROKE MURINE MODEL.**

10:45 AM – Harper Center Room 3028B

Erica Sequeira, Marsha Pierce, Dina Akasheh, Stacey Sigmon and Thomas Murray, Department of Pharmacology, Creighton University, Omaha NE.

Rationale: Upper extremity motor impairments are the most prominent functional deficits in stroke survivors. Development of sensitive and reproducible behavioral tests in mice models are one of the major concerns in evaluation of new therapies effective for treatment of stroke. For this purpose, in the present study we used the pasta matrix task and catwalk apparatus to analyze forelimb impairments and recovery post stroke.

Methods: Food restricted male YFP mice were trained to reach with their preferred forelimb for pasta. Following systemic administration of a light sensitive dye, a photothrombotic stroke was induced in the caudal forelimb area of the motor cortex, contralateral to their preferred reaching limb through. In the pasta matrix task, mice reach from a Plexiglas box through an aperture to retrieve pieces of pasta from an array of 16 vertically oriented pieces of pasta. The number and the extent of pasta retrieved were determined during a 30 minute observation period. In parallel studies a catwalk analysis was used to analyze gait movements. Mice were trained for 5 days to walk in the instrument prior to stroke, and were then analyzed for several gait parameters on the 1st and 5th day post stroke.

Results: In the pasta matrix reaching task the success of pasta retrieval was significantly impaired after stroke with a reduction of pasta retrieval from 9-14 pieces to 4-7 pieces on the 1st day post stroke. Subsequent testing on the 5th day post stroke revealed improvement in pasta retrieval. Gait parameters affected by the stroke included maximum area, intensity, print area, print width and print length.

Conclusions: Preclinical research in a mouse stroke model provides behavioral assessment of neural insult-induced functional deficits. The pasta matrix task and catwalk analysis proved to be sensitive measures for the study of both impairment and recovery following a stroke.

Acknowledgment: This research was supported by NIH R01NS053398.

17. **PARTICIPATION TRENDS OF PHARMACISTS IN DIABETES SELF MANAGEMENT EDUCATION (DSME) PROGRAMS- A MIXED METHODS RESEARCH STUDY**

11:00 AM – Harper Center Room 3028B

Tanvee Thakur, Department of Pharmaceutical Sciences, Creighton University, Omaha NE.

Background: Diabetes Self-Management Education (DSME) programs provide patients with knowledge and skills necessary for self-care. The American Diabetes Association (ADA) is an organization providing recognition standards for DSME programs. Nurses, physicians, qualified dietitians, and pharmacists are commonly credentialed by the ADA as diabetes educators. Studies have identified improved diabetes control with pharmacist intervention in educating patients in a variety of settings. However, while the literature discusses the impact of DSME and different factors that can alter this impact, a gap exists about the participation of pharmacists in DSME programs.

Purpose: To conduct an exploratory nationwide study of DSME program directors to determine how and to what extent pharmacists participate in DSME programs.

Method: A sequential exploratory mixed methods approach is being used. The initial qualitative phase uses purposive sampling to identify 8 DSME program directors with knowledge of pharmacy involvement in DSME programs. These directors are interviewed using a semi-structured interview protocol. This is expected to be a sufficient number of interviews to achieve data saturation. Interviews will be transcribed and analyzed using traditional qualitative thematic analysis techniques. Qualitative themes will inform the development of a survey. The quantitative phase will consist of with administering a pilot survey to pharmacy diabetes educators to establish content validity. Subsequently, a revised survey will be administered to a nationally stratified random sample of DSME program directors.

Results: The scope, extent and rationale of pharmacist engagement in DSME programs across the nation will be presented.

Conclusions: Findings will inform health professionals and policymakers about the role of pharmacists in DSME programs and enhance participation of pharmacists.

18. **A MOVE TOWARDS INDIVIDUALIZING ASSESSMENT**

11:15 AM – Harper Center Room 3028B

Hannah Wulbert and Beverly Doyle, Department of Education, Creighton University, Omaha NE.

The increased significance of standardized testing in the recent decades combined with the “No Child Left Behind” act of 2001 has caused many teachers in elementary classrooms across the country to develop a “teach to the test” attitude in their instruction and assessment methods. The goal of the research was to redesign instruction and assessment to create a more individualized learning experience for students, while still meeting the required standards of learning at both the state and national level. This research was conducted in a fourth grade classroom in Omaha, Nebraska, among 42 students. The teacher used hands-on methods of instruction and assessment to provide individualized instruction and practice for each student. As a result of this method, students become more motivated in their learning and understand subject matter more effectively. In Social Studies, the average scores of the 42 students indicate a four-point increase from the pre-test to the post-test as well as a five-point increase in motivation. In Science, the average scores indicate a two-point increase from pre-test to post-test, as well as a four-point increase in motivation. In Math, the average scores indicate a one-point increase from pre-test to post-test as well as a two-point increase in motivation. Students are more motivated to participate fully in their own learning when hands-on methods are used in the classroom setting. The students in this class all developed their learning abilities, participation skills, and strengthened their social skills.

19. **THE EFFECT OF MUSCLE QUALITY ON THE PHYSICAL WORKING CAPACITY AT THE FATIGUE THRESHOLD**

1:45 PM – Harper Center Room 3028A

Garrett Kenyon, Michael Schulte, Jacob Miller, and Matthew Noguchi, Department of Exercise Science, Creighton University, Omaha NE.

Echo intensity of an ultrasound image can be used to assess muscle quality. If it could be shown that muscle quality is related to muscle fatigue then echo intensity could be used as an indicator of an individual’s fitness level. The purpose of this experiment was to determine if muscle quality, as indicated by echo intensity of a cross sectional ultrasound image, has an effect on physical working capacity at the fatigue threshold (PWCFT). It was hypothesized that low muscle quality would result in a lower PWCFT. This study tested 10 subjects (5 male, 5 female: Age (yr): 201.1 (18.9 – 21.1), Weight (kg): 78.311.8 (66.5 – 90.1), Height (cm): 177.48.2 (169.2 – 185.6)) who

voluntarily participated in the investigation. A cycle ergometer test to exhaustion was used to determine each subject's PWCFT. Ultrasound images were taken before the test and the echo intensity was determined. Echo intensities were then categorized as high or low and compared with PWCFT. There were no significant mean differences ($p = 0.4695$) in PWCFT between low echo intensity (high muscle quality) (PWCFT (W) = 207.587.3 (87.5 – 312.5)) and high echo intensity (low muscle quality) (PWCFT (W) = 172.554.8 (112.5 – 212.5)) which indicated that muscle quality does not have an effect on PWCFT. Based on this research, using ultrasound and echo intensity to determine muscle quality does not predict the fatigue level of a subject.

20. **TOWARDS A STABILITY THEORY FOR FEYNMAN'S OPERATIONAL CALCULUS IN THE PURELY DISCRETE SETTING: A DIRECT APPROACH^{†§}**

2:00 PM – Harper Center Room 3028A

Samantha Stanley and Dr. Lance Nielsen Mathematics, Creighton University, Omaha NE

Given the monomial $P^{m_1, m_2}(z_1, z_2) = z_1^{m_1} z_2^{m_2}$, we use Feynman's operational calculus to compute the function $P_{\eta_1, \eta_2}^{m_1, m_2}(A, B)$ of the not necessarily commuting operators $A, B \in \mathcal{L}(X)$, where η_1, η_2 are purely discrete, finitely supported probability measures on $[0, 1]$. Selecting sequences $\{\eta_{1,k}\}_{k=1}^{\infty}, \{\eta_{2,k}\}_{k=1}^{\infty}$ for which $\eta_{j,k} \rightarrow \eta_j$, $j = 1, 2$, as $k \rightarrow \infty$, we wish to prove that $P_{\eta_{1,k}, \eta_{2,k}}^{m_1, m_2}(A, B) \rightarrow P_{\eta_1, \eta_2}^{m_1, m_2}(A, B)$ as $k \rightarrow \infty$ in norm on $\mathcal{L}(X)$. Therefore, for a function of two complex variables, $\lim_{k \rightarrow \infty} f_{\eta_{1,k}, \eta_{2,k}}(A, B) = f_{\eta_1, \eta_2}(A, B)$. For our research, we are working to make a connection between discrete and continuous time-ordering measures. To do so, we select sequences $\{\eta_{1,k}\}_{k=1}^{\infty}, \{\eta_{2,k}\}_{k=1}^{\infty}$ for which $\eta_{j,k} \rightarrow \mu_j$, $j = 1, 2$, as $k \rightarrow \infty$, where μ_1 and μ_2 are continuous probability measures on $[0, 1]$. We wish to prove that $\lim_{k \rightarrow \infty} f_{\eta_{1,k}, \eta_{2,k}}(A, B) = f_{\mu_1, \mu_2}(A, B)$.

Acknowledgment: I want to give a special thanks to CURAS and the Clare Boothe Luce Foundation for funding my research. Also, I would like to thank Dr. Lance Nielsen for his continuous support and encouragement.

21. **ENDOTHELIAL CELL DIFFERENTIATION OF PORCINE ADIPOSE-DERIVED MESENCHYMAL STEM CELLS IS REGULATED BY THE EXPRESSION OF MMP-2 AND MMP-14**

2:30 PM – Harper Center Room 3028A

Sami Almalki, Yovani Llamas and Devendra K Agrawal, Department of Biomedical Sciences, Creighton University, Omaha NE.

Rationale: Adipose-derived mesenchymal stem cells (AMSCs) represent promising tools in various clinical applications. The molecular mechanisms that control the ability of AMSCs to remodel extracellular matrix (ECM) barriers during differentiation are not clearly understood. In this study, we investigated the expression of matrix metalloproteinases (MMPs) during the differentiation of AMSCs to endothelial cells (ECs).

Methods: AMSCs were characterized by positive staining for MSC markers, CD44, CD90, and negative staining for CD14, and CD45. The plasticity of MSCs was detected by multi-lineage differentiation. The mRNA transcripts for different MMPs and TIMPs were analyzed by RT-PCR.

The enzyme activity and protein expression were also analyzed by gelatin zymography, ELISA, and Western blot.

Results: The differentiation of AMSCs to ECs was confirmed by the mRNA expression of EC markers. The mRNA transcripts of MMP-2 and MMP-14 were significantly increased during the differentiation. Western blot and ELISA showed an elevated MMP-14 and MMP-2 expression. The enzyme activity of MMP-2 was also observed. MMP-2 and MMP-14 silencing showed significant increase in the expression of EC markers, formation of tubes, and acetylated-LDL uptake.

Conclusion: We demonstrated that porcine AMSCs have the ability to differentiate into ECs. The data presented herein, for the first time, demonstrated that the up-regulation of MMP-2 and MMP-14 has an inhibitory effect on the differentiation of AMSCs to ECs, and silencing them increases the differentiation of AMSCs to ECs. These results could provide novel insights aimed at therapeutic strategies for re-endothelialization of coronary arteries or regulation of angiogenesis.

22. **PROBLEM DRINKING AMONG AT-RISK COLLEGE STUDENTS WITH PAST EMOTIONAL/MENTAL PROBLEMS**

2:45 PM – Harper Center Room 3028A

Haley Pethick, Alicia Klanecky, and Dennis McChargue, Department of Psychology, Creighton University, Omaha NE.

Purpose: Demographic factors such as freshman status and Greek-affiliation have been associated with increased problem drinking among college undergraduates. Freshmen students drink greater quantities of alcohol and exhibit more alcohol dependence symptoms compared to non-freshmen (Grekin & Sher, 2006; Labrie et al., 2010). Greek-affiliated students drink more frequently and drink greater quantities compared to non-Greek students as well as experience greater alcohol-related consequences (Fairlie et al., 2010). Research has also focused on the association between mental health problems and problem drinking. Previous findings indicated college students who have experienced emotional or mental problems such as depression, anxiety, and trauma have increased levels of problem drinking (Geisner et al., 2015; Messman-Moore & Ward, 2014; Read et al., 2014). The goal of the present study is to look at the interaction among these demographic variables and mental health problems to further understand their influence on problem drinking among college students.

Method: Undergraduate students (N=367) from private and public Midwestern universities completed large online survey batteries. Data from both schools were aggregated for the current analysis.

Results: After accounting for gender and type of school, a three-way interaction among freshman status, Greek affiliation, and history of mental health problems was examined and found significant ($\Delta R^2=.026$, $\Delta F(1, 357)=9.963$, $p<.002$). Non-freshmen, regardless of a history of emotional/mental problems, exhibited more problem drinking if they were Greek-affiliated. Freshmen without a history of emotional/mental problems showed an increase in problem drinking when involved in Greek life. However, freshmen with a history of emotional/mental problems showed a decrease in problem drinking if they were involved in Greek life compared to those who were not.

Conclusion: The results suggest involvement in Greek life could buffer an increased risk for problem drinking among college freshmen with mental health problems.

23. **A TESTING BATTERY FOR EVALUATING FATIGUED VS. NON-FATIGUED HOP PERFORMANCE IN HEALTHY INDIVIDUALS**

3:00 PM – Harper Center Room 3028A

Allison White, Joseph B. Lesnak, Dillon T. Anderson, Matthew W. Franco, Meredith Chaput, Marcus R. Palimenio, Dimitrios Katsavelis, Jennifer J. Bagwell, and Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE.

Purpose: Most functional tests to determine return to sport readiness following injury are carried out in a non-fatigue state. Current fatigue models often incorporate equipment not available in all clinical settings or include tasks that are difficult to standardize. The purpose of this study was to determine the effects of a side hop test on single leg forward hop distance.

Methods: Twenty healthy participants (age=21.7±1.6 years, height=172.5±16.0 centimeters, mass=76.0±15.5 kilograms) performed a pre-test consisting of three single leg forward hops for distance (centimeters), with 30 seconds of rest between hops. Participants then performed the side hop test which requires participants to perform repetitive side-to-side jumping over two lines placed 40 cm apart for 30 seconds. The number of successful repetitions was recorded. The same pre-test testing sequence was then carried out, with the exception of no rest in-between each hop. The first forward hop for the pre-test was used as a practice trial and the maximum hop distance for other trials was used for data analysis. Paired t-tests were performed with jumping distance used as the outcome variable. Significance was set at a priori at $P < 0.05$.

Results: There was a significant decrease ($P < 0.001$) in jumping distance after completion of the 30 second side hop fatigue test (Pre= 166.6±29.5 cm, Post= 156.1±29.9 cm). Participants completed 47.7±12.7 repetitions in 30 seconds during the side hop test.

Conclusion: The results of this study indicate that 30 second side hop test effectively fatigued the participant, resulting in a decrease in jumping performance. It is possible this test could provide a more pragmatic approach for measuring functional ability when looking to return-to-sport following knee injury. Future studies should examine the use of this test in individuals following ACL reconstruction who are returning to sport.

24. **CLINICAL MEASURES TO PREDICT PATIENT FUNCTION FOLLOWING ACL RECONSTRUCTION**

3:15 PM – Harper Center Room 3028A

Meredith Chaput, Joseph B. Lesnak, Dillon Anderson, Matthew Franco, Allison K. White, Marcus Palimenio, Dimitrios Katsavelis, Jennifer Bagwell, and Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE.

Purpose: Single leg hop tests are commonly used clinically to assess function following anterior cruciate ligament reconstruction (ACL-R). The purpose of this study was to determine if quadriceps strength or single leg hop performance is a better predictor of return to sport function following ACL-R.

Methods: Fourteen individuals with a history of ACL-R (6 female, 8 male; mean±SD age= 20.3±6.5 y; height= 179.1±12.6 cm; mass= 76.2±14.9 kg; time since surgery= 6.9±4.9 months; IKDC= 83.3±14.5) and 20 healthy individuals (8 female, 12 male; age= 21.7±1.66 y; height= 172.5±16.0 cm; mass= 76.0±15.5 kg) volunteered for this study. Isometric quadriceps strength (Nm/kg) was measured using an isokinetic dynamometer (Biodex System 3) and single leg hop performance was measured using a single leg forward hop test (centimeters). Differences between limbs were expressed as a percentage using the limb symmetry index (LSI;

involved/uninvolved ACL; nondominant/dominant healthy). A component of the Knee Injury and Osteoarthritis Outcome Score (KOOS) was used to quantify patient reported function specific to sports and recreational activities (Sport/Rec). The ability to predict KOOS Sport/Rec scores using quadriceps strength and jumping performance was determined using stepwise linear regression.

Results: There was no significant difference between groups for age, mass, or height ($P > .05$). Participants with ACL-R had significantly greater asymmetries in strength ($P = .001$; ACL 76.0 ± 25.5 , healthy 109.2 ± 24.0) and single leg hop distance ($P = .005$; ACL 85.9 ± 16.1 , Healthy 97.6 ± 5.6). Quadriceps LSI provided the greatest ability to predict KOOS Sport/Rec scores ($R = .75$, $P = .002$) and jumping performance did not add to the predictive model ($R = .69$, $P = .006$).

Conclusion: The results of this study suggest that quadriceps strength is a better predictor of return to sport status than single leg hop tests. Although jumping performance provides insights to function it may be necessary to measure quadriceps function in clinical settings.

25. **CLINICAL FUNCTIONAL PERFORMANCE TESTS ARE INFLUENCED BY QUADRICEPS FUNCTION**

2:45 PM – Harper Center Room 3028B

Joseph Lesnak, Meredith Chaput, Dillon Anderson, Matthew Franco, Allison K. White, Marcus Palimenio, Dimitrios Katsavelis, Jennifer Bagwell, and Terry L. Grindstaff, Department of Physical Therapy, Creighton University, Omaha NE.

Purpose: The purpose of this study was to examine the characteristics of quadriceps function over time and the impact on clinical measures of functional performance in healthy individuals. Our hypothesis is that RTD at earlier time intervals will be able to explain a higher percentage of variance on the performance of functional lower extremity tests.

Methods: Twenty participants (age= 21.7 ± 1.7 years, height= 172.5 ± 16.0 cm, mass= 76.0 ± 15.5 kg, Tegner= 7.1 ± 1.2) volunteered for this study. Measures of athletic performance included single leg hop for distance (centimeters) and single leg vertical jump (centimeters). Quadriceps torque-generating capacity was quantified by examining maximum torque during a maximal voluntary isometric contraction (MVIC), RTD at different time intervals (50, 100, 150, 200, and 250ms) and maximal twitch potentiation following an electrical stimulation (resting twitch, RT) with the muscle in a relaxed state. Maximal torque and RTD were normalized to body mass ($N \cdot m/kg$). The ability to predict single leg vertical jump height (cm) and single leg hop distance (cm) from measures of quadriceps function was determined using stepwise linear regression.

Results: Quadriceps RT provided the greatest ability to predict vertical jumping height ($R = .488$, $P = .004$) while quadriceps MVIC provided the greatest ability to predict single leg hop for distance ($R = .675$, $P < .001$).

Conclusions: The results of this study indicate that both RT and MVIC account for 24-45% of the variance on functional lower extremity tests. Both RT and MVIC are representative of the contractile properties of the muscle. This shows that contractile properties are not the sole contributor to functional performance and other properties such as neural drive may contribute to performance as well. This information may be valuable for clinicians who work with individuals following knee injury or surgery who are considering return to sporting activities.

26. **THE IMPASSE IN THE SITUATIONIST DEBATE ON CHARACTER[‡]**

3:00 PM – Harper Center Room 3028B

Sofia Paz, Department of Philosophy, Creighton University, Omaha NE.

More and more, philosophers are applying methods traditionally associated with the sciences to answer philosophical questions. In one important set of cases, experimental philosophers have concluded that traditional virtue ethics is untenable, sparking a host of equally interesting rebuttals, some of which question the experimental methods employed, while others criticize the experimenters' conception of virtue ethics. While this dialogue has been valuable, the debate has reached an impasse. In my project, I offer a potential explanation for this impasse by examining the critiques themselves in light of developments in social and personality psychology. In light of these developments, I conclude that Social Psychology may not be the best science to draw conclusions from, for this debate, given the nature of virtue ethics. This conclusion helps move the discussion past the current impasse by shifting the focus to different fields, like Personality Psychology.

Acknowledgment: I would like to thank the University's Honors Program as well as CURAS for funding my project through a summer research scholarship.

27. **A HOST-PARASITE-COMMENSAL ECOLOGICAL MODEL BASED ON FIELD STUDIES IN THE GREAT PLAINS**

3:15 PM – Harper Center Room 3028B

Monika Satkauskas, Emma Schlagenhauff, and Rebecca Gasper, Department of Mathematics, Creighton University, Omaha NE.

Purpose: The biodiversity of an ecosystem can be negatively affected by pollution. We offer a model for a freshwater snail-trematode-*Chaetogaster* ecosystem found in the Pine Ridge Indian Reservation, a heavily polluted area. Although mathematical models for ecosystem dynamics exist, most do not consider commensal relationships between organisms. In our system, Trematodes infect snails, while the *Chaetogasters* both prey on the trematode and have a commensal relationship with the snail. Critically, we include in our model the impact of pollution on each species, to more accurately predict the future of the ecosystem. Field data and the model both showing a negative correlation between trematode and *Chaetogaster* prevalence, which suggests a decrease in biodiversity as pollution increases.

Methods: We created a model with a system of five ordinary differential equations utilizing field data. These differential equations incorporate the individual species, lifestyle, and water analysis measurements collected from four field sites in the Pine Ridge Indian Reservation. A numerical solver in Mathematica 10 was used to solve the equations for equilibrium points and create simulations for the model. Parameter values were determined through a literature search.

Results: The equilibrium points of this system include the trivial solution, quadratic solutions, and cubic solutions. Parameter values were determined and used to simplify the system. From the simulations, the results include both endemic and unstable equilibria, which signify that pollution does play a role in the health of the ecosystem.

Conclusion: The model is a possible representation of the host-parasite-commensal relationship between the snail, trematode, and *Chaetogaster*. These organisms interact with each other and the environment, where changes in pollution levels alter stable equilibria.

Acknowledgments: This work was supported by the Dr. George F. Haddix Faculty Research Fund, CURAS, and Dr. John Shea, S.J.'s research team.

SUMMER FACULTY FELLOW ABSTRACTS

1. MASCULINITIES IN LITERATURE OF THE AMERICAN WEST

Lydia Cooper, Department of English, Creighton University, Omaha, NE.

The Summer Faculty Fellowship funded archival research at the Beinecke Rare Book and Manuscript Library at Yale University in order to complete a scholarly book. That book, *Masculinities in Literature of the American West*, offers the first examination of performances of masculinity in contemporary Westerns. Performances of masculinity in contemporary literary Westerns reflect the sense of emergency related to "being a man" in U.S. culture. The book investigates the social and political ramifications of "cowboy masculinity" in the U.S. and offers insight into new ways to navigate masculinity in a world where taking pride in "acting like a man" is fraught with risk.

2. REACTION DYNAMICS OF SIMPLE POLYOXOMETALATE IONS IN WATER

Eric Villa and Matthieu Spriet, Department of Chemistry, Creighton University, Omaha, NE.

Polyoxometalate ions are an enormous class of metal-oxide clusters with extensive applications; however, the aqueous solution reaction dynamics of these ions are underexplored and many fundamental questions remain unanswered. Recently, we have been investigating the chemistry of the versatile Anderson-type polyoxometalate ions in solution. Here we will discuss the crystal structures and the reaction dynamics of these small molybdenum based polyoxometalates in aqueous solution.

Acknowledgments: Funding for the project was graciously provided by Creighton University's Summer Faculty Research Fund from the Center for Undergraduate Research and Scholarship (Summer 2015) and Nebraska EPSCoR First Award (EPS-1004094; January-September 2016).

HADDIX RESEARCH SCHOLAR ABSTRACTS

1. REMOTE SENSING AND APPLIED VEGETATION INDICES AS A MEASURE OF BIO-PRODUCTIVITY OF WETLANDS ALONG A SALINITY GRADIENT IN THE CHOPTANK ESTUARY AND WATERSHED

John Schalles and Ryan Lunn, Departments of Biology and Environmental Science, Creighton University, Omaha, NE.

The Choptank river system in the Delmarva Peninsula in eastern Maryland feeds into the Chesapeake Bay estuary. Our study compares the spatial patterns and bio productivity of wetland habitat vegetation with the salinity gradient of the estuary. We used remote sensing 8 band imagery from Digital Globe Worldview two and three satellites to assess complex vegetation patterns. The imagery we received had to be atmospherically corrected and translated into the proper format so we could isolate the wetland habitats for study. Environment Visualizing Images Geospatial software (ENVI) was used to process the data. We applied an algorithm based on measures of reflectance to determine the quantity and distribution of vegetation within different wetlands along the Choptank. A standard pixel of our imagery represents a two square meter plot of wetland habitat. This data processed in ENVI was then compared to measures of biomass from previous field data. The information and vegetation patterns observed were compared to the salinity gradient of the estuary to observe the influence on productivity.

Acknowledgment: This study is sponsored by NOAA, USGS, and the Maryland Department of Natural Resources.

2. PARASITES AS AN ECOLOGICAL BAROMETER

John Shea, Allison Hanser, Samuel Hagen, Requaw West, and Rebecca Gasper, Ph.D., Department of Biology, Creighton University, Omaha, NE.

Biological surveys help us understand inter-species interactions in ecosystems. Relatively little is known about parasite species distributions within Native American Reservations and South Dakota in general (Ahterson 1917). Previous studies suggest that the environment plays a role in parasite distribution (Faulkner 2014) and so may indicate ecosystem health. Parasites have complicated life cycles that utilize a variety of hosts (Gaston 2006). Thus their presence or absence can indicate the disturbance level and relative health of an ecosystem (Froeschke 2013). Higher parasite diversity should indicate a less disturbed ecosystem while lower parasite diversity should indicate a more disturbed ecosystem. To test this, we surveyed small mammals and their parasites at two sites in Pine Ridge reservation that differed in human disturbance. Yellow Bear Dam, located 10 miles south of Kyle, SD is a little used recreation park while Piya Wiconi, located on the campus of Oglala Lakota College in Kyle, compromised the more disturbed site. We predicted that the healthier, less disturbed environment would have a greater species diversity of parasites and hosts. Our results confirmed this hypothesis with greater Shannon diversity indices for host, ectoparasites and endoparasites at Yellow Bear Dam. However, our small sample size (39 hosts) from only two sites precludes making statistically significant conclusions. Further, the two sites also differed in their ecology and so could explain the differences in diversity. Future work will focus on sampling more hosts at different sites.

Acknowledgment: The Haddix grant supported this research.

3. **COMPARATIVE CONFORMATIONAL DYNAMICS OF CELLULAR PRION PROTEINS TOWARDS ELUCIDATING THE SPECIES BARRIER**

Ronald Shikiya, Patricia Soto and Robyn Hamada, Department of Physics, Creighton University, Omaha, NE.

Prion proteins are responsible for a series of fatal, transmissible neurodegenerative diseases. The infectious agents in prion diseases, PrP^{Sc}, result from the misfolding of the properly folded isomer, PrP^C. Prion diseases are capable of crossing the species barrier, but the factors that influence the species barrier are not yet fully understood. Our goal is to determine the extent by which the native conformation of PrP^C correlates with the species barrier. We will report on our structural bioinformatics study that analyzes the PrP^C ensemble from a number of species for which experimental evidence suggests distinct species barrier tendencies. Our observations suggest that the secondary and tertiary structure of the protein contribute more to the transmission barrier than the specificity of the primary sequence.

Acknowledgments: INBRE Grant and Presidential Haddix Funding from Creighton University

4. **DEVELOPMENT OF LOW COST 3D PRINTED TRANSITIONAL PROSTHESES**

Jorge Zuniga, Department of Exercise Science and Pre-Health Professions, Creighton University, Omaha, NE.

Introduction: There are increasing numbers of children with traumatic and congenital amputations or reductions. Children's prosthetic needs are complex due to their small size, constant growth, and psychosocial development (Krebs et al., 1991 and Zuniga et al. 2015). Families' financial resources play a crucial role in the prescription of prosthetics for their children, especially when private insurance and public funding are insufficient. Electric-powered (i.e., myoelectric) and body-powered (i.e., mechanical) devices have been developed to accommodate children's needs, but the cost of maintenance and replacement represent an obstacle for many families. Due to the complexity and high cost of these prostheses, they are not accessible to children from low income, uninsured families, or to children from developing countries (Krebs et al., 1991 and Zuniga et al. 2015). Advancements in computer-aided design (CAD) programs and additive manufacturing offer the possibility of designing and printing prostheses at a very low cost (Zuniga et al. 2015). The purpose of the present investigation was to demonstrate the manufacturing methodology of 3D printed transitional prostheses, examine improvement in perceived changes in quality of life, daily usage, and activities performed with these types of devices.

Methods: Nine children (two girls and seven boys, 3 to 16 years of age) with upper-limb reductions (one traumatic and eight congenital) were fitted with our 3D printed transitional prostheses and were asked to complete a survey. Inclusion criteria included boys and girls from 3 to 17 years of age with unilateral upper-limb reductions. Exclusion criteria included upper extremity injury within the past month and any medical conditions that would be contraindicated with the use of our 3D printed prostheses prototypes, such as skin abrasions and musculoskeletal injuries. The study was approved by the Creighton University Institutional Review Board and all the subjects completed a medical history questionnaire. All parents and children were informed about the study and parents signed a parental permission. For children 6 to 17, an assent was explained by the principal investigator and signed by the children and their parents. The survey was developed to estimate the impact of our prosthetic device including items related to quality of life, daily usage, and type of activities performed.

Results: After approximately 1 to 3 months of using our 3D printed prostheses 11 children and their parents reported some increases in quality of life (4 indicated that was significant and 7 indicated a small increase), while 1 indicated no change. Nine children reported using the device

1 to 2 hours a day, 3 reported using it longer than 2 hours and 1 reported using it only when needed. Furthermore, children reported using our 3D printed prostheses for activities at home (9), just for fun (10), to play (6), for school activities (4), and to perform sports (2). Four children reported malfunctioning and/or breaking of the 3D printed prosthetic device.

Discussion: The main finding of our survey was that our 3D printed transitional prostheses have a great potential in positively impacting quality of life, daily usage, and can be incorporated in several activities at home and in school. However, 36% of our research participants reported durability issues and/or malfunctioning of these devices. There is a need to develop medical grade 3D printed prosthetic devices to solve the durability constrains.

Conclusion: Although durability and environment are factors to consider when using 3D printed prostheses, the practicality and cost effectiveness represents a promising new option for clinicians and their patients. 3D printing technology for the development of prosthetic devices is at a very early stage. The supervision of a certified prosthetist is crucial for the proper development and use of 3D printed prostheses.

Clinical Applications: 3D printed transitional prostheses have a great potential in positively impact quality of life, daily usage, and can be incorporated in several activities at home and in school. The supervision of a certified prosthetist is crucial for the proper development and use of 3D printed prostheses.

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