St. Albert's Day
Student Research Forum

March 26, 2013

9:30 a.m.—3:00 p.m.

Ahmanson Ballroom

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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SUMMER FACULTY FELLOWSHIP PARTICIPANTS

Cho, Soochin
Gross, Erin
Wagner, Timothy
Yuan, Jinmei

HADDIX RESEARCH SCHOLAR PARTICIPANTS

Carney, James J.
Duda, Gintaras
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Hulce, Martin
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Strand, Palma
Strauss-Soukup, Julie

STUDENT POSTER ABSTRACTS

1. AID, REFUGEES, AND THE SPREAD OF INTERNAL CONFLICT

Spencer Wilson, Department of Political Science, Creighton University, Omaha, NE.

The clustering of civil wars casts doubt on the assumption that they are domestic phenomena. What explains the causes of civil war throughout the world? Refugee movements, aid, ethnicity, and bordering an existing conflict may be important in shaping civil war. This study tests these factors from 1960 to 1998 using a time series regression. The results show that each of these variables has a significant impact on civil war.

2. SEPARATIST MOTIVATION: AN EXAMINATION OF CULTURE

Nicholas Goeden, Department of Political Science, Creighton University, Omaha, NE.

Previous literature has studied separatist action as a result of language, religion, or ethnicity, rather than combining them as a measure of culture as a whole. By aggregating these factors, I test the role of cultural homogeneity between plurality groups and minority groups in activating separatist movements in the latter, in addition to testing them individually. I utilize data from the Minorities at Risk Report in clustered and unclustered logit models to test this relationship. Results suggest language – rather than cultural homogeneity, religion, or ethnicity – activates separatism.

3. SELF-DETERMINATION TO SELF-GOVERNANCE: NATIVE AMERICAN POLICY DEVELOPMENT IN THE CONTEMPORARY ERA

Margaret O'Connor and Raven Kapayou, Department of Political Science, Creighton University, Omaha, NE.

This paper examines the transition from self-determination to self-governance among Native American Tribal Governments. By taking a closer look at the policy development of Native Governing in the years since the Merriam Report in 1928, this paper suggest that there is a uniquely incremental approach taking place. This process allows for small steps, with focus on improving pre-existing programs, to improve bigger issues on Indian Country. This paper also applies what was discovered in this uniquely incremental process to self-governance to provide an example of where policy makers may take Tribal Governance in the future.

4. SOCIAL CAPITAL AND NATIVE SELF-GOVERNANCE: THE EFFECTS OF SOCIAL CAPITAL MEASURES ON SELF-GOVERNANCE LIKELIHOOD FOR AMERICAN INDIAN TRIBES

Emily Tanner, Department of Political Science, Creighton University, Omaha, NE.

With this paper, I examine the effect of social capital on American Indian self-governance. Social capital measures include family households, married households with children on a reservation, post-secondary education levels, percentage of households speaking a language other than English, median family income and whether a tribe has gaming. Using census data for 2000 and 2010, I find that education and gaming increase the likelihood of self-governance while non-English language frequency and intact family structures decrease self-governance likelihood. These findings suggest that traditional social capital measures may not provide an explanation of Tribal self governance similar to non Tribal governments.

5. THE CAUSES OF WARTIME CASUALTIES

Kaylyn Krzemien, Department of Political Science, Creighton University, Omaha, NE.

It is an inevitable phenomenon that countries will experience casualties within their militaries during wartime. This study tests certain factors such as military recruitment method, the amount of money spent per troop, nuclear presence and the presence of a major power ally. Using an OLS Regression model to test all military conflicts from 1945 to the present, my findings suggest that money spent per troop reduces casualties during wartime while other tested variables are not statistically significant.

6. USAID SPENDING IN LATIN AMERICA: AN ANALYSIS OF U.S. SIGNAL DATA

Grant Goodman, Department of Political Science, Creighton University, Omaha, NE.

What explains the variance in the amount of monetary aid distributed by USAID to Latin American countries? This paper examines the determinants for USAID in Latin America from 1990-1999, testing U.S. Signal data, level of democracy, export levels, infant mortality rates, and gross domestic product per capita. Using a Cross-Section Time-Series Analysis, I find that each of these variables shows significance on USAID. This study helps determine why countries receive USAID assistance.

7. IS BEAUTY REALLY IN THE EYE OF THE BEHOLDER?

Amanda Vigen, Sarah Ewin, and Dr. Isabelle D. Cherney, Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE.

The evolutionary perspective can be applied to the patterns of attraction towards women. Our ideals of beauty and how people view women wearing make-up sheds light into what makes women attractive. 125 participants rated the attraction of young women who wore different amounts of make-up.

8. BABES IN TOYLAND – THE EFFECTS OF FAMILIARITY AND SIBLINGS ON PLAY

Amy Ruomei Wu, Merijke Coenraad, and Isabelle Cherney, Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE.

The world we live in is highly gendered. However, little research has been conducted to examine how these gender stereotypes affect childhood development. For a child, much of these gender stereotypes are picked up during playtime, through the use of toys, which have been both consciously and unconsciously gendered by adults. The current study examined the play patterns of 56 children aged three to five with 40 gender-stereotyped, neutral, or ambiguous toys in a gender-balanced play lab. After 15 minutes of free playtime, children were asked to classify each toy as either a male or a female toy. Through play and gender categorizations, we examined children's reasons for gender assignments, the effects of familiarity on play, and the effects of siblings on play preferences. Results showed that a) children overall tended to play most with female toys and least with ambiguous toys, b) children with older siblings played the most with neutral toys, c) children tend to play longer with familiar toys, d) children tended to justify gender categorizations using gender associations and specific characteristics, and e) children were most likely to stereotype a toy to fit their own sex. These findings give us an insight into the gender categorizations of children, as well as the origin of these gender stereotypes. By understanding where these gender stereotypes arise from, it is

easier to prevent their formation, thus improving the cognitive and social development of children.

9. KEEP CHATTING!: IMPORTANCE OF PRE-MEETING TALK ON MEETING EFFECTIVENESS

Nicole Landowski,[1] Joseph Allen,[1] Nale Lehmann-Willenbrock,[2] and Holly Hinkel,[1] Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE, and Vrije Universiteit, Amsterdam

Purpose: This study investigates the importance of communication that occurs just before workplace meetings (i.e. pre-meeting talk). We explore how pre-meeting talk impacts meeting effectiveness by generating positive or negative feelings among meeting attendees that then ripple into (i.e. the "ripple effect") and impact the scheduled meeting. Moreover, we investigate the role of participants' personality in the context of pre-meeting talk.

Design/methodology/approach: Data were obtained using an online survey of working adults (N = 252). Because pre-meeting talk has not been studied previously, a new survey measure of meeting talk was developed.

Findings: Pre-meeting small talk was a significant predictor of meeting effectiveness, even while considering good meeting procedures. Participants' extraversion was identified as a moderator in this context, such that the relationship between pre-meeting talk and perceived meeting effectiveness was stronger for introverted participants.

Research Limitations/Implications: This finding provides the first empirical support for the ripple effect in relation to pre-meeting talk and workplace meetings and further confirms the usefulness of affective events theory in explaining the impact of meetings on employees in general. To address limitations inherent in the cross-section correlational design of the study, future research should experimentally test whether pre-meeting talk actually causes changes in meeting processes and outcomes.

Practical Implications: Managers should encourage their employees to arrive in time to participate in pre-meeting talk. Side conversations before a scheduled meeting starts can have beneficial effects for meeting outcomes and should be fostered.

Originality/Value: There is very limited research on the role of pre-meeting talk. We identify that small talk is a predictor of meeting effectiveness even after considering previously studied good meeting procedures.

Nicole Landowski earned summer research funding from the Dean of Arts and Sciences, summer 2012.

10. SPEAKING UP AND WORKING HARDER: HOW PARTICIPATION IN DECISION MAKING IN MEETINGS IMPROVES OVERALL EMPLOYEE ENGAGEMENT

Holly Hinkel and Joseph Allen, Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE.

Major Purpose: In this present study, I propose that participation in decision making in meetings increases workplace engagement above and beyond coworker and supervisor satisfaction. A measure was compiled using already validated, but slightly modified for the data set, measures from previous studies, that evaluated coworker and supervisor satisfaction,

participation in decision making in meetings and workplace engagement among several demographic variables. I argue that social exchange theory (Copranzano & Mitchell, 2005), and reciprocity norm as stated by Gouldner (1960) is the reason for this relationship. I found that Participation in decision-making in meetings raises levels of employee engagement more than their relationships with coworkers and supervisors.

Procedure: An online survey was administered to working adults that included measures on participation in decision-making, employee engagement, coworker satisfaction, supervisor satisfaction, and demographic control variables. These measure were used from different, validated studies, and modified for the purpose of this study. The final, usable sample included 319 participants.

Results: Correlation and regression analysis was used to find support for both hypotheses, coworker and supervisor satisfaction does significantly relate to employee engagement (ΔR^2=.13, p<.05) and that participation in decision-making in meetings significantly relates to higher levels of engagement (ΔR^2= .04, β=.27, p<.05) above and beyond coworker and supervisor satisfaction.

Conclusion: The present study suggests that participation in decision-making in meetings is important to overall employee engagement. Meaning that managers, supervisors, and other employees benefit from participating in meetings. Reciprocity norm would suggest that participating in decision making in meetings is a form of reciprocating for being given the opportunity to participate and work for those employers. Future research should continue to look at how meetings affect employee engagement.

11. VOLUNTEERING TO EMOTIONALLY LABOR: EMOTIONAL LABOR EXPECTATIONS IN THE NON-PROFIT SECTOR

Shelagh Hardrich, Joseph Allen, and Ravan Charles, Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE.

Purpose: The purpose of this study was to investigate the relationship between display rules and emotional labor as it applies to volunteers. The results show that positive display rules exclusively predict deep acting and negative display rules exclusively predict surface acting. Interaction with the public was found to moderate this relationship.

Methods: An online survey was administered to adults who volunteer at nonprofit organizations. Positive and negative display rules were measured using scales developed by Brotheridge and Grandey (2002) and Schaubroeck and Jones (2000). Surface acting and deep acting were measured using scales developed by Grandey (2003) and Kruml and Geddes (2000). The final usable sample included 1,283 adults.

Results: Using regression analysis and controlling for gender and dispositional affect, positive display rules was a significant positive predictor of deep acting (ΔR^2 = .02, β = .12, p < .05) and negative display rules was a significant positive predictor of surface acting (ΔR^2 = .03, β = .18, p < .05). We also found that public interaction moderated the relationship of positive display rules to deep acting (ΔR^2 = .01, p < .05) and negative display rules to surface acting (ΔR^2 = .01, p < .05) (see Figures 1 and 2).

Conclusion: The present study advances our understanding of volunteers by illustrating that they indeed engage in emotional labor in response to display rules. However, the results also show that while display rules are a predictor of emotional labor, certain display rules predict certain emotional labor. Further, we found that public interaction has a moderating effect on

these relationships. This is because the more volunteers interact with the public the more they respond to organizational display rules.

Acknowledgement: This study received internal funding in the summer of 2012.

12. FAKING APPROPRIATE EMOTIONS IN WORK MEETINGS: THE IMPORTANCE OF ORGANIZATIONAL POLITICS IN THE EMOTIONAL LABOR TO WORKPLACE MEETING SATISFACTION RELATIONSHIP

Mary Kate Hutfless and Dr. Joseph Allen, Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE.

Purpose: The purpose of this study was to investigate the effect of emotional labor on workplace meetings and to investigate the moderating effect of politics on this relationship. The findings show that surface acting in meetings lowers the overall satisfaction. Organizational politics were found to moderate this relationship.

Methods: A survey was administered online and 215 employed adults participated. The survey included validated measures of surface acting (Grandey, 2003), meeting satisfaction (Cohen et al., 2011), organizational politics, and positive and negative affectivity.

Results: The hypothesis was confirmed.

Conclusion: The present study indicates that meeting attendees who engage in surface acting also evaluate their meetings as being lower in overall satisfaction. Furthermore, when there are organizational politics perceived, this strengthens this negative relationship between surface acting and meeting satisfaction.

13. EXPLORING THE AMOUNT AND DEPTH OF TEACHING THE ACTIVITY OF DAILY LIVING (ADL) OF SEXUALITY IN OCCUPATIONAL THERPAY PROFESSIONAL EDUCATION

Alexandra Kobrin, OTS and Helene Lohman, OTD, OTR/L, Department of Occupational Therapy, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: Sexuality in occupational therapy (OT) practice has been an ignored subject due to practitioner's discomfort (Jones, Weerakoon, & Pynor, 2005), different opinions regarding the relevance of sexuality in practice (Sakellariou & Algado, 2006), and lack of formal training (Neistadt, 1986). In preparation for practice, it is important to include sexuality in OT education because it promotes holistic care and has been shown to be a major concern among people with disabilities (Sakellariou & Algado 2006).

Methods: Researchers collected quantitative and qualitative data through a closed and open ended survey questionnaire to obtain an understanding of the amount of time, type, and depth of education dedicated toward the subject of sexuality from OT educators in professional masters and doctor of occupational therapy (OTD) programs.

Results: Results show that the majority of OT educators believe that sexuality is an important topic in OT education. On average, educators dedicate 3.5 hours in their courses towards teaching sexuality. Educators ranked the ADL of sexuality as equally important compared to teaching other ADLs. The majority of education about sexuality is provided in classes such as physical rehabilitation, physical dysfunction, and gerontology. More specifically, in the context of clinical conditions including aging, cerebral vascular accident, and spinal cord injury.

Conclusion: Although sexuality is being taught in OT education, many educators feel that it is an overlooked topic due to the lack of educational background, discomfort from students and other educators, and lack of information in OT textbooks. For sexuality to not be an overlooked topic it is important to approach teaching sexuality as a normal part of life, better define sexuality in the Occupational Therapy Practice Framework, a document that outlines the scope of practice for OT(American Occupational Therapy Association, 2008), and to increase comfort discussing sexuality.

14. ACUTE CARE 30 DAY READMISSIONS

Kari L. Simmons, RN, Healthcare Administration and Policy, College of Arts and Sciences, Creighton University, Omaha, NE.

Purpose: The purpose of this study was to investigate the primary causes of acute care 30 day readmissions and search out possible solutions. The reason this has become so important is due to the Centers for Medicare and Medicaid Services (CMS) changes in their payment processes and for certain diagnoses. The CMS changes include facilities not receiving reimbursement for specific diagnosis on readmission within 30 days (to include heart failure, pneumonia, etc.).

Methods: After reviewing 119 charts that were pulled based on billing codes, several trends were identified. For instance, there is a high readmission rate for recurrent heart failure, pneumonia, and internal bleeding. It was also discovered that there is an inconsistency in the education provided at discharge, especially if the person is discharged to home versus a skilled care facility. There is a higher readmission risk for heart failure within specific months that we are able to intervene on. It was also discovered that internal bleeding was the number 5 cause of 30 day acute care readmissions across the nation and little data is available for causes or prevention interventions.

Results: As a result of our investigation, we are implementing a new way of educating the patient and their family at discharge, starting a support group to focus on ways to improve on dietary indiscretion, and possibly finding a way to improve outpatient anticoagulation management to decrease risk of internal bleeding readmissions.

Conclusion/Significance: The significance of this is that if changes are not made, there will be a direct financial impact on the facility. By making the fore mentioned changes, there will be higher patient satisfaction, improved patient safety, and ensure there will not be the financial impact from CMS.

15. COMMUNITY AS CLASSROOM: THE IMPACT OF COURSE-RELATED COMMUNITY ENGAGEMENT ON STUDENTS

Heidi Carpenter, Joy Doll, and Kathy Flecky, Department of Occupational Therapy, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose and /or Rationale: Community engagement and service learning in coursework and curricula has a greater presence now in higher education in the health professions than 10 years ago; however, little research exists exploring the longitudinal impact of engaging students in service-learning (1). The purpose of this study is to assess the impact of course-related community engagement on occupational therapy students over time. The research question addressed in this study: How do community engagement course learning experiences impact student achievement of course learning outcomes, professional identity and attitudes toward service-learning?

Methods: A mixed method design was used to collect data longitudinally from entry-level doctoral occupational therapy students in order to explore the importance, significance and influence of service-learning. Written reflections were collected from two different courses in the curriculum that contain embedded service-learning objectives. Data from Occupational Patterns in Culture was collected over a three year time period. Data from Occupations and Health was collected over a two year time period. The reflections were then analyzed by two researchers and prevalent themes were identified.

Results: Three themes for each course emerged for a total of six themes that reflect the student experiences while engaging in service learning.

Conclusion/Significance: Themes identified from student reflective assignments demonstrate that service-learning community engagement experiences impact student learning, especially in areas emphasized by the themes. The themes identified were: internal reactions, awareness, life-long learning, future practice, complexity of health care, and reciprocal learning. Students' responses reflected the concept that service-learning can be an effective teaching method for entry-level occupational therapy students. Student reflections demonstrated that service-learning can introduce and reinforce skills necessary for becoming a competent, client-centered practitioner. Service-learning may help students engage in experiences which invoke reflection upon personal contributions as a health professional and individual contribution to society.

References:

1. Welch, M., & Billig, S. H. (2004). *New perspectives in service-learning: Research to advance the field.* Greenwich, CT: Information Age Publishing.

16. ARTIFICIAL RETINA: NEURO TECHNOLOGY FOR ENHANCING INTERPROFESSIONAL REHABILITATION

Dr. Shirley Blanchard, Ph.D., Kathleen Joyner Wood, OTS, & Dr. Karen Wilson, O.D., Department of Occupational Therapy, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.
Contributing Authors: Joy Ashley, Arvonda Diaz, & Mar Rodriguez

Rehabilitation for persons with low vision requires an interprofessional approach. Optometrist, Ophthalmologists, and Occupational Therapists collaborate to ensure safe participation in meaningful life tasks (such as independent self-care, work, play or leisure). Through rehabilitation, quality of life is enhanced. Persons with low vision, central or peripheral field deficits, or altered visual perceptual processing may also experience impaired mobility and difficulty performing instrumental activities of daily living (including accessing the community, money management, and health maintenance). Low vision research and simulation studies of normally sighted persons suggest that there is a correlation between visual field and mobility (Ameri, Ratanapakorn, Ufer, Eckhardt, Humayun, & Weiland, 2009). Neuro-technology is used to restore or enhance vision and helps to map, record, stimulate, or produce a neuro-sensory response. The artificial retina is an example of a neuro-prosthesis which is being used to address the visual challenges of patients with Retinitis Pigmentosa (RP), Aged Related Macular Degeneration (AMD), and Diabetic Retinopathy (DR). This technology translates a photic image into an electrical response which results in the perception of a visual image (Chader, Weiland, & Humayun, 2009). The retinal prosthesis applies electrical stimulation to neuro receptors (rods and cones) in order to restore visual perception in patients with profound vision loss ($\geq$20/500). The retinal prosthesis uses a video camera to capture image data, an implanted microelectronic device for converting data into a stimulus pattern, and an electrode array interface for delivering the stimulus current to the retina. The visual field is directly related to the size of the stimulus

area of the retina and the size needed for the electrode array. Varied sized electrode arrays implanted into the retina with a projected field of up to 34 degrees significantly impacts visual field needed for mobility and occupational performance. Therapeutic interventions will be presented.

Ameri, H., Ratanapakorn, T., Ufer, S., Eckhardt, H., Humayun, M.S., & Weiland, J. D. (2009). Toward wide-field retinal prosthesis. *Journal of Neural Engineering*, 6(3),035002 online version; http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2861858/

Chader, G., Weiland, J., & Humayun, M. (2009). Artificial vision: needs, functioning, and testing of a retinal electronic prosthesis. *Progress in Brain Research*, 175, 317-332.

17. PREVENTING PROGRESSION OF POST-THROMBOTIC SYNDROME: QUALITY IMPROVEMENT EVIDENCE-BASED PROJECT FOR POST-DEEP VEIN THROMBOSIS PATIENTS

Anne M. Schmidt, RN, DNP Student, and Cindy Costanzo, RN, PhD, Creighton University School of Nursing, Omaha, NE.

Purpose: Post-thrombotic syndrome (PTS) is a chronic condition that develops in 20-50 % of patients with an acute deep-vein thrombosis (DVT). Cost, decreased quality of life and decreased personal productivity define the burden of PTS. The purpose of this project is 1) Compare DVT patient care practices within a private hospital to the American College of Chest Physician (ACCP) 2012 guidelines; 2) Develop and implement a quality improvement initiative to prevent progression of PTS; 3) Conduct nursing/provider education based on the ACCP 2012 guidelines for post-DVT patients to prevent PTS; and 4) Revise patient discharge education to include PTS prevention strategies.

Method: A retrospective chart review was completed with 75 charts including ICD-9 code of lower extremity DVT from January through December, 2011. The quality improvement project included education and revisions of post-DVT discharge instructions.

Results: Retrospectively, 75 charts were reviewed: 15 % had compression stockings ordered day 1 or 2 of admission; 57 % had compression stockings within two days of the order; and 35 % had compression stockings on the same day or before the order. For ambulation, 40% were ordered on day 1 or 2 of admission; 13 % were ambulated by physical therapy or in the hall day 1 or 2; and 57% had bedrest ordered on day 1 or 2.

Conclusion: In conclusion, the following are recommendations for clinical practice A) Employee and patient education on current guidelines; B) Revision of patient discharge instructions; C) Use of Villalta scale for PTS; D) Primary care provider follow-up for PTS prevention; E) Future development of a post-DVT order set within the electronic medical record.

18. A COMPARISON OF LOCAL AND NATIONAL IMMUNIZATION RATES AMONG AFRICAN AMERICANS

Candace Nakanishi, Linda Ohri, Alicia Vanden Bosch, and Victor Padron, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: Report immunization status survey data collected from the Black Family Health Fair (BFHF) in Omaha, Nebraska, compare findings to most recent national data and assess survey tool effectiveness.

Methods: Data was collected during the BFHF using a standardized interview survey tool utilized by Creighton University Operation Immunization pharmacy student volunteers over 3 annual data collection events (2010, 2011, 2012). The survey identified participants' gender, age group, selected high-risk conditions and vaccination status. Participants were screened for influenza, pneumococcal, Td/Tdap, Hepatitis A and B, HPV, MMR, Varicella, Shingles and Meningococcal immunization status. A comprehensive literature search to identify published immunization rates for the US African American (AA) population was also performed (2007 – 2013). Data collected from the health fairs was analyzed using IBM-SPSS-v20 software, and compared to published immunization rates for the targeted population group.

Results: Comparison of local data collected at annual events over a three year period suggests the survey tool is generally consistent when collecting immunization status data for repeated samples from this AA population. Data suggest that immunization rates among the local survey sample groups tend to be higher than national findings.

Conclusion/Significance: This "snapshot" survey tool provides pertinent and fairly reliable information to local advocacy groups regarding the immunization status of this community. The health fair interaction also provides volunteers the opportunity to further educate community members on the importance of immunizations. One limitation is an inability to assure that those attending the BFHF truly represent the broader AA populace of this geographic area. National 2012 data is not yet available to compare to our local 2012 "snapshot" data.

Acknowledgement: Center for Health Services, Research and Patient Safety (CHRP)

19. IMMUNIZATION ACCESS THROUGH OMAHA AREA PHARMACIES

Manuel A. Bangsil, Jilyan A. Ruckman, Linda K. Ohri, and Ted Kasha, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: Creighton University pharmacy volunteers partner with the Immunization Task Force-Metro Omaha (ITF) to promote immunizations in Omaha. This research updates information since a prior survey on Omaha pharmacies providing immunization services and on changes in available vaccines. Pharmacy contacts were also asked about interest in promoting new pneumococcal (PCV13; PPSV23) vaccine recommendations.

Methods: In 2012, we repeated a 2010 telephone survey to assess the number of pharmacies offering vaccines, and to describe services offered. We surveyed all licensed pharmacies (105) in the Omaha area that provide general pharmacy services to the public. Microsoft Access was utilized for data entry, with statistical analysis conducted in SPSS Version 20. We compared vaccines provided in 2012 versus 2010 to examine evolving trends in specific vaccine availability.

Results: Analysis identified numbers of eligible pharmacies vaccinating in 2012 (84; 80%) versus 2010 (74; 72%). Proportions of pharmacies offering specific vaccines in 2012 typically increased from 2010. All pharmacies in both years provided trivalent influenza vaccine (TIV). By 2012, 46% of pharmacies provided intradermal vaccine, and 58% high dose influenza vaccine (2010, no information obtained, high dose vaccine: intradermal vaccine not available). Availability of the live nasal influenza dosage form decreased from 2010 (46%) to 2012 (24%). There was increased availability for several vaccines in 2012 compared to 2010: PPSV23 (79%; 64%), Shingles (77%; 38%), TdaP (64%; 22%), Hepatitis B (45%; 14%), and Hepatitis A (45%; 12%). While no pharmacy provided the new PCV13 vaccine in 2012, 57% of surveyed contacts expressed interest in working with the researchers on a proposed pneumococcal promotion initiative.

Conclusion/Significance: More Omaha pharmacies offered immunizations in 2012, with more vaccines available. Pharmacies constitute an excellent access point for immunizations in the Omaha area, and a substantial resource for promotion of new vaccine initiatives.

20. DEPRESSION AND MEDICATION TAKING BEHAVIOR

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Purpose: Patients diagnosed with depression are often undertreated; one potential reason is medication non-adherence. The purpose of this study is to assess the occurrence of depression in 3 primary care clinics and how it might predict medication taking behavior.

Methods: The Patient Health Questionnaire (PHQ-9; 9 questions based on DSM-IV diagnosis criteria for depressive disorders) along with the Modified Morisky Scale (MMS; medication adherence screening tool) were given to non-pregnant patients 18 and older during the fall of 2012. The survey was anonymous and voluntary. The PHQ-9 determined the presence of depression as negative or positive. Patients were alternatively classified as major depression (experienced 5 or more depressive symptoms at least "more than half the days" in the past 2 weeks and must include anhedonia or depressed mood) or "other" depression (experienced 2-4 depressive symptoms at least "more than half the days" in the past 2 weeks and must include anhedonia or depressed mood). The MMS determined whether a patient was at risk for medication non-adherence as yes or no. All collected data was evaluated using descriptive statistics.

Results: The sample included 111 patients, 64 were women and average age was 49. Overall, 18% screened positive for depression, 14% for major depression, 9% for "other" depression and 60 patients were identified as at risk for medication non-adherence. Of those at risk for medication non-adherence, 10 were assessed as major depression, 6 as "other" depression and 44 as negative for depression.

Conclusion: Medication non-adherence and depression do not seem to be as closely linked in this sample population as other studies have shown. The results suggest medication non-adherence is a concern but factors other than depression may be responsible. Further study is needed to identify potential causes of medication non-adherence and ways to address them.

21. MOLECULAR MODELING OF DRUG POLYMER INTERACTIONS: STABILIZATION OF BINARY AND TERNARY SOLID DISPERSIONS

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Purpose: Correlate in-silico drug-polymer interactions with amorphous stabilizations of binary and ternary solid dispersions.

Materials and Methods: The optimized geometries of indomethacin-polymer complexes were obtained using the B3LYP/6–31G** calculations performed by the Jaguar (Schrodinger LLC, 2012) program with gradient-corrected density functionals and default convergence criteria for geometry optimization. Intermolecular energy values and hydrogen bond lengths between drug and polymer functional groups, known to predict the most stable complexes, were calculated. Continuous UV spectrophotometery was used to calculate the concentration change of indomethacin with time in presence of polymer and polymer mixtures. PVPK90, Eudragit EPO,

and PEG 8000 polymers were used in the study. Solution ^{1}H NMR was done to study the drug-polymer interactions in solution. Amorphous binary and ternary solid indomethacin-polymer dispersions were prepared using rotavapor. Physical mixtures and solid dispersions were characterized using PXRD and MDSC. IR and Raman spectra were used to investigate the possibility of drug-polymer interactions.

Results: Intermolecular energies and shortest intermolecular hydrogen bond distances were computed for indomethacin complexed with monomers of PVP K90, Eudragit EPO and PEG 8000. These results show the stability of the complexed indomethacin with PVP and EPO monomer units was greater than PEG 8000 monomer units. PVP K90 and Eudragit EPO were found to be the most efficient indomethacin precipitation inhibitors individually and in combination. Solution ^{1}H NMR confirmed the existence of drug-polymer interaction. In solid state, PVP K90 and Eudragit EPO formed stable amorphous binary and ternary solid dispersions of indomethacin. IR and Raman confirmed the possible interactions of Indomethacin with PVP K90 and Eudragit EPO.

Conclusions: Good correlation between in-silico drug polymer interactions and amorphous stabilization of binary and ternary solid dispersions were observed.

22. MOLECULAR MODELING OF DRUG POLYMER INTERACTIONS: CORRELATION TO PRECIPITATION INHIBITION AND AMORPHOUS STABILIZATION OF POORLY SOLUBLE ANTICANCER DRUG

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Purpose: Correlate the in-silico drug polymer interactions with poorly soluble drug precipitation inhibition and amorphous stabilization by various polymers.

Materials-Methods: The optimized geometries of flutamide-polymer complexes were obtained using the B3LYP/6–31G** calculations performed by the Jaguar (Schrodinger LLC, 2012) program with gradient-corrected density functionals and default convergence criteria for geometry optimization. Intermolecular energy values and hydrogen bond lengths between drug and polymer functional groups were calculated; these calculations are determined to predict the most stable complexes and are correlated with precipitation inhibition efficiency of polymers. Biotek plate reader was used to monitor the absorbance of drug concentration with time. Polymers, mainly PVP K90, HPMC, Eudragit EPO and PEG 8000, were used in the study. Amorphous flutamide-polymer solid dispersions were prepared using rotavapor. Physical mixtures and solid dispersions were characterized using PXRD and MDSC. IR and Raman spectra were used to investigate drug-polymer interactions.

Results: The intermolecular energies were computed for flutamide complexed with monomers of PVP K90, Eudragit EPO, HPMC and PEG 8000. Further, intermolecular hydrogen bond distances between flutamide and monomers of Eudragit EPO, PVP K90, PEG 8000, and HPMC were calculated. These results show the stability of the complexed flutamide and the PVP monomer was greater than other polymers monomer units. PVP K90 and PEG 8000 were found to be the most efficient flutamide precipitation inhibitors. In solid state, no melting endotherm was observed in flutamide-PVP and flutamide-PEG dispersions, indicating formation of stable amorphous solid dispersions. Further, IR and Raman confirmed the possible interactions of flutamide with PVP and PEG.

Conclusions: Good correlation between the in-silico drug-polymer interactions and polymers' precipitation inhibition and amorphous stabilization efficiency was observed.

23. PHYSICOCHEMICAL PROPERTIES BASED COMPUTATIONAL PREDICTIONS TO CLASSIFY DRUGS AS GLASS FORMERS

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Purpose: Prediction of glass forming ability by computational tool using physicochemical properties for the successful development of poorly soluble compounds in early drug development process.

Materials and Methods: Around 90 poorly soluble drugs and their physicochemical properties (e.g., melting point, molecular weights etc.) as reported in the literature were used for the glass forming ability predictions. Other molecular descriptors like log D, hydrogen bond donors and acceptors etc. were taken from standard online references. The glass forming abilities of selected drugs were experimentally determined by using melt quenching and mechanical activation methods. The solids produced were investigated using Modulated Differential Scanning Calorimetry (MDSC). Computational studies using machine learning algorithms to construct functions that will accurately perform such a prediction were explored. The capabilities of multiple learning machines, including the multilayer perceptron (MLP), the support-vector machine (SVM), and various polynomial decision functions, were investigated. Sets of training and testing vectors were constructed to evaluate the learning machines, and attribute selection discussed.

Results: Drugs are successfully characterized by MDSC as glass former using experimental studies. Computational modeling provided insight into the relative importance of molecular descriptors in amorphous formation of drugs, with success rates at predicting glass formation of up to 87%. Initial computational results indicated a correlation with experimental results.

Conclusions: In-silico studies can play an important role in poorly soluble amorphous drug development. More computational studies and detailed data analysis are needed to successfully use in-silico predictions for the development of poorly soluble amorphous drugs.

24. RHABDOMYOLYSIS AND ANTIPSYCHOTIC USE: A RETROSPECTIVE COHORT STUDY

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Purpose: Rhabdomyolysis is a less known side effect of antipsychotics, which increases levels of creatinine kinase (CK) in the blood. One proposed mechanism is that antipsychotics may increase skeletal muscle permeability, involving serotonin receptor antagonism which increases permeability to CK. Another theory suggests a central mechanism in that dopaminergic blockade in the nigrostriatal pathway in the brain results in involuntary movements resulting in elevations in CK. The purpose of this study was to establish the relationship between antipsychotic use and rhabdomyolysis, to assess for correlation in predisposing factors, and to elucidate the mechanism of rhabdomyolysis.

Methods: Of 673 patients admitted to Bryan Medical Center with rhabdomyolysis between January 2009 and October 2011, 74 were found to be on antipsychotics and were included in this retrospective cohort study. Data collected included age, gender, race, height, weight, temperature, smoking status, illicit drug use, alcohol use, serum creatinine, BUN, serum sodium, serum potassium, CK, myoglobin, urine myoglobin, liver enzymes, lactate

dehydrogenase, psychiatric diagnosis, co-morbid conditions, recent use of electroconvulsive therapy, presence of tardive dyskinesia, use of concomitant drugs, antipsychotic use, documented cause of rhabdomyolysis, and outcome of hospitalization.

Results: Out of 673 patients with rhabdomyolysis, 74 (11%) were on an antipsychotic versus 1.3% of the general population in the US ($P<0.0001$). There was no documented cause of rhabdomyolysis in 30% of patients, and antipsychotic use was suspected in only 9% of cases. Due to the small sample size, no statistically significant correlations were found between antipsychotic type and other patient specific parameters including age, gender, CK, serum creatinine, illicit drug use, concomitant illnesses, smoking status, concomitant medications. The largest number of patients was on quetiapine which is the most prescribed antipsychotic in the US.

Conclusion: Antipsychotic use is a risk factor for rhabdomyolysis. More research needs to be done to determine which drugs have a higher risk and which receptor(s) are involved. Providers should be aware of the risk of rhabdomyolysis associated with antipsychotic use.

25. EMPLOYING MOE FOR RATIONAL DRUG DESIGN AND EDUCATIONAL INITIATIVES

Amanda Neppl and Dr. Brian Henriksen, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Molecular Operating Environment (MOE) was used for (1) rational drug design of novel HIV integrase inhibitors and (2) production of full motion videos for use in the classroom. Retroviral integrase's strand invasion activity is the last HIV event before its irreversible integration into the human genome. Currently only two integrase inhibitors are marketed. The purpose of our docking study was to determine a novel series of integrase inhibitors to be synthesized. Prospective compounds were sketched utilizing the builder function, placed in integrase's active site, protonated through the Protonate3D function to mimic pH 7.4 environment, docked using triangle matcher and rigid receptor stipulations, and affinity was established through the LigX function. After docking compounds with highest affinity as well as confirmed visual active site placement were selected and are going to be utilized in further research to determine their potential for synthesis as a novel HIV pharamcotherapeutic agent.

MOEvies were composed as a supplemental learning tool to solidify complex chemical concepts associated with medicinal chemistry (ex: drug-receptor complex and structure activity relationship). Two dimensional images and three dimensional full motion videos were created for the following topics: proton pump inhibitor mechanism of action and pharamacophore, the metabolic pathway of epinephrine and norepinephrine, morphine pharamacophore, and corticosteroid pharamacophore. Molecules were sketched using the MOE builder after which manipulations needed for fluid full motion were captured as key frames using the MOEvie function. With the MOEvie function drugs were rotated, zoomed, or modified in addition to narratives or labels added to each successive key frame. The MOEvie application interpolated the frames between captures to create a fluid full motion video. Full motion videos will aid in the visualization of spatial orientations needed to mentally manipulate abstract chemical concepts, a key skill needed to interpret and apply material taught in medicinal chemistry.

26. DESCRIPTION OF A VANCOMYCIN DOSING NOMOGRAM IN A COMMUNITY HOSPITAL

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Purpose: A vancomycin dosing nomogram was created to determine an initial regimen based on body weight ≥ 40 kilograms and an estimated creatinine clearance ≥ 30 milliliters per minute. A vancomycin trough was obtained for patients receiving vancomycin for 4 or more doses. The purpose of this study was to evaluate the percentage of adult patients who achieved an initial serum trough concentration within 10 – 20 mg/dL using a vancomycin dosing nomogram in a community hospital.

Methods: A retrospective chart review was conducted on adult patients receiving intravenous vancomycin using a dosing nomogram from August 2012 through February 2013. Patients were included if vancomycin was dosed correctly using the nomogram and if an initial trough was drawn. Patients were excluded if vancomycin was not dosed using the nomogram, a trough level was drawn before the fourth dose, or patients who received dialysis or continuous renal replacement therapy. The primary outcome was the percentage of adult patients who achieved an initial serum trough concentration within 10 – 20 mg/dL using a vancomycin dosing nomogram. A secondary outcome was to determine the percentage of patients who experienced nephrotoxicity.

Results: A total of 89 patients met the criteria for chart review and analysis. The average length of vancomycin therapy was 5 days with the most common indications of pneumonia and cellulitis. Analysis showed 72% of patients achieved an initial serum trough concentration within 10-20 mg/dL and 19% had a trough within 5-9 mg/dL. The incidence of nephrotoxicity was 9%.

Discussion: Majority of the patients achieved an initial vancomycin trough within the range of 10-20 mg/dL using the dosing nomogram. Utilization of a loading dose may increase the percentage of patients within target trough range. Daily evaluation for de-escalation of vancomycin therapy and minimizing concomitant nephrotoxic agents could impact the occurrence of nephrotoxicity.

Acknowledgement: I greatly acknowledge Dr. Ryan Dull, Dr. Estella Davis, and the Student Research program for providing their time, effort, and funding.

27. A BRIEF PRIMARY CARE INTERVENTION TO REDUCE FEAR OF MOVEMENT IN CHRONIC BACK PAIN PATIENTS

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The fear-avoidance model proposes that chronic pain, when interpreted as a sign of serious injury, leads to excessive fear (kinesiophobia) and avoidance of movement followed by disability and depression. The Tampa Kinesiophobia Scale (TSK) has identified patients who have benefited from cognitive-behavioral treatment (CBT) designed to change fear-avoidance beliefs. Four chronic low back pain patients with TSK > 2.5 were selected for participation in this multiple baseline with changing criterion design study. Baseline, end of study, and 2 week follow-up measures included the TSK and six other self-reported outcome measures. During baseline subjects were timed as they walked two laps of a clinic hallway (185 ft). Following a stable baseline, subjects received a 45 minute informational talk that their pain was chronic, pain was not an indication of harm, and that movement was acceptable. They were given visual

performance feedback regarding baseline data and asked to speed-walk, a graded in vivo exposure to fear of movement, on the course with a goal set at 3 seconds below baseline. After 3 successful trials at the 1st goal, a 2nd goal was set at 3 seconds faster than the average goal 1 performance. The intervention phase ended with 3 successful trials at the 2nd goal. Two weeks later, subjects completed the measures again and did 3 trials of speed-walking. Results indicated that 3 of the 4 subjects had 100% and the 4th had 83% non-overlapping data between baseline and goal 1, goal 2, and follow-up phases. All 7 outcome measures improved from baseline to end of study and 6 of 7 outcome measures improved from end of study to follow-up.

28. EFFECTS OF SITE-DIRECTED OXIDATION ON *DICTY* MYOSIN II

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Purpose: We have examined the effects of oxidation on the functionality of *Dictyosteilum discoideum (Dicty)* myosin II by performing site-directed mutagenesis. Protein oxidation by reactive oxygen species (ROS) is crucial for cell function, but also creates oxidative stress, which indicates disease progression and biological aging. One of the most sensitive and selective targets of ROS in the cell are the thiol groups of proteins, which means the sulfur containing amino acids, methionine (Met) and cysteine (Cys), are the main targets of ROS in proteins.

Methods: In order to see the consequences of Met oxidation, a Dicty myosin II construct was used devoid of native reactive cysteines. *Dicty* has been found to be an appropriate model for examining the oxidation of human skeletal myosin, due to its conservation of thiol containing amino acids (See Figure 2B). Oxidative modification of Met in myosin II is associated with a functional decline in actomyosin interaction and myosin functionality. It has been previously determined through actin-activated ATPase assays that residue M394 on the cardiomyopathy loop is susceptible to oxidation due to its exposure to the actin-binding interface. Wildtype (WT) T688C myosin has three Met residues susceptible to oxidation. We have monitored the change in ATPase activity of T688C as a function of inorganic phosphate (Pi) release in High Salt ATPase assays. We have added methionine sulfoxide reductase (Msr) and the reducing agent dithiothreitol (DTT) to the oxidized myosin and have observed its effect on ATPase activity.

Results: Oxidized TC88C myosin exhibited a significant drop in ATP production similar to that observed in M394C. Unlike actin-activated oxidation of M394C, high salt ATPase assays failed to recover functionality of oxidized TC88C by addition of Msr A.

Conclusions: 1) Oxidation of Met on *Dicty* myosin II decreases ATP-ase activity by more than 2-fold in both high salt and actin-activated ATPase assays. This suggests that methionines are key to the functionality of the protein Myosin. 2) High salt ATPase assays may have a limiting effect on the reversibility of oxidation of Met with Msr A and DTT. The actin activated assay lead to a reversal of oxidation. However, the high salt assay experiment should be repeated to confirm the results. 3) Msr reduces at least one MetO back to Methionine. And this one reduction allows for a significant recovery of protein functionality. Reversibility would indicate that oxidative stress could be reversed, thus have major effects for biological aging and muscular disease progression.

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29. EXPRESSION OF *GLYPICAN 3* IN HOMOLOGOUS AMYGDALA-LIKE REGIONS OF DIVERSE VERTEBRATES

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Purpose: The amygdala plays has a central role in the regulation of complex social behaviors and controlling basic survival functions, including fear. Fear response is important to many areas that influence an organism's fitness; however, little is known about how fear reactions evolved in vertebrates. Glypicans are a family of heparan sulfate proteoglycans that interact with numerous cell-cell signaling processes to mediate multiple roles in development, homeostasis, and disease. One of these, glypican 3 (gpc3) is strongly expressed in the amygdale in mice, an area that controls fear responses. Mutations of gpc3 in humans cause Simpson-Golabi-Behmel syndrome, which is associated with high-risk behaviors suggestive of impaired fear responses. We hypothesized that gpc3 is expressed in homologous areas of the amygdala in two diverse vertebrates, chick (Gallus gallus) and zebrafish (Danio rerio).

Methods: Brains of chicks were sectioned, and underwent in situ hybridization for gpc3. In situ hybridization on zebrafish was done on whole mounts and then sectioned. Staged embryos were used to determine the development of the expression patterns.

Results: gpc3 was expressed in the lateralmost nidopallium of chicks, and in a region adjacent to the medial part of the dorsal area (Dm) in zebrafish.

Discussion: The expression of gpc3 in chick and zebrafish is locationally similar to that in mice, where gpc3 is expressed in the intercalated amygdalar nucleus. gpc3 expression thus appears to be highly conserved in amygdala-like regions of diverse vertebrate lineages, and may play a critical role in the development and/or function of these regions. Our results are consistent with the hypothesis that areas of the amygdala controlling these behaviors developed very early in vertebrate or pre-vertebrate evolution.

30. HETEROGENEOUS CATALYSIS: THE HORIUTI-POLANYI MECHANISM AND ALKENE HYDROGENATION

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The hydrogenation of alkenes by heterogeneous catalysts has been studied for 80 years. The foundational mechanism was proposed by Horiuti and Polanyi in 1934, and consists of three steps: (1) alkene adsorption on the surface of the hydrogenated metal catalyst, (2) hydrogen migration to the □-carbon of the alkene with formation of a □-bond between the metal and □-C, and finally (3) reductive elimination of the free alkane. Hundreds of papers have appeared on the topic, along with a number of variations on the Horiuti-Polanyi mechanism. The second step is highly reversible, leading to extensive deuterium/hydrogen exchange when $D_2(g)$ is used. We will describe our investigation of gas phase reactions between deuterium and 1-butene using a supported palladium catalyst under ambient laboratory conditions, and how the results are consistent with the Horiuti-Polanyi mechanism. An Excel spreadsheet for modeling the extent and distribution of deuteration within butane-d_x will be described. Analysis of the butane produced by ^{1}H-NMR and GC-MS leads to numerous conclusions in support of the Horiuti-Polanyi mechanism.

31. EVOLUTIONARY CONSERVATION OF A POTENTIAL MAMMALIAN RIBOSWITCH

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Riboswitches, which are a type of non-coding RNA sequence, are found in untranslated regions of mainly bacterial mRNAs. Many riboswitch RNAs undergo conformational changes upon binding to a specific cellular metabolite. We are interested in identifying riboswitches in animals and are investigating the structure and function of a potential riboswitch conserved among a wide variety of mammalian species that is thought to control polyamine biosynthesis. Polyamines serve important functions in the cell ranging from controlling cell development to initiating cell apoptosis. We hypothesize that the potential riboswitch will bind specifically to a ligand and demonstrate conformational changes upon ligand binding. Moreover, we are using various analogs of the natural ligand that differ slightly in the polyamine structure and stereochemistry to investigate the specificity and affinity of binding between the riboswitch and ligand. We are utilizing equilibrium dialysis and in-line probing, among other techniques, to properly characterize this riboswitch. Our preliminary results indicate that the RNAs from diverse species possess similar binding affinity and specificity. The identification of riboswitches in mammals could be useful as therapeutic targets for modulating gene expression, particularly in cancer growth.

32. ION DETECTION SPECIFICITY OF GOLD NANOPARTICLES AFTER FUNCTIONALIZATION

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Identification and quantitation of the presence of metal ions as strontium, barium, and calcium in solution can be achieved with gold nanoparticles. The specificity of the nanoparticles for these metal ions was accomplished via functionalization with the dicarboxylic acid mercaptosuccinic acid (MSA). The nanoparticle solution color changes from red to blue in the presence of the metal ions. Absorbance scans detected a shift in wavelength from 520 nm to 65X nm, where X was dependent upon metal ion identity. Scans also indicated the specificity of functionalizing nanoparticles. Comparison of the absorbance wavelength of bare nanoparticles with the ion to the absorbance wavelength of functionalized nanoparticles indicated the usefulness. The detection limits of MSA-gold nanoparticles was determined to be 10 μM for strontium, 20 μM for barium, and 30 μM for calcium. In solution, the order of addition of buffer, salt, and nanoparticles did affect the absorbance of the solution with, as well as without the ion present. However, the absorbance of the bare nanoparticles at 520 nm was ~1.6 times greater compared to the functionalized nanoparticles. This would indicate that the functionalized nanoparticles are less sensitive in absorbance scans.

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

Alexander Stock and Dr. Juliane Strauss-Soukup, Department of Chemistry, Creighton University, Omaha, NE.

Riboswitches are found in non-coding regions of mRNA molecules, and gene expression is modulated when 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. The *glmS* riboswitch binds to glucosamine-6-phosphate (GlcN6P), a building block of the cell wall in Gram-positive bacteria,

and undergoes self-cleavage resulting in inactivation of the mRNA. We have shown that the ligand amine and phosphate functionalities of GlcN6P are essential for binding of the metabolite to the riboswitch RNA and for catalysis by the *glmS* catalytic RNA (ribozyme). These requirements for binding and catalysis of the GlcN6P-dependent riboswitch/ribozyme have been used to design and synthesize novel ligand analogs. The goal of this project is to determine how to deliver GlcN6P and similar synthetic analogues into Gram-positive bacteria in order to down regulate *glmS* gene expression and ultimately inhibit bacterial cell wall synthesis. The use of nanoparticles is being investigated as a possible delivery mechanism.

34. INCORPORATION OF 4(5)-BENZYL-L-HISTIDINE INTO A PEPTIDE USING Fmoc-BASED SOLID-PHASE PEPTIDE SYNTHESIS

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Calcitonin gene-related peptide (CGRP) is a potent peptide vasodilator that is produced in the peripheral and central nervous systems. Binding of CGRP to its receptor causes dilation of cerebral and dural blood vessels, thought to be the source of nociception in individuals susceptible to migraine. Previously, it was reported that derivatized CGRP fragment Nα-benzoyl-[4(5)-benzyl-L-His^{10}]-CGRP(8-37) is a CGRP antagonist with 100-fold greater binding affinity compared to a standard antagonist, CGRP(8-37). The goal of this research is to develop a peptide synthesis method that gives high yields of [4(5)-benzyl-L-His^{10}]-CGRP(8-37) using 4(5)-benzyl-L-His prepared from L-His and benzaldehyde by Pictet-Spengler cyclocondensation–transfer hydrogenation. Current studies involve N-imidazole protection of 4(5)-benzyl-L-His using triphenylmethyl chloride, and investigation of racemization of Fmoc-4(5)-benzyl-L-His during Fmoc-based solid-phase peptide synthesis of the model peptide [4(5)-benzyl-L-His]-L-Ala-Gly.

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

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Riboswitches are found in the 5' untranslated region of mRNAs and bind cellular metabolites in order to induce a conformational change in the mRNA, subsequently modifying the expression of the coding region nearby. This coding region is involved in the synthesis of the same metabolite it binds, and this system provides an efficient feedback mechanism of genetic control. Various riboswitches have been described as effective controls of genetic expression in bacterial cells, but we propose here a potential mammalian riboswitch. We are investigating the structure and function of a potential mammalian riboswitch conserved over a wide variety of species and thought to control polyamine biosynthesis. Polyamines are essential for cellular proliferation and differentiation, and therefore they play a key role in cancer and tumor development. The goal of this project is to solve the crystal structure of this putative riboswitch RNA bound to the polyamine spermine. Preliminary crystallization results have aided in optimizing the chemical conditions necessary for crystal growth. In addition we will study the thermodynamic properties of spermine binding to its riboswitch by utilizing Isothermal Titration Calorimetry (ITC). ITC directly measures the energy involved in the binding of ligand to the sample. Results will render a better understanding of the binding properties of the metabolite to the RNA and may aid in development of synthetic ligands/metabolites for use as cancer therapies.

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36. *GLMS* RIBOZYME DISOCIATION CONSTANTS FOR AGONIST AND ANALOGS AND THEIR POTENTIAL APPLICATION AS ANTIBIOTICS

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The bacterial *glmS* ribozyme is a mechanistically unique functional RNA among both riboswitches and RNA catalysts. Its self-cleavage activity is the basis of riboswitch regulation of glucosamine-6-phosphate (GlcN6P) production, and catalysis requires GlcN6P as a coenzyme. Kinetic analysis using the agonist and analogs has helped determine the K_D value for the GLMS ribozyme and the various ligands. Two such compounds are candidate antibiotics that might disrupt normal cell metabolism in a variety of human pathogens that harbor the *glmS* ribozyme.

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37. ANTIBIOTIC PROPERTIES OF ARTIFICIAL AGONISTS FOR A BACTERIAL RIBOSWITCH

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The *glmS* riboswitch is a self-cleaving ribozyme that inhibits replication of bacteria by degrading the *glmS* mRNA, which in turn prevents the translation of the proteins that make up the bacterial cell wall. Through this method, the bacteria are prevented from replicating and incurring the mutations that lead to the resistance to modern antibiotics. The *glmS* sequence leads to the production of Glucosamine-6-phosphate (GlcN6P), a sugar needed to build the bacterial cell wall. GlcN6P also binds the *glmS* riboswitch to initiate self-cleavage of the mRNA and therefore stops production of the sugar. We are studying the efficacy of artificial analogues in eliciting this same response. Through kinetic assays and the study of the binding affinity with an isothermal titration calorimeter (ITC), we are able to determine the following for each analog: the time and the optimal concentration at which they cause self-cleavage and the affinity they have for the *glmS* riboswitch. Preliminary results have identified several analogues as potential agonists of the natural ligand, GlcN6P. The development of these analogues into antibiotics would be useful in the current struggle against numerous bacterial infections.

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38. THE SYNTHESIS AND PHOTOOXIDATION OF 2-METHYL-3,4,5-TRIPHENYL-2,4-CYCLOPENTADIENONE

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Purpose: The purpose of this research is to make progress toward the synthesis of cyclopentadienone derivatives and evaluate products of a subsequent photooxidation using LED light at 627 nm.

Methods: Benzil and 4- heptanone were condensed using catalytic KOH in ethanol. The reaction mixture was poured on ice and dehydrated with acetic anhydride and catalytic H_2SO4. The resulting dark red solid was filtered and dried. This reaction was repeated using prepared 1-phenyl-2-butanone in place of 4-heptanone. About 15 milligrams of the original product was sealed in a hypovial with oxygen, concentrated methylene blue in dichloromethane, and a stir bar and stirred under red LED light at 627 nm for 30 minutes. The mixture was run through an alumina plug and evaporated. The products were analyzed with thin layer chromatography, H-NMR, and GC/MS.

Results: The condensation reaction produced 30% yield on average of the first cyclopentadienone (2,5-dimethyl-3,4-diphenyl-2,4-cyclopentadienone) and 80.2 % yield of the second (2-methyl-3,4,5-triphenyl-2,4-cyclopentadienone). TLC and H-NMR analysis of both products revealed that 1-phenyl-2-butanone resulted in a more stereochemically pure product, whereas reaction with 4-heptanone produced several isomers. Photooxidation of 2,5-dimethyl-3,4-diphenyl-2,4-cyclopentadienone occurred via two pathways, an “ene” reaction or carbon monoxide elimination. Current experiments are aimed at determining if the pathway is a result of cyclopentadienone structure or the presence of isomers.

Conclusion: The next goal in this investigation is determining if the cyclopentadienone substituents have an effect on which pathway the substrate undergoes during photooxidation. Currently, we are testing a new analog with fewer isomeric possibilities. After this new cyclopentadienone is photooxidized, the products will be analyzed with GC/MS, H-NMR, and TLC to determine which pathway occurred. Ideally, the next step is to determine a mechanism specific reaction conditions for each pathway.

39. THE CHROMATOGRAPHIC DETERMINATION OF NICOTINE IN AVIAN EMBRYOS

Jordan Otto, Dr. David Dobberpuhl and Dr. Mark Reedy, Department of Chemistry, Creighton University, Omaha, NE.

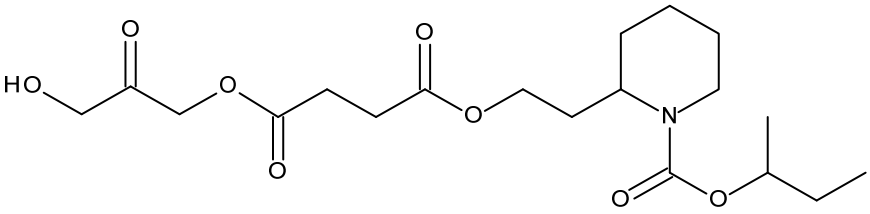
Cigarette smoke can have significant health consequences, perhaps especially for a developing fetus. As such, pregnant women who smoke are counseled to consider alternatives such as nicotine patches or nicotine gum. Yet nicotine itself is a powerful drug with cholinergic activity. Previous work with avian embryos, which can be extrapolated to human fetuses, has shown that nicotine slows growth and heart rates, and eventually results in neurological changes. Based upon the physiological response of avian embryos, it is assumed that nicotine added to the albumin likely diffuses into the embryos. However, nicotine uptake has never been directly measured in avian embryos. Initial work reported here focused on identifying chromatographic strategies offering the most promise for the determination of nicotine. Gas chromatography with mass spectrometry (GC-MS) proved to be more promising than high performance liquid chromatography with UV absorbance detection (HPLC-UV). Limits of detection (S/N≥3) for GC-MS approached 0.5 ppb based on 1.0-µL injections of standard solutions. Subsequently, avian eggs were dosed with nicotine tartrate at 24 hours of incubation with the total concentration of

nicotine in the egg approximating plasma levels of those using the nicotine patch. Five-day-old embryos were then excised and homogenized. The resulting solutions underwent further extraction before injection into the GC-MS. Several extraction strategies were investigated using various solvents and solid-phase techniques. Initial results indicated that nicotine extraction is challenging given the complex biological system. Work is ongoing to elucidate how nicotine partitions into various solvents as a function of pH, with the ultimate goal being the development of an extraction strategy that isolates nicotine from the embryonic matrix.

40. ORGANIC SYNTHESIS OF A COVALENTLY BOUND INSECT REPELLENT

Alexander Y. Kim, and Dr. Martin Hulce, Department of Chemistry, Creighton University, Omaha, NE.

In an effort to create a long-lasting, skin-bound spray-on insect repellent, covalent binding of the non-toxic insect repellent icaridin to the sunless tanning agent 1,3-dihydroxyacetone via a hydrolysable linker was investigated. It was determined that reacting icaridin with succinic anhydride in pyridine allowed for isolation of a succinic half ester product which could be elaborated to the desired adduct with 1,3-dihydroxyacetone (**1**, below) by further esterification. Testing of this adduct by application to shed snake skin and determination of hydrolytic stability post application by diffusion chamber and headspace analysis will be described.



41. PARTICLE IDENTIFICATION FOR ELECTRON-POSITRON PAIRS IN ULTRAPERIPHERAL COLLISIONS AT RHIC

Jarrod Bang, Department of Physics, College of Arts and Sciences, Creighton University, Omaha, NE.

At RHIC (Relativistic Heavy Ion Collider), two atomic nuclei are accelerated to near the speed of light in opposite directions. Ultraperipheral collisions occur when these two nuclei interact in such a way that they have an impact parameter greater than twice their nuclear radius. While the nuclei continue along the beam line, particles are produced from the intense electromagnetic interaction. Studying direct electron-positron pairs can aid in understanding the quantum electrodynamics involved due to these intense fields. This talk will discuss different particle identification methods used by STAR (Solenoidal Tracker At RHIC) in relation to electron-positron pair production in ultraperipheral interactions. Funding is provided by the United States Department of Energy.

42. GENTAMICIN DIFFERENTIALLY AFFECTS OHC AND IHC METABOLISM AS REVEALED BY NADH FLUORESCENCE LIFETIME IMAGING

Kristina G. Ward[1], L.V. Zholudeva[1], M.G. Nichols[1], H. Jensen-Smith[2], Creighton University, Departments of Physics[1] and Biomedical Sciences[2], Omaha, NE.

Annually more than 100,000 people treated with lifesaving antibiotics develop hearing or balance disorders. Of the two types of cochlear sensory cells, inner hair cells (IHCs) are

significantly more resilient than outer hair cells (OHCs) to acoustic trauma, age-related hearing loss, and antibiotic ototoxicity. Changes in the fluorescence lifetime of the metabolic intermediate NADH were measured in I/OHCs to determine if endogenous and antibiotic-induced differences in sensory cell mitochondrial metabolism exist. The dynamic range of NADH metabolism (maximum NADH oxidation and reduction) was greatest in high-frequency OHCs. Sodium cyanide redistributed NADH into different subcellular microenvironments in IHCs and OHCs. Pretreatment with the ototoxic antibiotic gentamicin (GM) altered the NaCN effect in I/OHCs. These initial descriptions of fundamental differences between IHC and OHC mitochondrial metabolism indicates how high-frequency OHCs are profoundly sensitive to a number of cochlear challenges including ototoxic antibiotics.

Conducted at the Integrative Biological Imaging Facility at Creighton University, supported by the C.U. Medical School, NIH NCRR (5P20RR016469) and NIGMS (8P20GM103427). MN supported by R15GM085776. KW and LZ supported by NIGMS (8P20GM103427). HJS supported by NIH NIDCD (RO3DC012109) and COBRE (8P20GM103471-09).

43. INTEGRATION OF STAR BEMC CONTROL SYSTEM

Charles Costello, Ryan Gnabasik, Jiro Fujito, and Michael Cherney, Department of Physics, Creighton University, Omaha, NE.

The control system for the STAR (Solenoidal Tracker at RHIC) detector is based on EPICS (Experimental Physics and Industrial Control System) software. The STAR Barrel Electromagnetic Calorimeter (BEMC) was developed using LabVIEW as a control system in 2005. The calorimeter was incorporated into the STAR experiment before the LabVIEW system was fully integrated with EPCIS in which the interface only allows monitoring of the sub-detector. A new interface is being developed that will allow both the control and monitoring of the calorimeter. We have created a working prototype for the STAR BEMC LabView system demonstrating that the calorimeter can be controlled and monitored fully from EPICS.

44. PHI MESON PHOTOPRODUCTION IN ULTRAPERIPHERAL COLLISIONS AT RHIC

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

We are studying ultraperipheral gold-gold collisions at 200 *GeV* collected with the STAR (Solenoidal Tracker at RHIC) detector. In these collisions, where the impact parameter is greater than twice the radius of the gold nuclei, the interactions are electromagnetic. We focus on φ meson photoproduction through its decay channel into K+ and K- mesons. Coherent photoproduction results in φ mesons with transverse momentum less than 0.15 *GeV/c*. However, the decay products from these are not within STAR's acceptance. Φ mesons with momentum greater than 0.15 *GeV/c*, whose decay products are within STAR's acceptance, may come from incoherent photoproduction. We investigate the possibility of experimentally separating φ mesons produced from incoherent photoproduction from those produced in hadronic interactions. We compare our data with STARlight, a Monte Carlo simulator of the physics of ultraperipheral collisions.

Acknowledgment: This research was funded in part by the U.S. Department of Energy, Office of Science.

45. CONSTRAINTS ON UNIVERSAL EXTRA DIMENSIONS THEORY FROM DARK MATTER DIRECT DETECTION

Christopher Lefky, and Dr. Gintaras Duda, Department of Physics, College of Arts and Sciences, Creighton University, Omaha, NE.

Purpose: The theory of Universal Extra Dimensions (UED) contains an excellent dark matter candidate, the $B^{(1)}$, which is the lightest Kaluza-Klein excitation/particle (LKP). Constraints can be placed on the two most fundamental parameters of UED Theory, R (the size of the extra-dimension) and Λ (the cutoff scale of the theory) using recent dark matter direct detection results. Recent limits from the XENON experiment are used to calculate a generic WIMP-nucleon cross section for a range of masses. Using UED phenomenology, these cross section limits can yield limits on the mass splitting Δ, the ratio of the Lightest Kaluza-Klein particle (LKP) to the Lightest Kaluza-Klein quark (LKQ). This project builds upon previous work where constraints were placed on R and Λ for fixed values of the mass splitting. The presentation will address constraints on the fundamental UED parameters as a function of mass splitting and will comment on the usefulness of direct detection bounds to restrict UED theory. Results obtained are compared against recent accelerator bounds, specifically the lower bound for 1/R from the ATLAS experiment.

Conclusion/Significance: The radius of the extra dimension and the cutoff scale of UED theory can be remarkably well constrained if direct detection experiments place tight bounds on the cross section. However, it is neither realistic nor expected for direct detection experiments to be able to pin down the WIMP mass very well. Anne Green finds that only a lower limit can be placed on 500 GeV WIMPs and on the cross section. Lower mass WIMPs in the 5-10 GeV range are ruled out by limits on place on 1/R.

Acknowledgment: Christopher Lefky and Gintaras Duda would like to thank the Ferlic Research Scholarship for the funding which supported this work.

46. DESIGN AND CONSTRUCTION OF A SPATIALLY-RESOLVED OXIMETER FOR METABOLIC PROFILING OF MULTICELL TUMOR SPHEROIDS

Christian T. Meyer and Mike G. Nichols, Department of Physics, Creighton University, Omaha, NE.

Background: The condition of the metabolism of a cell is a direct reflection of its vitality. As such, developing a method to measure the activity in a tissue can be useful in determining its health. The electron carrier nicotinamide adenine dinucleotide (NADH) is a ubiquitous and integral part of the eukaryotic metabolic process; it is also an endogenous fluorophore. The Fluorescence Lifetime Imaging Microscopy (FLIM) of NADH is a noninvasive technique to gauge the efficiency of the metabolism. FLIM yields information about the intensity and lifetime of the fluorescence which provides insights into the NADH concentration and enzyme binding.

Purpose: The purpose of the research is to highlight the change in both NADH concentration and binding in various conditions which will then be used to establish standards for determining the cause for metabolic inhibition *in vitro*. The direct relation of NADH trends to metabolic activity have yet to be correlated to the typical measures such as the consumption of glucose and oxygen.

Methods: To correlate variation of NADH intensity and lifetime to oxygen availability, the spatially-resolved oxygen concentration within and around the spheroid is measured using a Clark-style oxygen microelectrode. By measuring the oxygen concentration at different locations

relative to the spheroid, the metabolic oxygen consumption rate can be determined. The oxygen electrode lies on a translation stage controlled by a motorized micropositioner. To ensure the electrode passes through the center of the spheroid, the tip is located using two orthogonal microscopes constructed with CMOS cameras to capture live video. Data acquisition and micropositioning is accomplished using a custom LabVIEW program.

Conclusion: Experimental progress has yet to yield any data; however, the protocol and apparatus is complete and ready to produce results.

Acknowledgements: This work is supported by grants from the National Center for Research Resources (5P20RR016469) and the National Institute for General Medical Science (NIGMS) (R15GM085776 and 8P20GM103427), a component of the National Institutes of Health (NIH) and its contents are the sole responsibility of the authors and do not necessarily represent the official views of NIGMS or NIH.

47. USING MULTINEST TO COMPARE RESULTS OF DARK MATTER EXPERIMENTS

Erin Borchers, Nicholas Battafarano, and Dr. Gintaras Duda, Department of Physics, Creighton University, Omaha, NE.

Much research done in modern physics is designed to search for direct evidence of dark matter, the non-luminous matter that makes up the majority of the universe. Dark matter, which is theorized to be composed of WIMPs (Weakly Interacting Massive Particles), is electrically neutral and does not interact strongly with normal matter, making it very difficult to detect. Many modern experiments have been designed to directly detect these particles. However, the communication of these research results remains difficult, due to the non-uniformity of assumptions made during direct detection experiments. The calculation of the rate of dark matter detection depends on several yet-uncertain variables, primarily the astrophysical distribution of the dark matter in the dark matter halo. Physicists are forced to make assumptions about this distribution, leading to discrepancies among dark matter experiments – the model an experiment uses is fundamentally intertwined into the experiment and its results. Our research aims to remove the uncertainties and create halo-independent constraints. Using MultiNest, a Monte Carlo simulator, we make simple assumptions about the halo model, and thus fit the data from multiple direct detection experiments together. By fitting the velocity distribution function of the dark matter with a series of step functions, MultiNest will generate a numerical solution for a halo model that is consistent with all experiments. By removing the differences in theoretical assumptions from dark matter detection experiments, we attempt to make reporting experimental results more transparent and comparable. The final results of this study, which is funded with a NASA Nebraska Space Grant Fellowship, are forthcoming.

48. CONFORMATIONAL DYNAMICS OF AMYLOID PROTEINS AT THE AQUEOUS INTERFACE

Matthew Armbruster[1], Nathan Horst[1], Brendy Aoki[2], William Marquardt[2], Saad Malik[1], and Patricia Soto, [1]Department of Physics, [2]Department of Chemistry, Creighton University, Omaha, NE.

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

molecular modeling study in terms of the existence of preferential binding spots of the amyloid to the bilayer and the response of the bilayer to the interaction with the amyloid.

49. MOLECULAR MODELING OF AMYLOID PROTEINS

Charles Nguyen[1], William Graft[1], Dalton Bourke[2], and Patricia Soto, [1]Department of Physics, [2]Department of Psychology, Creighton University, Omaha, NE.

Proteins are the biological nanomachines that perform specific functions to ensure the wellbeing of every living cell. Proteins attain the right shape through a delicate balance of competing interactions between the protein and the cell environment. Our cross disciplinary research uses theories and tools from physical and life sciences, and high-performance computer methods to advance our understanding of the process of protein folding (how proteins attain the functional shape). The link between misfolded proteins (i.e. mis-shaped proteins) and amyloid diseases is addressed together with potential avenues for the rational design of therapeutics. We focus on studying the conformational dynamics of proteins hallmark of two amyloid neurodegenerative diseases: Prion protein, the agent of transmissible spongiform encephalopathies, and α-synuclein, found in protein deposits in Parkinson's disease. We will present our work on finding the binding modes of a molecule inhibitor against prion protein misfolding, on studying model prion protein structures and how they relate to the transmission barrier effect and on studying likely conformations of tetramer α -synuclein under physiological conditions.

50. CHANGE IN BIRTH WEIGHT PATTERNS IN REFUGEE IMMIGRANTS: A RETROSPECTIVE STUDY

Anupama S. Khandare, MBBS, MPH, Kunalpreet S. Gugnani, MBBS, and Jayashree Paknikar, MD, FAAFP, Creighton University School of Medicine, Omaha, NE.

Objective: The aim of this study was to examine the increase in birth weight patterns in the Asian refugee immigrant population. We also derived the incidence of fetal and maternal complications as a result of the increase in fetal birth weights.

Study Design: We performed a retrospective study of the data of an Asian female refugee population residing in Omaha, Nebraska and who delivered during January 1, 2011 to December 31, 2011. For this study, we investigated the relationship of relative macrosomia (birth weight >7.5lb) to perinatal complications in the mother and neonate. These included 3rd and 4th degree perineal tears in mother, C-sections after prolonged labor, Shoulder Dystocia and related injuries in the neonate. The data was extracted from Creighton Medical Associate Electronic Health Records (EHR).

Results: During this time period, 21 out of 68 (30.88%) women in the study had fetal birth weight greater than 7.5 pounds. 7 out of 68 (10.29%) women had shoulder dystocia during delivery. 6 out of 68 (8.82%) women had 3rd or 4th degree perineal laceration. 5 out of 68 women had caesarean section due to failure to progress in labor. Neonatal complications included bone injuries like a humerus and a clavicular fracture.

Discussion: The average birth weight of prior deliveries in their native countries of residence for these 68 women included in the study was 6.64 pounds. In our study, we noted that average birth weight of current delivery in the United States was 7.13 pounds (4.91 to 9.48 lbs.).

Conclusions: The change in birth weight patterns among this immigrant population may be attributed to the extreme change in lifestyle like availability of nutritious food, less walking, and relatively less stress levels in the prenatal period. We plan to develop a pilot project educating

this population on their diet in addition to making health education materials available and encouraging compliance with prenatal visits.

51. CLINICAL ANATOMY OF THE SUBLINGUAL ARTERY IN DENTAL IMPLANT SURGERY

Clay F. Gunnell, Takanari Miyamoto, and Neil S. Norton, Creighton University School of Dentistry, Omaha, NE.

Introduction: Dental implant surgery has become a common treatment to restore function and esthetics. Understanding the clinical anatomy significantly decreases the potential for complications. In the mandible, there are several anatomical structures critical in placing implants, including the inferior alveolar nerve and vessels, lingual nerve, and long buccal nerve. In this study, we placed mandibular implants in fresh edentulous cadaver heads and dissected the medial border of the mandible examining the relevant anatomy.

Methods: Five fresh edentulous cadaver heads were scanned using cone beam computed tomography (CBCT) to determine the proper anatomical placement of implants. On one side of the mandible, the implants were properly placed. On the opposite side, the implants were placed more medial to cause damage to the lingual plate of mandibular cortical bone. After a second CBCT scan was performed to determine the placement of the implants, each cadaver head was dissected.

Conclusion: In our study, we observed the sublingual artery and its branches were most susceptible to damage because it is intimately located along the medial mandible. If the implant angle is incorrect, a medial perforation of the lingual cortical plate can occur damaging the sublingual artery. Hemorrhaging of the sublingual artery can spread through the submandibular fascial space and potentially compromise the airway. Thus, proper placement of mandibular implants is not just important for function and esthetics, improperly placed implants may lead to serious consequences, including death.

52. UNDERSTANDING THE ASSOCIATION BETWEEN THE PRESENCE OF OCCLUSAL FISSURE CALCULUS AND CARIES

Michael L. Brechon, Sonia M.S. Rocha-Sanchez, and Douglas K. Benn, Creighton University School of Dentistry, Omaha, NE.

Background: The pits and fissures of the tooth's occlusal surface are the most vulnerable region of the tooth, accounting for over 80 percent of caries while making up only 13 percent of the overall tooth surface. However, it has also been shown that bacterial contents of the fissures may progressively mineralize.

Objective: To determine by an *in vitro* study if an inverse relationship exists between calculus and caries within the pits and fissures of the teeth.

Methods and Materials: One molar tooth was selected and sectioned through the buccal-lingual plane using a SCIFAB Series 1000 Deluxe Hard Tissue Microtome (Scientific Fabrications, Littleton, CO, USA). Photomicrographs were taken with an Olympus DP71, 12.5 megapixel cooled CCD camera mounted to a stereomicroscope (Leica S8APO). Scanning electron microscopy (EMITECH SC7620 Mini Sputter Coater and Hitachi TM3000 Tabletop Microscope) was used to assess the presence of calculus in the fissure.

Results: Varying amounts of calculus and caries were found in the fissure system. There

appeared to be an inverse relationship between the amount of calculus and the presence of caries.

Conclusion: Calculus can be found in carious fissures and may indicate an inverse relationship to active caries. However, without serial examinations over time it is not possible to determine the relationship between caries activity and fissure calculus. Further work is needed.

Acknowledgement: The authors would like to express their gratitude to Dr. Wayne Barkmeier for his support with the electron microscope. This work was supported in part by funds from the Oral Biology Master Program and the NIH/NIDCR R41-DE023003 grant awarded to Dr. Douglas Benn.

53. EFFECT OF MMA CONCENTRATION ON ION RELEASES FROM GLAZE

Joshua Fulton, Stephen M. Gross, Mark A. Latta, William A. McHale, School of Dentistry, Creighton University, Omaha, NE.

Objectives: The objective of this study was to determine the effect of methyl methacrylate concentration in a glaze formulation on the release of biologically available ions from microcapsules with ion permeable membranes.

Methods: A heterogeneous polymerization technique was utilized to prepare microcapsules containing an aqueous solution of 4 M potassium phosphate dibasic and 4 M calcium nitrate. Fifteen weight percent of microcapsules containing either the phosphate salt solution or calcium salt solution were formulated into glaze formulations with different concentrations of methyl methacrylate. Ion release profiles were studied as a function of ion type and time up to 8 months. Phosphate ion detection was performed by the molybdenum blue method and reported as ppm of phosphate ion released per gram of formulation. Calcium ion release measurements were performed using ion specific electrodes and reported as ppm calcium ion released per gram of formulation.

Results: Ion release profiles were studied as a function methyl methacrylate concentration in glaze formulations.

Conclusions: Ion release profiles were generated for glaze formulations containing microencapsulated aqueous solutions that contained biologically available phosphate and calcium ions useful in remineralization. The preparation of glaze formulations with controlled release profiles appears promising based on the variation off methyl methacrylate in the continuous phase of the formulation. **Acknowledgement:** The authors would like to acknowledge Premier Dental Products, NSF University-Industry Partnership Grant and Creighton University for support of this work.

54. ENCAPSULATION OF CALCIUM AND PHOSPHATE IONS IN A TOOTHPASTE FORMULATION

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

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

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

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

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

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

55. THE INTERACTION OF THE MADDEN-JULIAN OSCILLATION WITH EASTERN PACIFIC TROPICAL CYCLOGENESIS

Heather Buinicky and Joseph A. Zehnder, Department of Atmospheric Sciences, Creighton University, Omaha, NE.

African Easterly Waves regularly propagate off the coast of West Africa and across the Atlantic Ocean. Only a small number of these waves develop into tropical cyclones in the Atlantic, while most of them continue their propagation across Central America and into the Pacific Ocean. When crossing Central America, the interaction of the waves with the topography initiates vorticity. Meanwhile, there are westerly wind bursts that are propagating across the Pacific Ocean in 40-50 day intervals, which is known as the Madden-Julian Oscillation (MJO). The goal of this research is to show that when the MJO interacts with the African Easterly Waves, the MJO acts to enhance the vorticity, which encourages tropical cyclone development in the Eastern Pacific Ocean.

56. INFLUENCE OF DECREASING ARCTIC SEA ICE ON LARGE-SCALE ATMOSPHERIC CIRCULATIONS IN THE NORTHERN HEMISPHERE

Heather Graffius, and Dr. Joseph Zehnder, Department of Atmospheric Science, Creighton University, Omaha, NE.

Sea ice plays an important role in the atmospheric energy budget. Arctic sea ice extent varies annually, with the most sea coverage in spring and the least in autumn. It has been observed that during recent autumn months sea ice cover has drastically reduced in comparison to previous decades. The rate of freezing and melting Arctic ice throughout the year has many effects on the large-scale atmospheric circulations, in ways such as: precipitation, seasonal temperatures, storm tracks, and severe weather events. These effects are noticeable throughout the entire Northern Hemisphere. It is possible that the 2012 midwest drought, coldest Alaska January in 95 years, and the second wettest year in the United Kingdom are linked to the Arctic sea ice melting.

57. EXAMINING TRANSPORTATION OF NATURAL GAS EXPLORATION EMISSIONS

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

Purpose: Natural gas as an alternative fuel source has become increasingly popular due to its high efficiency and cost-effective qualities. However, concerns about air pollution associated with natural gas production are rising. Pollutants adversely affect air quality, with ground-level ozone being one of the major concerns due to its impacts on human health and ecosystems. Surface ozone production relies on chemical reactions between nitrous oxides and volatile organic compounds (VOCs). Natural gas drilling produces both of these chemicals: nitrous oxides are produced from heavy machinery involved in drilling, and VOCs are vented into the atmosphere via minor leaks of natural gas.

It was found that a conservatively estimated 3.6 to 7.9% of methane from natural gas drilling sites escapes into the atmosphere via leaks and routine venting. Equipment leaks occur at every stage of natural gas production, with the largest leak of methane through fracturing fluids at well completion time. This project examines the relationship of natural gas drilling sites with ozone concentration levels by looking at analysis of past emissions from individual sites.

Acknowledgement: We would like to acknowledge the Clare Boothe Luce foundation for funding this project.

58. COMPARISON OF UPWIND AND DOWNWIND SOUNDINGS DURING CONVECTIVE EVENTS

Michael Austerberry, and Dr. Joseph Zehnder, Department of Atmospheric Science, Creighton University, Omaha, NE.

Purpose: The CuPIDO field experiment (from 2006) involved studying convection using airborne and ground-based data over the Catalina Mountains. It is hypothesized that precipitating convection can only occur when the air has been modified by shallow convection that moistens the atmosphere and prevents clouds from entraining dry environmental air and dissipating.

Methods: This project compares vertical profiles of moisture and temperature, obtained from mobile soundings in positions upwind and downwind of the areas of convection, as well as data obtained from instrumented aircraft.

Results: There is clear indication of modification determining the extent of moistening as clouds are developing. Three-dimensional plots of soundings and flight tracks of the instrumented aircraft show higher moisture content in environmental air downwind of areas of convection.

Conclusion: More intense convection can only occur when moisture has been advected into environmental air, reducing the entrainment of dry air.

59. STRATIFORM CLOUD DECKS IN THE CONTINENTAL UNITED STATES

Hallie Dusselier, Department of Atmospheric Science, Creighton University, Omaha, NE.

The formation of nocturnal stratiform cloud decks in tropical West Africa is directly related to the existence of a known low-level nocturnal jet. Cloud decks exhibiting similar characteristics to

those in West Africa have also been observed in the south central and gulf regions of the United States. This is an area in which a low-level jet is also common. Using data gathered from hourly surface weather observation, wind profiler networks, and the Tropical Rainfall Measuring Mission satellite, algorithms identify cases that match pre-defined conditions. The present research defined 12 conditions of varying strictness, based on combinations of cloud cover, cloud height, and precipitation. For a date to meet the strictest condition, the sky must be more than 75% covered, cloud heights must be less than 400 meters, and there must have been no precipitation at the time of the observation and six hours prior; additionally, the observation six hours prior to sunrise needs to report no low clouds. This definition ensures that these clouds form under similar conditions to the cloud decks in West Africa. Cases are identified by their location and the conditions which they meet, allowing the computation of composite synoptic conditions. Preliminary findings will be presented and then compared to the annual cycle of the cloud deck formation in West Africa. Early results suggest that, although processes and conditions under which these clouds decks may form are similar, the annual cycle of their formation appear to be very different from the clouds of West Africa. Studying the formation of these stratiform cloud decks in the United States is imperative because of the significant impact that they have on the radiation budget, resulting in greater potential for improved forecasts.

60. GENERATION OF A FLOXED-SHH TRANSGENIC MICE FOR CRE-DIRECTED MISEXPRESSION OF SONIC HEDGEHOG

Ashley McClure, Lori Fong, Daniel Gonzalez, Anna Heberle, Bryan Shaw, Karin Van Dyke, Heidi Horstman, Jocelyn Calado, Daniel Munt, Laura Cotiguala, and Aimee Limpach, PhD, Department of Pharmaceutical Sciences, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Introduction: Sonic hedgehog (Shh) signaling is required for normal development of the cerebellum because it governs proliferation of granule cell precursors (GCP), the most abundant neuronal population in the brain and the cells believed to be of origin of medulloblastoma (MB). It is suggested that MB arises as an aberration of normal development; in that GCPs fail to exit the cell cycle at the appropriate time and eventually expand to form a tumor. Our laboratory investigates the mechanism(s) by which activation of Shh signaling leads to MB formation.

Purpose: MB is the most common malignant brain tumor in children. The survival rate for MB is about 50%, however existing therapies often leave survivors with life-long, debilitating side effects. Investigation into the mechanism(s) whereby genes and proteins regulate proliferation in GCPs, and in turn how dysregulation of this process leads to the formation of MB, will help to identify targets for new therapies.

Methods and Results: Using the Cre-Lox transgenic system, we have generated a mutant mouse line that develops MB. We show that ectopic Shh is expressed in mutant mice in the region of the cerebellum that is believed to give rise to MB. These mutant mice exhibit cerebellar hyperplasia and develop subsequent tumors that resemble MB.

Conclusion and Future Studies: Future studies with our mouse model for MB will focus on further dissecting the genetic regulation of the endogenous mechanisms that maintain neural progenitor pools in a state of continuous self-renewal vs. those that induce cell cycle exit and differentiation.

61. SYNTHESIS AND CHARACTERIZATION OF L-PHENYLALANINE CHELATES

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Purpose and Rationale: The aim of the study was to synthesize, separate, purify, and characterize L-phenylalanine chelates.

Methods: L-Phenylalanine chelates were synthesized using hydroxides of sodium and potassium; chloride salts of calcium and magnesium. The aqueous solutions of L-Phenylalanine with chloride salts of calcium and magnesium were treated with Potassium Hydroxide for basification respectively. Each of the aqueous solutions was then lyophilized. Synthesized chelates were separated from the reaction mixture by preparative thin-layer chromatography (TLC). The separated and non-separated fractions, obtained from the TLC, were characterized by Electron Spray Mass Spectrometer (ESI-MS). The TLC fractions in methnol:water (90:10) were characterized on Q-1 positive mode at a flow rate of 10 µL/min and the parameters were optimized manually. The chelates were analyzed using Fourier Transform Infrared spectrum analysis (FTIR) in the range of 600cm^{-1} to 4000cm^{-1} and the % transmittance was measured as a function of wavenumber for phenylalanine as well chelates. 5mg of phenylalanine and the metal chelates were analyzed using Thermo gravimetric analysis (TGA). The samples were heated up to350^{o} C at the rate of 10^{o} C/min.

Results: Non-migrated spot of sodium-phenylalanine chelate from the preparative TLC was identified at 187.87 in ESI-MS which corresponds to the theoretical mass. Similar pattern was observed for all the chelates. The FTIR spectra showed the broadening of NH_2 stretch, decreased intensity of N-H stretch, symmetric and asymmetric COO^- stretch and shift to longer wavenumber that confirmed the formation of chelates. The chelates showed different degradation pattern than phenylalanine which confirmed that the phenylalanine and chelates are separate entities.

Conclusion: The phenylalanine chelates were synthesized successfully and separated using prep TLC. The ESI-MS, FTIR spectra and TGA confirmed the formation of a different chemical entity.

62. CLC3 TRANSCRIPT VARIANTS IN THE ACTIVATION AND MIGRATION OF EOSINOPHILS IN ALLERGIC ASTHMATICS

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Rationale: Migration and activation of eosinophils play a major role in the pathophysiology of allergic asthma. Recently, we reported the role of CLC3 in TGF-β-induced migration of eosinophils, increased expression of CLC3b and CLC3e transcript variants on eosinophil membranes in response to TGF-β and eotaxin. Here, we focused on the function of CLC3 in eosinophils of allergic asthmatics.

Methods: Human peripheral blood eosinophils were isolated (>99% pure >98% viable) with negative selection from healthy and mild-to-moderate allergic asthmatic donors. Cells were stimulated with TGF-β1, eotaxin-1, eotaxin-3, DIDS and NPPB. QPCR, chemotaxis, flow-cytometry, fluorescence microscopy, and whole-cell patch were used to obtain outcome measures.

Results: CLC3 and NOX2 ($gp91^{phox}$) mRNA levels were 5-9 fold and 5-25 fold, respectively, higher in asthmatics compared to healthy individuals ($n=4$, $p<0.05$). Also, CLC3b and CLC3e transcript variants were 7-11 fold and 13-21 fold, respectively, higher in asthmatics than in controls ($n=4$, $p<0.05$). NADPH oxidase inhibitor – DPI, and CLC3 inhibitors – DIDS and NPPB, blocked PMA-induced intracellular ROS in human eosinophils. Increased CLC3 current and greater migration of eosinophils was observed in the eosinophils of asthmatic compared to healthy individuals.

Conclusions: Significantly greater increase in CLC3e transcript variant compared to CLC3b in asthmatic eosinophils suggests it's imperative role in allergic asthma. Greater migratory potential of eosinophils and higher activity of CLC3 channel in asthmatics support its importance in allergic asthmatics. NADPH oxidase is vital for oxidative burst, and to compensate the resultant charge imbalance, CLC3 works in conjunction with NADPH oxidase. Higher level of NOX2 mRNA in asthmatics suggests that the cells are in an activated state with active participation of both CLC3 and NADPH oxidase.

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63. THE ROLE OF ALPHA-TECTORIN IN ZEBRAFISH INNER EAR DEVELOPMENT

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Purpose: Sensorineural hearing loss affects approximately one in one-thousand newborns, and five percent of autosomal dominant nonsyndromic hearing loss is associated with mutations in the *alpha-tectorin* (*TECTA*) gene. Studies suggest that this loss of hearing occurs due to a poorly formed tectorial membrane (TM), a gel-like structure which is normally attached to the kinocilium of the hair cells (HC). Previous studies show that *TECTA* null mice are deaf and have a TM that is detached from the HCs. To better visualize membrane-HC interactions, we are using optically transparent zebrafish (*Danio rerio)* and hypothesize that *TECTA* has a similar role in attaching the otolith to the HCs in the zebrafish inner ear.

Methods: Morpholinos and RNA were injected to assess knockdown and overexpression of TECTA. To determine when and where TECTA is expressed in zebrafish embryos, we used RT-PCR and *in situ* hybridization.

Results: TECTA is endogenously expressed in the otic placode at 27 hpf. Morpholino knockdown results in smaller otoliths, and the posterior otolith appears to float within the otocyst. Exogenous mutant mouse tectorin expression results in similarly smaller otoliths, and at high concentrations affects overall embryo morphology.

Conclusion/Significance: *TECTA* is involved in attaching the otolith to the HCs, and is expressed during early ear development. We will continue to study the interactions of *TECTA* with the membrane, and will further analyze whether *TECTA* has conserved interactions in the zebrafish otolith with proteins also found in the human and mouse TM.

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64. COMPARISON OF ENDOGENOUS PrP^C LEVELS IN HAMSTER LYMPHATIC TISSUE

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Purpose: Transmissible spongiform encephalopathies are fatal neurologic diseases affecting animals, including man. The infectious agent is a misfolded protein known as a prion. The prion protein has two isoforms, a normally expressed endogenous isoform, PrP^C, and a misfolded infectious form, PrP^{Sc}. The key pathologic event is a poorly understood template-dependent misfolding event where PrP^{Sc} comes into contact with native PrP^C and changes its native conformation to PrP^{Sc}. Accumulation of PrP^{Sc} causes clinical disease. Disease pathogenesis requires presence of PrP^C for clinical symptoms to occur, as PrP^C null mice cannot be infected. The objective of this study was to compare PrP^C levels in hamster lymphatic tissues involved in the early pathogenesis of prion infection.

Methods: Lymphatic tissues were collected from healthy golden Syrian hamsters and Western blot analysis was performed to quantify PrP^C levels in tissue homogenates. Beta-actin was quantified to normalize total protein content in samples, so relative PrP^C levels could be quantified and compared between samples.

Results: Nasal associated lymphoid tissue contained the highest PrP^C level followed by Peyer's patch, mesenteric lymph node, submandibular lymph node and finally spleen. Interestingly, differences were noted between PrP^C levels in tissues of the same type such as lymph nodes and mucosal associated lymphatic tissue. Unique Western blot banding patterns of PrP^C indicate possible differences in glycosylation patterns.

Conclusion: Differences in PrP^C levels between lymphatic tissues involved in the pathogenesis of prion diseases could account for different efficiencies in inoculation routes.

Acknowledgement: This work was funded by NIH RO1 BNS061994.

65. EPIDERMAL GROWTH FACTOR DEPENDENT COLLAGEN LOSS IN HUMAN CAROTID PLAQUES IS MEDIATED BY MATRIX METALLOPROTEINASE-9

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Purpose: The rupture of atherosclerotic plaque in the fibrous cap and subsequent thrombus formation leading to stroke is the primary cause of acute cardiovascular events. Matrix metalloproteinases (MMPs) and growth factors present in atherosclerotic human plaques may be related to plaque remodeling and increased risk for plaque destabilization and rupture. This study was conducted to investigate the relationship between epidermal growth factor (EGFR) and MMP-9 on the stability of extracellular matrix (ECM) fibrillar collagens (Type I and III) in isolated vascular smooth muscle cells (VSMCs) from symptomatic (S) and asymptomatic (AS) patients with carotid stenosis.

Hypothesis: This study tested the hypothesis that selective inhibition of elevated MMP-9 and epidermal growth factor receptor (EGFR) increases fibrillar collagens (Type I and III) in vascular smooth muscle cells (VSMCs) from symptomatic (S) and asymptomatic (AS) patients with carotid stenosis.

Methods: Cultured human VSMCs from both AS and S groups were treated with or without epidermal growth factor (EGF). The proteolytic activity of MMP-9 and MMP-2 was quantified by gelatin zymography.

Results: The mRNA transcripts of MMP-9, MMP-1, EGFR and collagen types I (COL1A1 and COL1A2) and III (COL3A1) were analyzed by qPCR. EGF treatment significantly increased MMP-9 activity and mRNA transcripts for MMP-9, MMP-1and EGFR, while mRNA transcripts for collagen types I and III were decreased in both AS and S groups. Inhibition of EGFR (AG1478) and MMP-9 (small molecule inhibitor and MMP-9 siRNA), decreased the activity and mRNA expression of MMP-9 but increased the collagen I and III transcripts in EGF treated VSMCs.

Conclusion: These results establish a mechanism by which MMP-9 induced by EGFR could be a leading cause of plaque instability in patients with carotid stenosis; and the selective blockade of EGFR and MMP-9 may be a novel strategy and a promising target for treating human unstable and vulnerable plaques.

Acknowledgment: This work was supported in part by NIH grant R01HL0733490 to Dr. Devendra K. Agrawal.

66. GENETIC DELETION OF Adam12 RESULTED IN DECREASED TUMORIGENESIS IN A CHEMICAL CARCINOGENESIS MODEL OF ORAL CANCER

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Purpose: Head and neck cancers are the eighth-most deadly type of cancer in the United States, with treatment costing $3.2 billion in 2010. Over-expression of the matrix metalloproteinase ADAM12 (A Disintegrin And Metalloprotease-12) is associated with oropharangyeal cancer development and progression. We hypothesized that genetic deletion of Adam 12 would reduce oropharyngeal carcinogenesis in the mouse.

Materials and Methods: To investigate the biological significance of ADAm12 expression in oropharangyeal cancer, a chemical carcinogenesis protocol that produces primarily tongue tumors was carried out in Adam12-/- and Adam12+/+ mice. The mice were given the 50 µg/mL of the carcinogen 4-nitroquinoline 1-oxide (4-NQO) in the drinking water ad libitum for 16 weeks. The mice were euthanized at twenty-two weeks, and the tongue, oral cavity were examined.

Results: Twenty-two weeks after treatment, no lesions were identified in the water-only treated groups. In contrast, an average of 2.8 ± 0.31 and 5.7 ± 0.67 tumors per mouse were identified in the 4-NQO-treated Adam12 null and Adam12 wild type control mice, respectively, at 22 weeks. This 51% decrease in tumor multiplicity upon genetic deletion of Adam12 was statistically significant ($P \leq 0.05$). The mean area of Adam12 wild type tumors (0.0096 ± 0.0015 mm2) compared to Adam12 null tumors (0.0082 ± 0.0017 mm2) was not significantly different using a Student's t-test.

Conclusions: Genetic deletion of Adam12 significantly reduced oropharyngeal tumor number and burden in a mouse chemical carcinogenesis model, suggesting further investigation of the influence and functions of ADAM12 during oropharyngeal cancer development and progression is warranted.

67. HrpG IS A POTENTIAL TYPE III REGULATORY CHAPERONE IN *PSEUDOMONAS SYRINGAE*

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Purpose: The bacterial plant pathogen *Pseudomonas syringae* (DC3000) uses a Type III secretion system (TTSS) to inject proteins called effector proteins into plant cells. Collectively these proteins enable the pathogen to cause disease on a suitable host. Some effector proteins require cytoplasmically located proteins called chaperones (specifically type III chaperones or TTCs) for secretion. This project is focused on determining the molecular role of a potential TTC, HrpG. This protein contains the molecular features of a TTC and through yeast two–hybrid screens we previously found that it interacts with several proteins, including the regulatory protein HrpV. Our hypothesis is that HrpG is a TTC that plays a role in regulating the TTSS.

Methods: To confirm HrpG interacts with HrpV, and to potentially isolate other interacting proteins, we have engineered a strain of *P. syringae* to encode a hemagglutinin (HA)-tagged version of HrpG. We have also engineered a mutant *P. syringae* strain that lacks the HrpG gene.

Results/Conclusions: Strains have been confirmed via colony PCR. We are in the process of using the mutant strain in assays that will help us determine if a lack of this protein has a measurable effect on regulating the TTSS as we can look at expression of TTSS genes, actual secretion of proteins, and if this deletion affects virulence of *P. syringae*. The tagged strain will be used to immunoprecipitate and analyze HrpG and interacting proteins.

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

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Approximately 34 million people are infected with human immunodeficiency type-1 (HIV-1) world-wide. These statistics could be reduced if at-risk groups, including those individuals with a high likelihood of repeated exposure to HIV-1, were provided antiretroviral pre-exposure prophylaxis (PrEP). This experiment is designed to evaluate the efficacy of nanoparticles in gel as carrier systems for the simultaneous transport and sustained release of three antiviral drugs in cellular model systems for human disease associated with HIV infection. A thermosensitive vaginal gel containing raltegravir + efavirenz (RAL+EFV-NP), cellulose acetate phthalate (CAP), or cellulose acetate phthalate + efavirenz (CAP+EFV-NP) loaded PLGA nanoparticles for pre-exposure prophylaxis of HIV was prepared in order to test the efficacy of drug-loaded nanoparticles. The CAP, CAP+EFV and RAL+EFV–NPs were fabricated using a modified emulsion–solvent evaporation method and characterized for size and zeta potential. Thermosensitive vaginal gel containing RAL+EFV–NPs was successfully prepared using a combination of Pluronic F127 (20% w/v) and Pluronic F68 (1% w/v). A thermosensitive gel containing CAP-NPs and CAP+EFV-NPs was successfully prepared using a combination of Pluronic F127 (20% w/v) and Pluronic F68 (1% w/v). The CAP, CAP+EFV, and RAL+EFV–NPs

were evaluated for inhibition of HIV-1_{NL4-3} using TZM-bl indicator cells. The EC_{90} of RAL+EFV–NPs was lower than raltegravir + efavirenz (RAL+EFV) solution but did not reach significance. Compared to control HeLa cells without any treatment, RAL+EFV–NPs or blank gel were not cytotoxic for 14 days in vitro. The intracellular levels of efavirenz in RAL+EFV–NPs treated HeLa cells were above the EC_{90} for 14 days whereas raltegravir intracellular concentrations were eliminated within 6 days. Our preliminary data show that novel nanoparticle formulations of the CAP and EFV significantly inhibit HIV-1 replication at concentrations well below the IC_{50} of free drug or CAP alone. Transwell experiments of NPs-in-gel demonstrated rapid transfer of fluorescent nanoparticles from the gel and uptake in HeLa cells within 30 min. These data demonstrate the potential of antiretroviral NP-embedded vaginal gels for long-term vaginal pre-exposure prophylaxis of heterosexual HIV-1 transmission. Furthermore, novel drug carrier systems, such as nanoparticles, are promising tools that may help overcome obstacles and provide successful universal therapy.

69. NEUTRAL LIPID ACCUMULATION IN *CHLAMYDOMONAS* AND ALGAL ISOLATES COLLECTED IN THE MIDWEST

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Unicellular green algae have emerged as an excellent biofuel feedstock, since they can accumulate high levels of neutral lipids under stress conditions including nitrogen starvation. Our group uses *Chlamydomonas reinhardtii* as a model strain to study lipid inducing factors, conditions, and pathways. We also bioprospect for high lipid producing algae from the Midwest. For this project, one of our goals has been to determine if *Chlamydomona*s needs exposure to light to accumulate lipids. We found that lipid accumulation by cells grown under photoautotrophic conditions was high. This light-mediated lipid accumulation could be enhanced by supplementary carbon sources such as acetate. We also found specific conditions under which cells could accumulate lipids when grown heterotrophically, e.g. grown with acetate in the dark. This possibly could be applied to a biodiesel production scheme where plenty of organic carbon is available but light is limiting. In a parallel project our goal has been to isolate high lipid producing algal strains collected from waters in the Midwest. From a collection of about 30 strains we have found one isolate more effective at accumulating lipids than *C. reinhardtii*. We are currently further characterizing this strain.

70. *PSEUDOMONAS SYRINGAE* TRIGGERED REDUCTION OF HOST HISTONE H3K9 ACETYLATION IS TYPE III EFFECTOR DRIVEN AND MAY INVOLVE HISTONE DEACETYLASE HDAC5

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Pseudomonas syringae, a Gram-negative plant pathogen, relies on a type III secretion system (T3SS) to proliferate and cause disease in the model host plant *Arabidopsis thaliana*. The T3SS penetrates the host cell wall and membrane, enabling an arsenal of virulence proteins called type III effectors (T3Es) to travel from the bacterium into host cells. Although the specific molecular mechanisms of T3Es have yet to be discerned, T3Es collectively contribute to disease primarily by suppressing plant innate immunity. Our laboratory has found rapid deacetylation of histone H3 lysine 9 (H3K9) in *Arabidopsis* plants infiltrated with wildtype *P. syringae.* Plants infiltrated with a mutant strain incapable of injecting T3Es did not show this genetic modification. Using chromatin immunoprecipitation (ChIP) assays combined with

quantitative PCR (qPCR), we found reduced H3K9 acetylation along a subset of innate immunity-related genes in only the wildtype pathogen-infected plants. Reduction in H3K9ac can be caused by either downregulation of histone acetyltransferases (HACs) or the upregulation of histone deacetylases (HDACs). We therefore examined a selection of HACs and HDACs for transcriptional changes in response *P. syringae* infection. Preliminary qPCR analysis of post-infection plant samples showed at least one HDAC (HDA5) becomes progressively upregulated in plants exposed to the wildtype strain compared to those exposed to the T3SS mutant, and that innate immunity genes were progressively downregulated. Current work focuses on the potential role of HDA5 in deacetylating H3K9 along innate immunity genes. Additionally, we are considering the effect of T3Es on HDA5. Preliminary data suggests that multiple T3Es are involved in deacetylation as plants exposed to several polyeffector strains that lack different combinations of T3E genes show reduction in H3K9ac.

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71. CARBAPENEM RESISTANCE IS NOT ASSOCIATED WITH VIRULENCE OF *PSEUDOMONAS AERUGINOSA* USING THE *DICTYOSTELIUM DISCOIDEUM* VIRULENCE MODEL

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Purpose: The purpose of this study was to analyze the virulence associated with carbapenem-resistant *Pseudomonas aeruginosa* mutants using the cellular slime mold *Dictyostelium discoideum* virulence model.

Methods: Nine mutants and their isogenic parent PA42 were evaluated for virulence using the *Dictyostelium discoideum* model. Controls for virulent phenotypes included the positive control strain PA14, and negative control strains PA14Δ*rhlR* and *Escherichia coli* B/r. The degree of bacterial virulence was quantified by measuring the number of *D. discoideum* amoebae inhibited by *P. aeruginosa*. No *Dictyostelium* growth on the bacterial lawn indicated a virulent phenotype, while plaque formation due to *Dictyostelium* growth indicated a less virulent phenotype.

Results: *D. discoideum* growth was inhibited by the carbapenem susceptible but virulent control strain PA14 while plaque formation was observed for the carbapenem susceptible clinical strain PA42 (at 10,000 amoebae). All mutants had meropenem MICs of 16 µg/ml but doripenem MICs varied (1 - 8 µg/ml). Two mutants with dorpenem MICs of 2 and 4 µg/ml showed plaque formation at 50,000 and 25,000 amoebae, respectively. Four mutants with doripenem MICs ranging from 2 - 8 µg/ml showed plaque formation at 10,000 amoebae, while three mutants with doripenem MICs ranging from 1-4 µg/ml showed plaque formation at 1,000 amoebae.

Conclusions: The degree of virulence differed among the *P. aeruginosa* mutants but did not directly correlate with specific carbapenem MICs. These data suggest that meropenem challenge resulting in the movement of IS*Pa*8 also influences the degree of virulence among these carbapenem-resistant mutants. The use of the *Dictyostelium* virulence model is a simple, inexpensive system to initially evaluate different phenotypic traits and their association with a virulent phenotype.

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

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Background: Vitamin D, a hormone once thought to have a role limited to calcium homeostasis and bone mineralization, has pleotropic effects on different types of cells. Vitamin D receptors are reported in vascular smooth muscle cells, endothelial cells, and cardiomyocytes. Adipose derived MSCs (ADMSCs) are multipotent cells with capacity to differentiate into cells of different lineages. To our knowledge, the presence of Vitamin D machinery on porcine ADMSCs is not yet reported. In this study, we investigated whether ADMSCs possess vitamin D machinery and whether they participate in vitamin D metabolism, by analyzing the expression levels of vitamin D receptor (VDR), vitamin D metabolizing enzymes (CYP24 A1 and CYP27B1) after in vitro stimulation with active Vitamin D, calcitriol.

Methods: MSCs were isolated from porcine adipose tissue by collagenase treatment and density gradient centrifugation. The expanded monolayer cells were characterized by positive staining for MSC markers CD44, CD73, CD90, and negative staining for macrophage marker CD11b and hematopoetic stem cell markers CD34 and CD45; and by tri-lineage differentiation to osteocytes, chondrocytes, and adipocytes. The mRNA and protein expression of CYP24A1, CYP27B1 and VDR was analyzed by immunostaining, qPCR and western blot (n=6). Vybrant cytotoxicity assay kit was used to evaluate cell viability after stimulation with different concentrations of calcitriol (0.1-100nM). The in vitro time dependent effect of calcitriol (10nM) on the vitamin D machinery on cultured ADMSCs was determined by qPCR after stimulation for 0, 1,2, 3, 4, 6, 12, 24 and 48h.

Results: No cytotoxicity was observed after stimulation of MSCs with 0.1 to 10nM concentrations of calcitriol. However, a significant amount of cytotoxicity was observed at 50nM and 100nM. The expression of vitamin D metabolizing enzymes and VDR on ADMSCs was confirmed by immunostaining, qPCR and western blot. A significant increase ($p<0.01$) in mRNA expression of CYP24A1, CYP27B1 and VDR was observed after stimulation of MSCs with calcitriol (10nM). The VDR and CYP27B1 expression peaked at 3h, and CYP24A1 at 24h respectively after stimulation of MSCs with calcitriol (10nM). Parallel results were obtained with western blot. This demonstrates the regulation of vitamin D metabolism in MSCs.
Conclusion: Porcine ADMSCs possess vitamin D hydrolases and VDR to metabolize and respond to vitamin D. Hence, in vivo circulating 25-hydroxy vitamin D may have significant role in regulating the differentiation of adipose MSCs.

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73. CRITICAL ROLE OF SOX9 IN THE DIFFERENTIATION OF MESENCHYMAL STEM CELLS TO ENDOTHELIAL CELLS

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Objective: Mesenchymal stem cells (MSCs) have been shown to replenish and repair endothelial cells (ECs) of the cardiovascular system. However, mechanisms underlying differentiation is still unclear. Exposure of MSCs to vascular endothelial growth factor (VEGF)

enhances *in-vitro* differentiation of MSCs to ECs. Here, we investigated a potential role of Sex-determining region Y related protein (Sox9) signaling in the differentiation of MSC to EC in response to VEGF.

Method and Results: MSCs were isolated from the bone marrow of Yucatan micro swine and cultured in Dulbecco's modified Eagle medium (DMEM) containing 10% FBS. The cells were differentiated in the media containing 50 ng/mL VEGF that induced significant increase in EC markers, PECAM, VE Cadherin and vWF, in differentiating MSCs. Western blot analysis revealed a 3-fold increase in sox9 expression in VEGF-treated differentiating MSCs compared to control MSCs. Flow cytometry results revealed that the transfection of MSCs with siRNA specific for Sox9 decreased the expression of EC markers in VEGF-treated differentiating MSCs. Overexpression of MSCs by transfecting with Sox9 cDNA, followed by culture in normal growth media, significantly increased the expression of EC markers in differentiated MSCs. Pre-treatment of MSCs with PD173074, a VEGFR-2 blocker, followed by culturing in the differentiating media decreased EC marker expression with no significant change in Sox9.

Conclusion: Sox9 plays a critical role in the differentiation of MSCs to ECs via cellular communication between phosphorylated VEGFR-2 and Sox9.

Acknowledgements: This work was supported by NIH grants R01HL090580 and R01HL104516 to DKA.

74. VITAMIN D SUPPLEMENTATION REDUCES SUPPRESSORS OF CYTOKINE SIGNALING EXPRESSION IN THE LUNGS OF CRA-SENSITIZED AND CHALLENGED MICE HAVING ACUTE OR CHRONIC ASTHMA

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Rationale: Vitamin D is a potent immunomodulator regulating functional response of immune cells. Vitamin D deficiency may decrease lung volume and lung function. In allergic airway inflammation, many immune cells and cytokines are involved in the pathogenesis of the disease. The immune response due to inflammatory mediators is regulated by suppressor of cytokine signaling (SOCS) proteins that are released in response to cytokines. Th2 phenotype is prevalent in allergic airway inflammation and in asthmatic patients. We have recently found that vitamin D supplementation decreases many cytokines, including IL-4, IL-5, IL-6, IL-13, IL-17, and TNF-α and increases IL-10 levels in the BALF.

Methods: Female BALB/c mice were fed with vitamin D-deficient, sufficient (2,000 IU/kg) or supplemented (10,000 IU/kg) diet and were sensitized and challenged with cockroach-antigen (CRA) till they get acute or chronic asthma. AHR, airway inflammation, lung histological examination, mRNA and protein expression of SOCS-1, 3 and 5 was examined in CRA sensitized as well as PBS control groups.

Results: Vitamin D-supplementation reduced AHR in the CRA-sensitized and challenged mice as compared to vitamin D-deficient group. Also there was a reduction in inflammatory cell percentage in the BALF of vitamin D-supplemented mice sensitized and challenged with CRA. Vitamin D-deficient lungs exhibited exaggerated airway remodeling, mucus production and collagen production both at acute and chronic stages of asthma. The lungs of vitamin D-deficient mice expressed increased mRNA and proteins of SOCS-1, SOCS-3 and SOCS-5 compared to those in the lungs of vitamin D supplemented mice.

Conclusion: The increase in SOCS proteins in vitamin D deficiency could be an endogenous compensatory mechanism to regulate the detrimental effect of inflammatory cytokines in the lung.

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75. EVALUATION OF *BLA*$_{CTXM14}$ AND *BLA*$_{CTXM15}$ IDENTIFIES DIFFERENTIAL GENE EXPRESSION AMONG SEQUENCE TYPE 131 (ST131) AND NON-ST131 (NST131) *E. COLI* (EC)

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Purpose: CTX-M-14 (CTXM14) and CTX-M-15 (CTXM15) β-lactamases are the most prevalent extended spectrum β-lactamases worldwide. ST131 Ec producing CTXM15 are associated with urosepsis more frequently than NST131 CTX-M producers. The purpose of this study was to compare the level of *bla*$_{CTX-M}$ expression in ST131 and NST131 Ec isolates and correlate that expression with cefotaxime (CTX) and ceftazidime (CAZ) susceptibilities.

Methods: Thirteen unrelated CTXM15 or CTXM14 producing Ec (ST131 and NST131) were collected from the US, UK, and India. MICs to CTX and CAZ were determined by E-test. *bla*$_{CTXM14}$ and *bla*$_{CTXM15}$ promoters were sequenced. Transcriptional start sites (TSSs) were identified by 5′ RACE. *bla*$_{CTX-M}$ copy number was evaluated by real-time PCR. Promoter deletion clones were constructed using PCR and transformed into Ec K12. mRNA expression and ½ life studies were evaluated by real-time RT-PCR.

Results: All isolates had a *bla*$_{CTX-M}$ copy number of 1 and 2 TSSs. Steady-state *bla*$_{CTXM15}$ RNA levels from ST131 Ec were 18 to 67-fold higher than *bla*$_{CTXM14}$ expression in NST131 Ec. The RNA ½ life of *bla*$_{CTXM15}$ in ST131 was 8 minutes (m) whereas the ½ life of *bla*$_{CTXM14}$ in NST131 was ≤ 2 m. The ½ life of both genes in K12 transformants was ≤ 2 m. Promoters for all isolates were identical. Removal of the first promoter decreased RNA expression between 18 to 28-fold with no decrease in CAZ or CTX MICs.

Conclusions: The extended ½ life of *bla*$_{CTXM15}$ in ST131 correlates with increases observed in the steady-state RNA expression. These differences suggest the genetic makeup of ST131 influences the expression of *bla*$_{CTXM15}$. Increased levels of CTXM15 in ST131 Ec could complicate treatment of these organisms with β-lactam/β-lactamase inhibitors. Therefore, when evaluating the potency of newer β-lactam/β-lactamase inhibitors there is a need to identify both the ST and the CTX-M β-lactamase being evaluated.

76. THE ROLE OF HOST FACTORS IN PRION STRAIN INTERFERENCE

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Purpose: Prion diseases are infectious, fatal neurodegenerative disorders that affect mammals. The infectious agent (PrP^{Sc}) is an abnormal isoform of an endogenous host protein (PrP^{C}). Prion conversion involves a conformational change of PrP^{C} into PrP^{Sc} and may involve ribonucleic acid (RNA). Prions have different strains, and a long incubation period (blocking) strain can interfere with the emergence of a short incubation period (superinfecting) strain. We hypothesize that in strain interference, RNA molecules are sequestered by blocking strains,

preventing their use by superinfecting strains. The purpose of this study is to investigate the role of RNA in prion conversion and in strain interference to gain insight into prion adaptation.

Methods: Uninfected hamster brain homogenate was RNase digested to remove RNA and used as substrate in protein misfolding cyclic amplification (PMCA), a prion conversion assay. RNase treated homogenate reconstituted with RNA was also used. RNA was added in excess to a PMCA strain interference model drowsy (DY) transmissible mink encephalopathy (TME), the blocking strain, and hyper (HY) TME, the superinfecting strain.

Results: RNase digestion resulted in inhibited prion conversion, and the addition of RNA rescued conversion. We predicted that in PMCA strain interference, saturation with RNA would enable the superinfecting strain (HY TME) to overcome the interference effect. However, addition of RNA to PMCA strain interference did not result in the rapid emergence of HY TME.

Conclusions: Based upon these results, RNA is involved in prion conversion, but not in prion strain interference. It is possible that the blocking strain (DY TME) sequesters PrP^C or another host factor, leading to the inhibited emergence of the superinfecting strain (HY TME).

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77. EMERGENCE AND SPREAD OF MRSA: THE MECHANISM OF SCCMED TRANSFER

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Background: While methicillin-resistant *Staphylococcus aureus* (MRSA) is a well known public health threat; the precise means by which the resistance genes are transferred in staphylococcal populations remains obscure. The older scientific literature suggested transduction as the means of genetic exchange but was conflicted by the optimal conditions for transfer due, in part, to a lack of understanding that methicillin resistance is encoded by a cluster of genes termed staphylococcal chromosomal casette *mec* (SCC*mec*). We undertook studies to confirm and clarify conditions promoting horizontal SCC*mec* transfer in *S. aureus* populations.

Materials and Methods: *S. aureus* donor strains were propagated with phages 80α and 29. Transductants were selected with cefoxitin at 30 or 37°C for 24 to 72 hours. Pulse Field Gel Electrophoresis (PFGE) confirmed transductants were of the recipient lineage. Analysis of the SCC*mec* associated direct repeat unit (*dru* typing) confirmed specificity of SCC*mec* transduction.

Results: We found optimized conditions for SCC*mec* transfer were at 30°C for 48 to 72 hours. Although SCC*mec* transfer frequencies were relatively low, 10^{-9} to 10^{-10} transductants per plaque-forming unit (pfu), transduction was successful by homologous recombination when the recipient strain harbored a penicillinase plasmid; however, SCC*mec* transductions were unsuccessful in co-transduction of a tetracycline resistance plasmid and SCC*mec*.

Conclusions: These results confirm transduction as a means of SCC*mec* transfer in *S. aureus*. The lack of transfer between dissimilar donors and recipients indicates that homologous recombination rather than *ccr* recombinase activity was involved, suggesting additional aspects of SCC*mec* transfer are yet to be identified. Nevertheless, the transduction

of SCC*mec* observed here is clearly an important aspect of the methicillin resistance spread in *S. aureus* populations.

78. DIETARY INTAKE AND NUTRITIONAL STATUS OF COLLEGE-AGED MEN

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Rationale/Purpose: Between 1991 and 2004 the prevalence of obesity in college students increased from 12% to 36%. College represents the first time that many students are away from home and begin making independent food choices. Because poor eating habits may make them susceptible to obesity and its co-morbidities, the purpose of the current study was to examine the dietary intake of college-aged men for comparison to national guidelines.

Methods: Twenty-four men (X age ± SD = 22 ± 3 yr, BMI = 24.3 ± 4.0) completed a 3d dietary log (2 weekdays, 1 weekend) and were coached to accurately measure food and record their daily food and beverage intake. Dietary records were analyzed using EatRight® Dietary Analysis software and percent body fat (%BF = 16.6 ± 7.7%) was measured via air-displacement plethysmography. Descriptive data and associations between nutrient intakes, %BF, and BMI were analyzed by Pearson r correlations ($p < 0.05$) using JMP® Statistical Software.

Results: Energy intake was 2680 ± 934 kcal, which was 520 kcal lower than recommended (3200 ± 400 kcal). The percentage of Calories from carbohydrate, fat, and protein were 47%, 35%, and 18%, respectively. Compared to national standards, subjects consumed adequate amounts of calcium (1127 mg) and iron (24 mg), but over-consumed saturated fat (34 g), cholesterol (535 mg), and sodium (4734 mg). Subjects also ate less than the recommended servings of fruits (1.0 vs. 4.0) and vegetables (2.1 vs. 2.5), which contributed to a low intake of fiber (24 g vs. 38 g). Total energy intake and fat intake were not correlated ($p > 0.05$) with %BF ($r = -0.13$ and $r = -0.03$, respectively); however, %BF was associated with BMI ($r = 0.41$, $p = 0.04$).

Conclusion: These results suggest that college-age men are at risk for the development of diet-related chronic disease. Therefore, nutrition education programs that focus on lowering fat and cholesterol and increasing fruit and vegetable intake in this population are warranted during the college years. In addition, in contrast to popular belief, fat intake is not correlated with %BF.

79. COMPARISON AMONG DIFFERENT ALGORITHMS FOR DETERMINING NEUROMUSCULAR FATIGUE

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Purpose: The purpose of this study was to apply and compare three different computerized regression-based algorithms for determining neuromuscular fatigue derived from the electromyographic (EMG) amplitude.

Methods: Six healthy adults (4 men and 2 women; mean ± SD age = 24.7 ± 5.4 years of age; body weight = 74.2 ± 12.8 kg, and height = 175.2 ± 8.7 cm) performed an incremental treadmill test to exhaustion while the EMG signal was recorded from the vastus lateralis muscle and gas exchange parameters were collected and analyzed.

Results: The three different computerized regression-based algorithms were successfully applied to the EMG amplitude versus $\dot{V}O_2$ relationship during incremental treadmill running for all subjects in the present study. The results of the one-way repeated-measures ANOVA indicated there were no significant ($p \leq 0.05$) mean differences for $\dot{V}O_2$ or running velocity among $EMG_{brakingpoint}$ (mean ± SD = 3.31 ± 0.95 $L \cdot min^{-1}$ and 15.13 ± 1.96 $km \cdot h^{-1}$), $EMG_{V\text{-}slope}$ (3.69 ± 0.78 $L \cdot min^{-1}$ and 15.55 ± 1.46 $km \cdot h^{-1}$), $EMG_{D\text{-}max}$ (3.44 ± 0.83 $L \cdot min^{-1}$ and 15.40 ± 1.68 $km \cdot h^{-1}$), and AT (3.98 ± 0.79 $L \cdot min^{-1}$ and 15.41 ± 1.73 $km \cdot h^{-1}$).

Conclusions: The results of the present study indicated the computerized regression-based algorithms typically used to identify metabolic fatigue derived from the carbon dioxide production (VCO2) versus $\dot{V}O_2$ relationship can be applied to the EMG amplitude versus $\dot{V}O_2$ relationship to assess neuromuscular fatigue. The non-significant mean differences among the $EMG_{brakingpoint}$, $EMG_{V\text{-}slope}$, and $EMG_{D\text{-}max}$ suggested that any of these computerized regression-based algorithms can be used to identify neuromuscular fatigue derived from the EMG amplitude versus $\dot{V}O_2$ relationship.

80. FINDING THE LINK BETWEEN METABOLIC AND NEUROMUSCULAR FATIGUE: A NEW ELECTROMYOGRAPHIC FATIGUE THRESHOLD

Benjamin E. Fisher, Matthew P. Bubak, Daniel E. Neighbors and Jorge M. Zuniga PhD, Department of Exercise Science, College of Arts and Sciences, Creighton University, Omaha, NE.

Purpose: The purposes of this study were twofold: 1) to apply the computerized V-slope mathematical model used to determine the anaerobic threshold (AT) and respiratory compensation point (RCP) to the amplitude content of the electromyographic (EMG) signal; and 2) to compare and correlate the oxygen uptake ($\dot{V}O_2$) and running velocity associated with the AT, RCP, and a new neuromuscular fatigue threshold derived from the EMG signal called $EMG_{V\text{-}slope}$.

Methods: Six healthy adults (4 men and 2 women; mean ± SD age = 24.7 ± 5.4 years of age; body weight = 74.2 ± 12.8 kg, and height = 175.2 ± 8.7 cm) performed an incremental treadmill test to exhaustion while the EMG signal was recorded from the vastus lateralis muscle and gas exchange parameters were collected and analyzed.

Results: The computerized V-slope mathematical model successfully identified a braking point for the EMG amplitude versus $\dot{V}O_2$ relationship during incremental treadmill running for all subjects in the present study. The results of the one-way repeated-measures ANOVA indicated there were significant ($p \leq 0.05$) mean differences in $\dot{V}O_2$ and running velocity for AT (mean ± SD = 3.54 ± 0.9 $L \cdot min^{-1}$ and 15.41 ± 1.59 $km \cdot h^{-1}$, respectively) vs. RCP (3.98 ± 0.79 $L \cdot min^{-1}$ and 16.47 ± 1.67 $km \cdot h^{-1}$, respectively). There were no significant mean differences in $\dot{V}O_2$ or running velocity among the $EMG_{V\text{-}slope}$ (3.69 ± 0.78 $L \cdot min^{-1}$ and 15.74 ± 1.59 $km \cdot h^{-1}$, respectively), AT and RCP. There were significant correlations for $\dot{V}O_2$ and running velocity among all thresholds (r = 0.85 to 0.97).

Conclusions: The results of the present study indicated the computerized V-slope mathematical model formally used to identify metabolic fatigue derived from the carbon dioxide production (VCO2) or minute ventilation (VE) versus $\dot{V}O_2$ relationship can be applied to the EMG amplitude versus $\dot{V}O_2$ relationship. The significant correlations and no mean differences

between the AT, RCP, and $EMG_{V\text{-}slope}$ suggested that these fatigue thresholds may be mediated by a common underlying physiological mechanism.

81. REGULATION OF MAMMALIAN SYMPATHETIC NEUROTRANSMITTER RELEASE AND INTRAOCULAR PRESSURE BY HYDROGEN SULFIDE DONOR, GYY 4137

Ankita Salvi, Pratik Bankhele, Jamal Jamil, and Catherine A. Opere, Department of Pharmaceutical Sciences, Creighton University, Omaha, NE.

Purpose: We have evidence that hydrogen sulfide (H_2S) donors can regulate sympathetic neurotransmission and intraocular pressure (IOP) in the mammalian anterior uvea. In this study, we investigated the effect of a slow releasing H_2S donor, GYY 4137 on electrically evoked [^{3}H]NE release in isolated superfused, bovine iris-ciliary bodies (ICB), *in vitro* and on IOP in normotensive male New Zealand White rabbits, *in vivo*.

Methods: Isolated bovine ICB were incubated in oxygenated Krebs solution containing 2.5 µCi/ml of [^{3}H]NE. Release of [^{3}H]NE was elicited by two (S_1 and S_2) electrical pulses (300 d.c) applied 27 min apart. For IOP studies, a single drop of GYY 4137 (0.1-2%) and vehicle were instilled into the right and left rabbit eyes, respectively. IOP measurements were made using a pneumatonometer (model 30 classic; Reichert Ophthalmic Instruments, Depew, NY) until baseline readings resumed.

Results: GYY 4137 (1-30µM) attenuated field-stimulated [^{3}H]NE release in bovine ICB in a concentration-dependent manner, achieving an inhibition of 20.8% ($n=3$; $p<0.05$) at 30 µM. Although cystathionine β-synthase inhibitor, aminooxyacetic acid (3 mM) and the ATP-sensitive potassium channel (K_{ATP}) inhibitor, glibenclamide (300 µM) had no effect ($p>0.05$) on [^{3}H]NE release, they both reversed the inhibitory action of GYY 4137 (10-30 µM) on the neurotransmitter release. GYY 4137 (0.1-2%) reduced IOP in both treated and untreated eyes for a duration of 7-9 h. with maximum inhibition of 27.76 % ($n=5$; $p<0.001$) 6 h in treated eye after GYY 4137 (2%) treatment.

Conclusions: The H_2S-donor, GYY 4137 attenuates sympathetic neurotransmitter release via in situ release of H_2S and activation of K_{ATP}-channels. GYY 4137 also decreases IOP in mammalian anterior uvea.

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82. EFFECT OF LIPIDS AND SURFACTANT MISCIBILITY ON THE PARTICLE SIZE OF FLUTAMIDE SOLID LIPID NANOPARTICLES

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Purpose: To study the correlation between miscibility of drug, lipids and surfactant on the particle size of solid lipid nanoparticles.

Method: Solid lipid mixtures of lipids namely Glyceryl monoleate (GMO), Precirol, Glyceryl monostearate (GMS), and Compritol were prepared with Gelucire 50/13 as surfactant. Also, physical mixtures of flutamide and lipids/surfactant were prepared in similar manner. Miscibility studies of drug, lipids and surfactant physical mixtures were investigated using Modulated differential scanning calorimetry in a temperature range of -40^0C to 125^0C at a ramp rate of 2^0C/min. Solid lipid nanoparticles with and without drug loading were prepared by

ultrasonication method and characterized before and after lyophilization for particle size analysis and zeta potential.

Results: MDSC experiments showed that GMO, Precirol, GMS and Compritol melted at around 20^0C, 54^0C, 59^0C and 71^0C respectively. These lipids showed exothermic crystallization peak at -13^0C, 52^0C, 56^0C and 71^0C respectively. Melting of flutamide and Gelucire 50/13 were observed at 115^0C and 60^0C respectively. Physical mixture of GMO-Gelucire 50/13 showed decrease in the melting temperature to 35^0C. Similarly, decreases in melting and crystallization temperature of Gelucire were observed with GMS and Precirol. In case of Compritol-Gelucire 50/13 physical mixture, individual melting and crystallization peak were observed indicating immiscibility. Similarly, MDSC data suggests good miscibility of flutamide in GMO, GMS and Gelucire. The particle size of solid lipid nanoparticles prepared from GMO and GMS with Gelucire 50/13 was found to be 70.2±5.4 and 92.6±8.5 compared to >200 nm particles obtained from Precirol and Compritol. Increase in particles size was observed only with Compritol on lyophilization.

Conclusion: Good correlation between drug, lipids and surfactants miscibility and particle size of solid lipid nanoparticles was observed.

83. FURTHER STUDIES ON REGULATION OF [^{3}H]D-ASPARTATE RELEASE BY HYDROGEN SULFIDE DONORS IN ISOLATED BOVINE RETINA, IN VITRO

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Purpose: Hydrogen sulfide (H2S) donors can regulate [3H] D-aspartate release in isolated mammalian was reported previously. In this study, we compared effect of H2S donors on K+-induced glutamate release (using [3H]D-aspartate marker) in isolated bovine retina. Furthermore, we examined mechanism of inhibitory action of H2S-donors on K+-induced [3H]D-aspartate release in bovine retina.

Methods: Isolated bovine retina were incubated for 60 min. at 37◦C in carbogen-gassed Krebs buffer containing 200 nM of [3H]D-aspartate. Release of [3H]D-aspartate was elicited by iso-osmotic concentration of K+ (50mM)-stimuli applied at 80-88 min. (S1) and 116-124 min. (S2) after onset of superfusion. H2S-donors were added 12-18 min. before S2 while antagonists were present before and during S1 and S2.

Results: The H2S-producing compounds, GYY 4137 (10 nM-10 μM), NaHS (1 nM-1 μM) and L-cysteine (1-10 μM) elicited a concentration-dependent inhibition of K+-induced [3H]D-aspartate release in isolated bovine retina. At equimolar concentration (1 μM), rank order of activity was as follows: L-cysteine > NaHS > GYY 4137. The substrate for endogenous H2S production, L-cysteine was most potent, eliciting maximum inhibitory action of 54.2% (n=4; $p<0.01$) at 10 μM concentration (IC50 about 5 μM). Whereas, cystathionine β-synthase inhibitor, aminooxyacetic acid (3 mM) and ATP-sensitive potassium channel (KATP) inhibitor, glibenclamide (300 μM) had no effect ($p>0.05$) on K+-induced [3H]D-aspartate release, they both reversed the inhibitory action of GYY 4137 (10 μM) and L-cysteine (1-10 μM) on the neurotransmitter release. Furthermore, the nitric oxide (NO) synthase inhibitor, L-NAME (300 μM) reversed the inhibitory action of GYY 4137 (1-10 μM) and L-cysteine (1-10 μM) on excitatory neurotransmitter release.

Conclusions: KATP-channels, NO pathway and in situ production of H2S contribute to inhibitory action of H2S-producing compounds on excitatory neurotransmitter release in isolated bovine retina.

84. PREPARATION AND CHARACTERIZATION OF DUAL FUNCTION SOLID LIPID NANOPARTICLES INTENDED FOR TARGETING CANCER STEM CELLS

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Purpose: To incorporate two hydrophobic anticancer agents (cyclopamine and paclitaxel) with differing mechanisms of action in a single dosage form (solid lipid nanoparticles).

Methods: Nanoparticles consisting of glyceryl monooleate as the lipid core and Poloxamer 407 as a stabilizer and the drugs cyclopamine and paclitaxel were prepared. Blank and drug loaded nanoemulsions were prepared by multiple oil-in-water emulsion using ultrasonication and solvent evaporation followed by lyophilization. Drug loaded nanoparticles were characterized for particle size and zeta potential (dilution factor=1000, n=3). HPLC analysis of cyclopamine and paclitaxel was performed using C18 Luna column (150 x 4.6 mm, 5µm) having the mobile phase of methanol:acetonitrile:sodium acetate (20:45:35 v/v/v) with a flow rate of 0.5ml/min and a run time of 11 minutes for determining the drug entrapment efficiencies. The nanoparticles were characterized for their moisture content by Karl Fisher titration and Thermogravimetric Analysis (TGA). The physical state (crystalline/ amorphous) of the nanoparticles was determined by using Differential Scanning Colorimetry (DSC).

Results: The average particle size of the drug loaded nanoparticles was found out to be 278.4±16.4nm with a polydispersity index of 0.283±0.02. Zeta potential was found out to be -0.25 ±0.84 mV. Entrapment efficiency of the nanoparticles for cyclopamine was 117.6±5.5%(w/v) and for paclitaxel was 88.9±14.3%(w/v). Karl Fisher titration revealed that the moisture content of the nanoparticles was 2.18±0.67% (w/w). The TGA data also supported this fact. The DSC data shows that the cyclopamine and paclitaxel present in the nanoparticles are not in the crystalline state.

Conclusion: Stable, monodispersed solid lipid nanoparticles containing cyclopamine and paclitaxel with high entrapment were successfully prepared intended for targeting cancer stem cells.

85. FURTHER STUDIES ON PREPARATION AND CHARACTERIZATION OF PLGA NANOPARTICLES CONTAINING HYDROPHOBIC AND HYDROPHILIC DRUGS

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Purpose: Develop and characterize PLGA nanoparticles containing paclitaxel and gemcitabine.

Methods: Anticancer agents paclitaxel and gemcitabine were entrapped in PLGA (intrinsic viscosity=0.2dl/g, L:G=75:25), PVA (88% hydrolyzed, 2%, w/v) was added as a stabilizer with propylene glycol as solvent for hydrophilic drug. Blank and drug loaded nanoemulsions were prepared by emulsification solvent diffusion using high pressure homogenization followed by solvent evaporation. paclitaxel:gemcitabine ratio was approximately 2.5:1 and the aqueous to organic phase volume ratio was 3:1. The particles were dried using lyophilization and spray drying. An HPLC method consisting of a Water's Nova-Pak C8 4µm (2.1×150mm) column and Acetonitrile: Methanol: Water (48.5:16.5:35 v/v/v) as a mobile phase at a flow rate of 0.5 ml/min with a 6 minute run time was developed for detection of both drugs. The effluent was monitored at 234nm. Lyophilized and spray dried nanoparticles were characterized by thermal analysis, particle size and zeta potential (dilution factor=1000, n=3). In-vitro drug release studies were carried out on lyophilized nanoparticles.

Results: Mean diameter of blank nanoparticles was 142.7(±2.1)nm with a polydispersity index of 0.242±0.016. In lyophilized drug loaded nanoparticles the mean diameter was 199.5±3.6nm, with a polydispersity index of 0.25±0.00291 and Zeta potential of -2.8±2.7 mV. Spray dried nanoparticle size was 564.4nm with polydispersity index of 0.321 and zeta potential of -2.75mV. Entrapment efficiency of paclitaxel was 72.01% and for gemcitabine was 6.9% (w/v). Drug content in unwashed lyophilized nanoparticles was 86.67% for paclitaxel and 88.06% for gemcitabine. PTX showed a burst release of 0.35% in 2hrs, followed by a sustained release of 0.03%/hr. Gemcitabine showed a stable release at 7.8%/hr.

Conclusions: PLGA nanoparticle system containing paclitaxel and gemcitabine can be prepared with high entrapment efficiency and sustained release.

86. ONE AND TWO PHOTON FLUORESCENCE CORRELATION SPECTROSCOPY ON PROTEINS IN GLUCOSE SOLUTIONS

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Cryopreservation is a powerful technology with many applications in biomedical fields from organ preservation to cellular research. Simple sugars such as glucose and fructose are among the most widely used cryopreserving agents, yet despite their widespread use, the mechanism through which sugars protect cells on the molecular level is poorly understood. The water replacement model predicts sugars preferentially bind to the surfaces of protein forming a protective layer against the denaturing ice formation. Under this paradigm, one would expect the hydrodynamic radius of diffusing protein to increase with increasing sugar concentration. In order to test this hypothesis, we have developed both one-photon and two-photon fluorescence correlation spectroscopy (FCS) to measure the hydrodynamic radius of fluorescent particles in glucose solutions. The two-photon technique was developed to investigate tryptophan-containing proteins. However, to date, we have only succeeded in measuring the diffusion of reasonably large, Avidin-coated polystyrene spheres that possess sufficient fluorescence to be reliably detected. Work is continuing on using this technique to study the diffusion of the protein hemocyanin. Given these difficulties with the limited brightness of tryptophan, the one-photon FCS setup is being used to investigate green fluorescent protein (GFP), a much smaller, but considerably brighter, fluorophore.

87. BALQSO KINETIC LUMINOSITY WITH C III* MEASUREMENT AND PI MODELING

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The outflowing mass implied by the presence of broad absorption lines in the spectra of BAL quasars have been suggested as a feedback mechanism through which the mass of supermassive black holes and their host galaxies are correlated. In order for the mass outflow to have a significant impact on galactic processes, such as star formation, the ratio of its kinetic to its bolometric luminosity must be above a certain limit. Photoionization models can predict important parameters to this ratio if the number density of the gas can be determined. We present results of a novel method of determining this density with C III* column density measurements and photoionization modeling.

88. CHARACTERISTICS OF BOTTOM JETS IN HIGH ENERGY PHYSICS

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The Large Hadron Collider (LHC) is the world's highest energy particle accelerator used to conduct high energy particle collision experiments. It is located at the European Organization for Nuclear Research (CERN) in Geneva, Switzerland. High energy particle collisions sometimes produce jets. A jet is a set of particles traveling away from the point of collision along a particular axis that is not the same as the axis of the beam pipe. These particles are typically decay products of heavier and more energetic quarks. It is possible then to characterize jets by the type of quark that a particular jet comes from. Jets that come from bottom quarks (bottom jets) are of interest to us.

89. DYNAMIC LIGHT SCATTERING IN NETWORK-FORMING OXIDE MELTS:TIES BETWEEN STRUCTURE AND DYNAMICS

Tri Tran and David L. Sidebottom, Department of Physics, Creighton University, Omaha, NE.

We report results from a series of dynamic light scattering studies of network-forming oxide glasses obtained using photon correlation spectroscopy. These studies focus specifically on how the dynamics of these viscous melts are influenced by systematic changes in the chemical structure of the oxide network and include studies of both sodium phosphate and sodium aluminophosphate melts. The fragility, a dynamical property of the liquid near the glass transition point is determined from these measurements and seen to decrease with increases in the average density of bridging oxygen bonds regardless of the alkali content. Moreover, this dependence of the fragility on bond density is shown to be identically reproduced in both alkali borate melts and chalcogenide glasses, provided accommodations are made for the presence of structural entities in the borate system that contribute to their intermediate range order[1]. The universal pattern that emerges suggests a significant tie between network structure and dynamics that is consistent with predictions for a rigidity transition near an average bond number of 2.4 and within the framework of a simple two-state bond model, may be traced to a common dependence of the configurational entropy on connectivity.

Acknowledgement: This work is supported by a grant from the National Science Foundation (grant # DMR – 0906640).

90. TOYS AS TEACHING AND LEARNING AIDS IN NIGERIA'S S.S.S.1: THE FUNDAMENTAL PHYSICS OF THE FLYING SHARK

Mark Akubo, Department of Physics, Creighton University, Omaha, NE.

My poster is a pictorial presentation of the use of the Flying Shark Toy as a teaching/learning tool for some basic principles of Physics in Nigeria's Senior Secondary School 1. It highlights such physical principles as buoyancy; Archimedes Principle, air resistance to motion, the Ideal Gas Law, center of mass, demonstrates navigation by airplanes, and application of electricity in remote sensor devices. An essential motive of this poster is to explore the possibility of learning Physics with some fun in an environment of Physics-phobia.

91. HUBBLE SPACE TELESCOPE SPECTRUM OF OUTFLOWS IN ACTIVE GALACTIC NUCLEI

Zachary Monti and Jack Gabel, Department of Physics, Creighton University, Omaha, NE.

We present a preliminary analysis of an ultraviolet (UV) spectrum of the Seyfert 1 galaxy MRK 279. We're studying the intrinsic UV absorption lines of MRK 279 which indicate mass outflow from the Active Galactic Nucleus (AGN). These observations were made with the Cosmic Origin Spectrograph (COS) aboard NASA's Hubble Space Telescope (HST). In this initial analysis we explore the absorption variability by comparing the COS spectra to previous HST spectra.

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

Rustin Haase and Andrew G. Baruth, Department of Physics, Creighton University, Omaha, NE.

Nanolithography, the ability to fabricate useful structures with at least one lateral dimension between the size of an individual atom and 100 nm, is an essential component to modern industry and is fundamental to many emerging technologies. These technologies can be found in the areas of magnetics, electronics, photonics, biomaterials, medicine, ultrafiltration, as well as energy collection and storage. This emergence is primarily due to the materials properties entering a new regime at these size scales, where discoveries of novel material interactions are continually being made. At present, these innovations are pushing beyond the capabilities of traditional optical lithography, the historical method (similar to photography) for producing small features, and, instead, rely on very expensive and time-intensive methods, including electron and focused ion beam lithography. Many useful structures for application and fundamental study rely on periodicity (e.g. repeating lines, dots, rings, etc.); such structures naturally lend themselves to organic materials that self-assemble into periodic shapes.

The proposed study will focus on the construction and testing of an advanced solvent vapor reaction chamber for block copolymer thin films. Such materials naturally self-assemble into a wide range of morphologies (i.e., shapes); however, without direction, this order has little periodicity at large lateral length scales. The solvent-induced, directed ordering of self-assembled block copolymer thin films will allow access to these novel periodic nanostructures with unprecedented control and precision, including newly discovered morphologies, placing this cheap and rapid method of nanolithography in competition with very expensive and time-intensive methods currently in use within the nanoelectronic, ultrafiltration, biosensing and magnetic storage industries. One exemplary application is the directed self-assembly of a nonoscale water filter, for the purification of viruses. This is a global challenge where such innovation could naturally offer a cost-effective solution.

93. DISPARITIES IN THE UTILIZATION OF OFFICE BASED PYSICAL THERAPY SERVICES IN THE UNITED STATES, 2009

Allie Bruns and Robert Sandstrom PT, PhD. Department of Physical Therapy, School of Pharmacy and Health Professions, Creighton University, Omaha, NE.

Purpose: To determine if disparities in utilization of therapy services exist among minority groups compared to non-Hispanic whites with three self reported conditions: stroke, arthritis, or functional limitation.

Methods: We utilized data from the Medical Expenditure Panel Survey (MEPS), household component from 2009. The variables analyzed include: number of office based therapy visits, race/ ethnicity, office based therapy expenditures, self reported strokes, self reported arthritis, self-reported functional limitations, years of education, insurance coverage, and family income. Data analysis was performed to obtain population estimates of persons utilizing therapy services, mean annual number of office based therapy visits and expenses for office-based therapy visits.

Results: Controlled for insurance status, poverty level, and years of education, non-Caucasians are 55% less likely than Caucasians to report an office based therapy visit for self-reported stroke ($p=0.05$), 24% less likely for self-reported arthritis ($P>0.05$), and 28% less likely for self-reported functional limitations ($p<0.05$). Individuals not having insurance at all in 2009, who self reported one of these three conditions were significantly less likely to receive therapy than those with insurance.

Conclusion/Significance: Uninsured Americans with common disabling conditions are less likely to utilize office- based therapy than persons with insurance coverage. This concludes that affordability is the major barrier to access. The Patient Protection and Affordable Care Act (PPACA) reforms can be anticipated to decrease this disparity. We can also conclude that racial and ethnic disparities to access of office- based therapy service exist for Americans with self-reported functional limitations, but further research is needed to better understand the source conditions and reasons for the disparities.

Acknowledgment: School of Pharmacy and Health Professions Student Research Program.

94. WORK REQUIRED TO PRODUCE QUADRICEPS FATIGUE USING AN ISOMETRIC EXERCISE PROTOCOL: A COMPARISON OF YOUNGER AND OLDER ADULTS

Laura Baumert, SPT, Alyssa Gillen, SPT, Sam K. Morton, MS, A. Joseph Threlkeld, PT, PhD
Creighton University, Physical Therapy Department, Omaha Nebraska

Purpose: To compare the quadriceps work required to cause fatigue in younger and older adults.

Methods and Materials: A group of 10 younger subjects (mean±SD, age= 25.1±2.8 years) and a group of 2 older subjects (mean±SD, age= 58±2.8 years) performed a fatigue protocol of repetitive quadriceps maximum voluntary isometric contractions (MVIC). Each MVIC lasted 7 seconds followed by a 3 second rest period. Knee extenson torque was monitored using a dynamometer. The 7-on, 3-off cycle was repeated until the subject reached fatigue, which was defined as ≤65% of the highest pre-fatigue torque for three consecutive MVIC. Outcome measures were total amount of isometric impulse (area under the torque vs. time curve which is the isometric equivalent of work) expressed in Joules (J), the number of repetitions to fatigue, and the average work per repetition.

Results: The younger group produced 99.2 J of total work, with an average number of 14.5 repetitions to reach fatigue, and an average work per repetition of 6.8 J/repetition. For the older group the total work done was 100.0 J, average number of repetitions until fatigue was 19, and average work per repetition was 5.3 J/repetition. The younger group performed more work per repetition than the older group while total amount of work to reach fatigue remained relatively constant between groups.

Conclusions: A comparison of the younger and older group indicate that the younger group produces more force per contraction and requires less repetitions, but performs the same

amount of work as older adults to reach a predetermined level of fatigue. This may be due to different distributions of muscle fiber type as the proportion of type II fast twitch to type I slow twitch muscle fibers has been previously shown to be greater in younger individuals.

Acknowledgements: This research was supported by the National Institute on Aging of the National Institutes of Health under grant number R15 AG040616.

95. EFFECTS OF HYPOXIA ON REGULATORS OF G-PROTEIN SIGNALING 2 (RGS2) REGULATION OF PULMONARY ARTERIAL CONSTRICTION

Neha Jain, Yaping Tu, and Peter W. Abel, Department of Pharmacology,Creighton University School of Medicine, Omaha, NE.

Purpose: Pulmonary hypertension (PH) is increased blood pressure in the pulmonary vasculature associated with excessive vasoconstriction. Vasoconstrictors: U46619, serotonin and endothelin-1 (ET-1) signal via Gq coupled GPCRs. Since RGS2 proteins inhibit Gq signaling and downstream vasoconstriction pathways, they may play a role in PH associated with excessive vasoconstriction. Our goal was to determine whether hypoxia reduces RGS2 in pulmonary arteries causing enhanced Gq-coupled GPCR agonist calcium (Ca) signaling and constriction.

Methods and Materials: Human pulmonary arterial smooth muscle cells (HPASMC) and RGS2 KO and WT mice were used. RGS2 protein was knocked down by RGS2 siRNA. HPASMC were incubated in hypoxia (1% O_2) or normoxia (21% O_2) for 1-48 hrs. We measured RGS2 expression by western blotting, Ca mobilization with Ca dyes and constriction of pulmonary arteries and SMC by video morphometry.

Results: RGS2 siRNA caused knockdown (KD) of RGS2 by 68%±1 in SMC. Ca mobilization for U46619 and endothelin1 (ET-1) was 2-fold higher for RGS2 KD HPASMC compared to control and constriction by ET-1 and U46619 was increased by 21%±2 and 14%±2, respectively. Pulmonary arteries of lung slices from RGS2 KO mice had increased constriction to serotonin (26%±4) and U46619 (20%±4) compared to WT. Hypoxia significantly reduced RGS2 at 8 (54%±9), 24 (59%±8) and 48 (71%±6) hours in HPASMC. 48 hours of hypoxia increased constriction for ET-1 and U46619 by 19%±3 and 21%±2, respectively while Ca was increased 2-fold for both agonists.

Conclusion: RGS2 plays a role in GPCR constriction of HPASMC and pulmonary arteries. Hypoxia downregulates RGS2, causing augmented Ca signaling and constriction which may contribute to PH.

Support: American Heart Association; American Asthma Foundation

96. EVIDENCE OF PATHOLOGY IN THE LATERAL HYPOTHALAMUS: A CONNECTION BETWEEN SLEEP DISORDER AND EPILEPSY IN KV1.1 KNOCK-OUT MICE

Harrison M. Roundtree, Kaeli K. Samson, Timothy A. Simeone, and Kristina A. Simeone, Department of Pharmacology, School of Medicine, Creighton University, Omaha, NE.

Rationale: Common symptoms experienced by epileptic patients with sleep disorders include decreased sleep efficiency, greater sleep fragmentation, and longer sleep latency, symptoms also seen in members of the non-epileptic population with dysregulation of the hypocretin network, located in the lateral hypothalamus (LH). Kcna1-null mouse is a well-defined model for temporal lobe epilepsy (TLE) and has been shown to display the same symptoms seen in

hypocretin dysregulation. We hypothesize that KO mice would exhibit injury in the LH and reduced inhibition of hypocretin neurons.

Methods: The extent of injury in the LH was determined using immunohistochemical staining of WT and KO LH. Blood-Brain Barrier (BBB) permeability was measured using anti-mouse ImmunoglobulinG (IgG). Glial fibrillary acidic protein (GFAP) and S100β were used as markers of astrogliosis. Sensitivity of LH to, cyclopentyladenosine (CPA) was determined using multi-unit recordings. Expression of A1R was determined in LH with western blotting.

Results: BBB permeability in the KO LH was observed as a significant decrease in discrete punctate staining. Incidence of reactive astrocytes was significantly increased in KO LH. A1R protein expression was reduced in the KO LH. KO LH was less sensitive to CPA application than WT.

Conclusions: We determined changes in the LH of a mouse model of TLE. Presence of injury in the LH was supported by increased BBB permeability and increase in incidence of reactive astrocytes. Reduction in A1R expression and a decreased efficacy of an A1R-specific agonist suggests a reduction in adenosinergic regulation in KO LH. Together, these data suggest injury and reduced inhibitory adenosine tone in the LH of an epileptic mouse model may contribute to sleep disorder comorbidities.

Acknowledgements: Epilepsy Foundation of America (KAS); NINDS (NS072179, KAS); LB692 (KAS); Creighton University Health Future Foundation Faculty Development Award (KAS); Faculty Start-up Awards (TAS and KAS)

97. ANTICONVULSANT EFFECTS OF PIOGLITAZONE ON HIGH POTASSIUM SEIZURE-LIKE EVENTS IN IN-VITRO HIPPOCAMPAL SLICES

Nirupama P. Ranade*, Kaeli K Samson, Kristina A Simeone, and Timothy A Simeone, *Department Of Pharmacology, School of Medicine, Creighton University, Omaha, NE.

Rationale: Peroxisome proliferator activated receptor gamma (PPARγ) is a transcription factor that regulates genes involved in neuroprotection and regulating inflammation. As such, PPARγ is under consideration as therapy for ischemic stroke, Alzheimer's disease, Parkinson's disease, multiple sclerosis and traumatic brain injury. Previous *in vivo* experiments using acute seizure models suggest PPARγ agonists have anticonvulsant efficacy. Here, we tested the hypothesis that acute application of a PPARγ agonist, Pioglitazone, would reduce seizure-like events (SLEs) in an *in vitr*o model of epilepsy.

Methods: The hippocampal tissue slices were incubated for an hour in artificial CSF (3mM KCl). Extracellular electrophysiological studies were performed using the Multi-electrode dish system. A drug wash-in period of 90 min was allowed. Spontaneous activity was then recorded as high potassium aCSF(8mM KCl) was introduced into the perfusion. The effect of both Pioglitazone (PPARγ agonist) and GW 9662 (PPARγ antagonist) on tissue slices was observed and calculated in terms of latency to burst, burst duration and the intraburst frequency. High K^+ was used as control. Effect of Pioglitazone on the severity of seizure-like events was also studied against control through Coastline Burst Index (CBI) comparison.

Results: Pioglitazone delayed the latency to burst significantly ($p=0.013$). Each ictal period was divided in three phases- transition (interictal spikes leading to the tonic phase), early (tonic phase), late (dying down of spikes leading to baseline). Pioglitazone significantly decreased the intraburst frequency of SLE by increasing the burst duration of each seizure-like event. It decreased the CBI for early and late phase significantly over control.

Conclusions: These results suggest that Pioglitazone may increase the seizure threshold and decrease the severity of ongoing seizures, supporting PPARγ activation as a potential anticonvulsant target.

Acknowledgements: This work is supported by grants from the Health Future Foundation (TAS) and Epilepsy Foundation (TAS).

STUDENT ORAL PRESENTATION ABSTRACTS

1. GRADED TALOCRURAL JOINT MOBILIZATION DOES NOT ALTER CORTICAL MOTOR EXCITABILITY OF THE SOLEUS IN INDIVIDUALS WITH CHRONIC ANKLE INSTABILITY

9:15 a.m. – Harper Center Suite 3028

Nadyne Dolan*, Sam K. Morton*, Brian G. Pietrosimone†, Terry L. Grindstaff*, *Department of Physical Therapy, Creighton University, Omaha NE, † Department of Kinesiology, University of Toledo, Toledo, OH.

Purpose: To determine the effects of talocrural joint manipulation or mobilization on corticomotor excitability of the soleus in individuals with chronic ankle instability (CAI).

Methods: Thirty participants (age=22.8±2.8 y, height=173.8±8.8 cm, mass=73.2±13.8 kg) volunteered for this study. All participants had CAI which was defined as repetitive episodes of instability, decreased self-reported function and at least a 5° deficit in ankle dorsiflexion compared to the contralateral ankle. Participants received each of the following interventions, in a randomized order, with at least 48 hours between testing sessions; talocrural joint manipulation, talocrural joint anterior to posterior mobilization, and a sham intervention. Cortical motor excitability of the soleus was determined by measuring the amplitude of a motor evoked potential (MEP) following transcranial magnetic stimulation. The intensity was set at 120% active motor threshold with five MEPs obtained. Maximal muscle response (Mmax) was determined by delivering a percutaneous electrical stimulus, with incremental increasing intensity, to the tibial nerve and measuring the maximal peak-to-peak amplitude of the soleus muscle response with three measures obtained. Outcome measure was the average peak-to-peak amplitude of the MEP normalized to Mmax (MEP/Mmax ratio). A two-way mixed model ANOVA was used to compare changes in soleus MEP/Mmax ratio between interventions over time (pre/post intervention).

Results: There were no significant differences between groups when examining changes in soleus MEP/Mmax ratio ($F_{2,47.8}$= 0.24, *P*= .79) (Grade V Pre= 2.67±1.08%, Post= 2.99±1.70%; Grade IV Pre= 2.91±1.90%, Post= 2.62±1.29%; Sham Pre= 2.76±1.68%, Post= 2.70±1.77%).

Conclusions: Neither talocrural joint manipulation or mobilization altered corticomotor excitability of the soleus individuals. Although talocrural joint mobilization has previously been reported to improve outcomes associated with CAI, the mechanism of effectiveness may not involve changes in cortical motor excitability.

Acknowledgment: Portions of this research was funded via the Student Research Program provided by the Office of Research at Creighton University, the Nebraska Foundation for Physical Therapy, and the Nebraska Tobacco Settlement Biomedical Research Development Program (LB692): New Initiatives Grant- Creighton University.

2. FINANCIAL EDUCATION AND HEALTH: CREIGHTON'S FINANCIAL SUCCESS PROGRAM

9:30 a.m. – Harper Center Suite 3028

Michelle Skaff, Department of Sociology, Anthropology and Social Work, College of Arts and Sciences, Creighton University, Omaha, NE.

Existing research suggests a strong association between poverty, gender, and health. The research, on which this presentation is based, focused on this association by studying Creighton University's Financial Success Program using qualitative methods: observations, participant observation, and interviews. This program's goal is to provide financial education to single, low-income mothers. The research (1) explored factors that prevent low-income women from accessing health care, and (2) discovered positive changes in program participants' health as a result of having completed the program.

Acknowledgement: This research was funded by the College of Arts and Sciences Dean's Summer Research Scholarship and mentored by Dr. Alexander Roedlach.

3. CALCULATING BOND ENERGIES OF SIMPLE HOMONUCLEAR DIATOMIC MOLECULES USING DFT

9:45 a.m. – Harper Center Suite 3028

Jason Goins and Mark Freitag, Department of Chemistry, College of Arts and Sciences, Creighton University, Omaha, NE.

Density Functional Theory (DFT) can be used to accurately model the molecular geometry and energy in molecules at computational costs lower than traditional wavefunction methods. DFT has therefore gained increasing popularity in condensed matter calculations, most specifically in the study of metals, transition metals, and complex proteins[1]. It also has application in physics, material science, chemical engineering, and geology[2]. With its proliferating use in computational laboratories, there is a disproportionate absence of DFT education in the undergraduate curriculum. Furthermore, students may use the results of DFT without understanding the underlying theory. Even for those students who wish to take on the study of DFT, literature exists but usually consists of review articles assuming extensive background knowledge or lacking mathematical detail.

A Microsoft Excel spreadsheet and accompanying manuscript are being created in order to familiarize undergraduates with DFT equations and their derivation, complementing the conceptual and mathematical text with 'hands on' spreadsheet calculations, and consolidating all necessary conceptual and mathematical information into a succinct, chronological order. The spreadsheet will illuminate the step-by-step process for performing Kohn-Sham DFT calculations on H_2, HeH^+, or He_2^{2+} using STO-*n*G (n=1,2,3) basis sets. The Local Density Approximation (LDA) method was employed for determining the Exchange-Correlation potential energy. We expect that energy calculations for the studied diatomic systems will converge towards literature values with acceptable accuracy. H_{core} and *Exchange* matrices demonstrated symmetry as expected for a homonuclear system. Results will validate the potential use of the spreadsheet and manuscript as an educational tool in the classroom. It should serve as a platform to those wishing to become knowledgeable and well practiced in a computational method that is experiencing an increasing influence in real world applications.

References
[1] Burke, K. (2012). "Perspective on density functional theory." *Journal of Chemical Physics, 136.*
[2] Sholl, D. (2009). *Density functional theory: A practical introduction*. Hoboken: Wiley and Sons.

4. NUCLEAR FACTOR 45 (NF45) AND NUCLEAR FACTOR 90/110 (NF90/110) INCREASE TRANSCRIPTIONAL ACTIVATION OF HIV-1

10:00 a.m. – Harper Center Suite 3028

Yan Li and Michael Belshan, Department of Medical Microbiology and Immunology, Creighton University School of Medicine, Omaha, NE.

Background/Purpose: Human immunodeficiency virus type 1 (HIV-1) transcription requires the viral transactivation protein Tat. Tat recruits the PTEF-b complex to facilitate phosphorylation of RNA Pol II and RNA elongation. In addition to PTEF-b, HIV-1 exploits additional host transcription factors to promote virus gene expression. The overall objective of our research is to identify novel cellular factors and characterize their role in HIV-1 transcription/replication. The purpose of this study was to evaluate two RNA binding proteins (NF45 and NF90/110) which were identified in previous proteomics studies of cellular fractions containing HIV-1 preintegration complexes at 20 hours post infection. We hypothesize that these RNA binding proteins interact with the HIV-1 RNA and enhance viral gene expression.

Methods: Viral infectivity assays were performed with VSVg pseudotyped HIV-1 luciferase (Luc) reporter viruses in 293T cells in which NF45, NF90 or NF110 were overexpressed. Viral production assay were performed by co-transfection NF45, NF90 or NF110 expression plasmid with pNLX-luc construct. Viral transcription assays were performed in 293T cells by co-transfection with NF45, NF90 or NF110 expression plasmid with a viral LTR promoter controlled Luc reporter gene construct. To investigate whether NF45 and NF90/110 bind HIV, RNA Immunoprecipitation-RT-PCR assays were performed either using NF45 antibody to pull down NF45 or FLAG tag antibody to pull down FLAG tagged NF90/110.

Results: Viral infectivity assays showed that excessive NF45 and NF90/110 expression enhanced HIV infection. Viral promoter assays indicated that over-expression of NF45 or NF90/110 directly increased HIV transcription. Interestingly, the enhancement of virus transcription was observed also in assays without Tat expression. RNA immunoprecipitation assays demonstrated that both NF45 and NF90/110 interacted with the HIV RNA.

Conclusion: We speculate that NF45 and NF90/110 are novel Tat-independent transcriptional factors of HIV-1. All of them bind HIV RNA in vitro suggesting they may stabilize the HIV RNA or enhance translation of viral proteins. Future study will focus the regulation of NF45 and NF90/110 during HIV infection and determine the RNA binding region for NF45 and NF90/110.

5. PROTEOMIC ANALYSIS OF THE HIV-1 NUCLEAR COMPARTMENT

10:15 a.m. – Harper Center Suite 3028

Jason DeBoer,[1] Teena Jagadish,[2] Pawel Ciborowski,[2] and Michael Belshan,[1] [1]Department of Medical Microbiology and Immunology, Creighton University School of Medicine, Omaha NE, [2]Department of Pharmacology and Experimental Neuroscience, University of Nebraska Medical Center, Omaha, NE.

PURPOSE: The human immunodeficiency virus type 1 (HI -1) exhibits a complex lifecycle and requires numerous host cell factors for productive replication. Mass spectrometry

(MS)/proteomics is a useful tool to identify novel virus-host cell protein interactions and/or changes in protein expression in response to virus infection. The purpose of this study was to perform a comprehensive study focusing solely on the changes in the nuclear proteome of HIV-1 infected cells.

METHODS: Synchronized infections of C8166-45 T-cells were performed using the spinoculation technique. Following a 20 hour infection, four distinct cell compartments were isolated using the Qiagen Qproteome Cell Compartment Kit. The nuclear proteins were then processed for Nano-LC-MS/MS identification of proteins. The spectra were searched using Sequest™ algorithm in Proteome Discoverer 1.2 software. Validation of select proteins was performed by Western blot.

RESULTS: Over 13,000 peptides and 2800 proteins by unique NCBI gi number were identified in the samples (HIV-1 infected and Uninfected/Control). Extensive analysis, limiting data to those proteins found in >2 replicates, identified 227 proteins. 17 were unique to the infected cells, 72 unique to the control, and 138 common between the two. A number of proteins in both samples were also found to be >2-fold enriched as determined by total Proteome Discoverer score. Changes in the subcellular expression in several candidate proteins were observed in independent cell lines over 72 hour time course infections.

CONCLUSIONS: Multiple known HIV-1 host factors were identified in the nuclear proteome study providing validation of the experimental approach. Numerous other candidate host proteins were identified as potential virus specific factors. Preliminary data suggests a vital role in HIV-1 infection for the candidate factors DEK and PPIB. PPIB been previously been shown to bind the HIV-1 Gag polyprotein although the impact of this interaction has not been examined. Identification of novel cellular factors in HIV-1 infection is key to further elucidating the viral lifecycle and revealing new treatment targets.

6. EFFECTS OF AUTOMATIC PROCESSING ON MEDICATION ADHERENCE BEHAVIOR

10:30 a.m. – Harper Center Suite 3028

Ryan Hafner, Department of Psychology, College of Arts and Sciences, Creighton University, Omaha, NE.

Medication nonadherence is overwhelmingly prevalent in today's healthcare industry, leaving both health and economic ramifications as a critical issue. Previous studies have looked at patient self-reports of the controlled analytic thought processes of patients but not the uncontrolled automatic processes. Differences in physician gender and pronunciation difficulty of a medication will be used to examine the effect of gender stereotypes and processing fluency on subsequent medication adherence behavior. Participants with clinical hypertension will partake in a six-month period of blood pressure medication consumption. Self-reports will be measured at one and six-month periods, including questions regarding perceived effectiveness of medication, competency of the physician, and risk of treatment. The modified Morisky scale will be used to measure medication adherence. It is hypothesized that both female physician and low processing fluency conditions will generate lower adherence scores, with a combination of the two conditions providing the lowest reported adherence score in the entire study.

7. ROLE OF microRNA IN CEREBELLAR DEVELOPMENT

10:45 a.m. – Harper Center Suite 3028

Taylor Mighell[1], Megan Bosch[1], Erik Arneson[1], Garrett Soukup[2], Annemarie Shibata[1], [1]Department of Biology, [2]Department of Biomedical Sciences, Creighton University, Omaha, NE.

Rationale: MicroRNAs (miRNAs) are small noncoding RNAs that require processing by the exoenzyme Dicer to function as regulators of protein translation. This regulation has been shown to be crucial in many cellular processes. The development of the cerebellum follows a well-defined pattern and the precision of this development is crucial to proper function. The role of miRNAs in cerebellar development has not been well studied. We hypothesize that miRNAs play a critical role in the development and function of the cerebellum.

Methods: In order to investigate the role of miRNAs in cerebellar development and function, conditional Dicer null mutants have been generated in mice under the control of the developmentally regulated promoter, Atoh1.

Results: Behavioral analyses show disruption of balance and an ataxic gait in Dicer null mice indicating potential dysfunction of cerebellar motor control. Immunohistochemical analyses show disruption in lobe formation, granular and Purkinje cell organization, and disruption of radial glial formation. RT-PCR and western blot analysis show disruption of protein and mRNA expression. Caspase 3 activation is observed in conditional Dicer null mutants as compared to controls.

Conclusion: These findings indicate a potential crucial role for miRNA in cerebellar development.

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8. MICROENVIRONMENT AND CYTOKINES IN PSEUDOMYXOMA PERITONEI

1:30 p.m. – Harper Center Suite 3028

Kush Raj Lohani, Shreya Jagadish Shetty, Sean J. Judge, Venkatesh Govindarajan, Peter Thomas, and Brian W. Loggie, Creighton University Medical Center, Omaha, NE.

Background: Pseudomyxoma Peritonei (PMP), a peritoneal mucinous neoplasm of appendix origin, is associated with inflammation and fibrosis which is central to PMP biology. Here, we examine possible biomarkers or regulators of PMP in peritoneal tumor microenvironment and in serum.

Methods: Matching PMP ascites and serum, and peritoneal washings were collected. Cytokines and C-reactive protein (CRP) levels were determined using Milliplex immunoassays. Immunohistochemistry (IHC) was performed on formalin-fixed tissue sections. LDH fluorescence assay was used for in vitro cell proliferation test. Statistical analysis was performed by Wilcoxon rank test, Mann Whitney U test, Unpaired Student t-test and Bivariate analysis.

Results: Serum CRP was significantly elevated in PMP (n=28) versus controls (n=4) (0.013 vs. 0.004mg/l,p=0.034). CRP levels were lower in ascites (0.0048 vs. 0.013 mg/l, p<0.001), but correlated with serum levels (R=0.74,p<0.001). Cytokines typically elevated after infection or injury - IL-1α, IL-1β, IL-2 and IFN-γ - were not elevated in PMP ascites; however, IL-6, IL-8, IP-10, MCP-1, MIP-1α, MIP -1β, TNF-α and VEGF were significantly different (p<0.001–0.03) in PMP with ascites (n=29) versus peritoneal washings (n=9). 32 patients were evaluated for these major cytokines. Ascites levels were significantly elevated compared to serum for IL-6 (623 vs. 3.2 pg/ml,p<0.001), IL-8 (162.5 vs. 5 pg/ml,p<0.001), IP-10 (3917 vs. 577 pg/ml, p<0.001), MCP-1 (2252 vs. 604.5 pg/ml, p<0.001) and MIP-1α (26 vs. 4,p<0.001). Serum levels were elevated compared to controls (n=6) for MIP-1β (p=0.003) and IL-8 (p=0.016). IHC revealed presence of IL-6 predominantly in stroma and IP-10 and MCP-1 in tumor cells. Recombinant IL-6-treated LS174T cells showed increased proliferation (p=0.0118) which was inhibited by anti-IL-6 antibodies (p=0.0005).

Conclusion: The local inflammatory interactions in the tumor microenvironment are complex and will likely determine tumor progression and the host response. CRP, MIP-1β and IL-8 could be potential serum markers for PMP. Anti-IL-6 could have potential therapeutic significance in PMP management.

9. EFFECTS OF SMALL RNA DEPLETION ON DEVELOPMENT OF MAMMALIAN INNER EAR AND SENSORY HAIR CELL DIFFERENTIATION AND MAINTENANCE

1:45 p.m. – Harper Center Suite 3028

Marsha L. Pierce, Heather C. Jensen-Smith, Sharalyn M. Steenson, Colby W. Bradfield, Isha Dewan, and Garrett A. Soukup, Department of Biomedical Sciences, Creighton University School of Medicine, Omaha, NE.

PURPOSE: Small RNAs, namely endogenous siRNAs and miRNAs, are crucial regulators of transcriptional and post-transcriptional regulation in eukaryotic cells. To elucidate the role of siRNAs versus canonical miRNAs in mouse inner ear development and maintenance, we examined *Dicer1* conditional knockout (CKO) that prevents miRNA and siRNA maturation to *Dgcr8* CKO that inhibits canonical miRNA maturation.

METHODS AND MATERIALS: To compare loss of small RNAs vs. loss of canonical miRNAs in mouse inner ear, we generated *Dicer1* CKO and *Dgcr8* CKO in the otic placode using *Pax2-Cre* and in hair cells using *Atoh1-Cre*. In addition to gross morphological observation, in situ hybridization was used to confirm miRNA depletion, and immunohistochemical detection of F-actin and MyoVIIa was used to examine development and maintenance of hair cells in each of these models.

RESULTS: Our prior studies of *Dicer1* CKO in mouse inner ear have shown considerable defects in gross development and maintenance of sensory hair cells depending on the timing and tissue or cell specificity of conditional deletion. We hypothesized that *Dgcr8* CKO would result in less severe outcomes than *Dicer1* CKO since only canonical miRNAs are affected. To the contrary, preliminary analysis of *Dgcr8* CKO demonstrates that depletion of only canonical miRNAs results in greater variability of developmental outcomes in the *Pax2-Cre* model and surprisingly more detrimental effects on sensory hair cell differentiation and maintenance in the *Atoh1-Cre* model.

CONCLUSIONS: Differences in outcomes between *Dicer1* CKO and *Dgcr8* CKO are interpreted to reflect the role of miRNAs in canalization (i.e. reproducibility of developmental

outcomes) and the importance of the balance of small RNA (siRNA and miRNA) functions in cell differentiation and maintenance.

This work is supported by: NIH–NIDCD:R01DC009025; NIH–NCRR:P20RR018788; NIH–NCRR:G20RR024001; NIH–NCRR:C06RR017417; and Nebraska State LB692.

10. THE MANY FACES OF AUTISM

2:00 p.m. – Harper Center Suite 3028

Anne Daly and Beverly A. Doyle, Department of Education, College of Arts and Sciences, Creighton University, Omaha, NE.

PURPOSE: Students identified as having autism spectrum disorders create challenges for teachers charged with meeting their educational and social needs. The purpose of this presentation is to present teaching strategies proven to maximize learning potential in the students.

METHODS: This presentation will focus on methods which have been proven to be effective in multiple research designs, and in both group and single subject studies. In addition, videos from a preschool classroom serving autistic children will focus on the implementation of these research findings, and the application of these strategies.

RESULTS: Research on effective educational interventions for autistic students revealed that in order for positive results to occur, and for students to make gains educationally and socially, programs must begin as soon as the child is diagnosed with autism. Full day school programs must be provided, and instruction should focus on small group lessons of short duration. These programs must focus on measurable objectives, evaluated regularly and adjusted according to data collected. In addition, programs should include a family component.

CONCUSIONS: Since 1 in 88 children in 2012 were identified as having autism, effective teaching strategies need to be adopted so that quality teaching and learning can occur. Methods presented focus on results from evidence based research, and can be implemented by those teaching autistic students.

11. PKCε-MEDIATED P-REX1 DOWNREGULATION SUPPRESSES BREAST CANCER CELL PROLIFERATION

2:15 p.m. – Harper Center Suite 3028

Chuu-Yun A. Wong, Yan Xie, Dennis W. Wolff, Peter W. Abel, and Yaping Tu, Department of Pharmacology, Creighton University School of Medicine, Omaha, NE.

Purpose: Phosphatidylinositol-3,4,5-triphosphate-dependent Rac exchanger Factor 1 (P-Rex1) is a guanine nucleotide exchange factor that specifically activates Rac by catalyzing exchange of GDP for GTP bound to Rac. P-Rex1 is upregulated and promotes tumorgenesis and metastasis of various cancers. We recently found that phorbol-12-myristate-13-acetate (PMA) downregulates P-Rex1 in breast cancer cells. The present study was to investigate the importance and mechanism underlying PMA downregulation of P-Rex1.

Methods & Materials: P-Rex1 mRNA and protein expression were determined by real-time RT-PCR and Western blot analysis, respectively. Cell proliferation was analyzed by counting cell numbers.

Results: We found that P-Rex1 expression is elevated in breast cancer MCF-7, T47D and BT-474 cell lines compared to normal breast epithelial cells. PMA treatment decreased P-Rex1 expression and proliferation of breast cancer cells by over 70%. Restoring P-Rex1 expression attenuated the PMA inhibition of cell proliferation. Thus, indicating PMA-mediated suppression of breast cancer cell proliferation is P-Rex1 dependent. Go6983, a protein kinase C (PKC) inhibitor, blocked the PMA inhibition of P-Rex1 expression and breast cancer cell proliferation, suggesting PMA effect is through the PKC signaling. Breast cancer cells express PMA-sensitive PKCα, PKCδ, PKCε and PKCη. PKCα/β inhibitor Go6976 or PKCδ inhibitor rottlerin had no significant effect on inhibiting the PMA-induced P-Rex1 suppression in MCF-7 cells, indicating PMA-mediated effect is not through PKCα and PKCδ. Overexpression of constitutively active PKCε, but not PKCδ or PKCη, significantly suppressed P-Rex1 expression and breast cancer cell proliferation.

Conclusions: In conclusion, PMA downregulates P-Rex1 to suppress breast cancer cell proliferation via a PKCε signaling pathway, which could be a new therapeutic target for development of a novel breast cancer treatment.

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SUMMER FACULTY FELLOW ABSTRACTS

1. TESTING THE HYPOTHESIS OF INCREASED ACID-STABILITY OF THE SALIVARY ALPHA-AMYLASE DURING EARLY HOMONID EVOLUTION

Kelsey Yamada, Kaitlyn Brittan, Anna Johnson, and Soochin Cho, Department of Biology, College of Arts and Sciences, Creighton University, Omaha, NE.

Primate salivary α-amylase (*AMY1*) and pancreatic α-amylases (*AMY2A and AMY2B*) break dietary into smaller carbohydrates. They arose though gene duplications from a single ancestral gene during early primate evolution. Subsequently, they underwent adaptive sequence changes to optimize their physiological contributions, which can be explained by two alternative models: neofunctionalization or escape from adaptive conflict (EAC). Here we aim to test which model explains the functional divergence of *AMY* genes better by ancestral gene resurrection. We have reconstructed the DNA sequences of the two ancestral amylases, AMYa (for extant AMY1 and AMY2A) and AMYb (for AMYa and AMY2B), to be expressed in yeast cells and tested for their enzymatic activities in response to changes in hydronium concentrations. We hypothesize that the AMYa will exhibit intermediate optimal pH and activity levels to that of AMY1 and AMY2 if their duplication and evolution followed the EAC model.

2. DEVELOPMENT OF CHEMICAL ASSAYS ON PAPER-BASED MICROFLUIDIC DEVICES

Erin M. Gross, Kalani A. Parker, and Jennifer L. Lambrecht, Department of Chemistry, College of Arts and Sciences, Creighton University, Omaha, NE.

Not all analytical measurements and clinical diagnoses need to be expensive tests performed in a laboratory setting. Sometimes, bringing the lab to the sample is the best solution. Paper-based microfluidic devices provide the opportunity for inexpensive yet accurate in-field testing. These are particularly useful in areas where resources are limited. This research project developed novel chemical assays with environmental applications. These tests were colorimetric and the color changes in the presence of functionalized gold nanoparticles were measured and evaluated. We characterized the nanoparticles by visual observation of the color change and by UV-VIS absorbance spectroscopy. The color changes on paper-based devices were characterized by capturing a digital image with a scanner. The cations measured were calcium, barium and strontium. Detection limits were at the low micromolar level for each cation. We found that transferring the assays to a paper-based device will be more challenging than anticipated. The colors of the nanoparticle solutions are not as vivid as observed in solution. However, paper-based microfluidics is an expanding field with numerous reports coming out in the literature. Work is ongoing to optimize the chemical conditions on the paper and the colorimetric responses.

Acknowledgements: This work was funded by a Creighton University Summer Faculty Fellowship and a College of Arts and Sciences Ferlic Summer Research Scholarship.

3. GROUND-BASED OBSERVATIONS OF CUMULUS ENTRAINMENT RATES IN CONTINENTAL AND MARITIME CONVECTION

Timothy J. Wagner, Department of Atmospheric Sciences, College of Arts and Sciences, Creighton University, Omaha, NE.

Rationale and Methods: Entrainment of environmental air by cumulus clouds has a significant impact on the macrophysical and microphysical characteristics of the cloud, and in turn their

impact on earth's radiative balance. Traditionally entrainment has been measured by in situ penetrations of cumuli by instrumented aircraft. A ground-based remote sensing algorithm capable of retrieving entrainment rates in cumulus clouds has been developed to measure entrainment on a far higher temporal resolution than can be accomplished with aircraft. This algorithm, called the Entrainment Rate In Cumulus Algorithm (ERICA), uses high-temporal resolution profiles of temperature, moisture, and radar reflectivity and velocity from ground-based instruments as inputs into a Gauss-Newton optimal estimation scheme. The observations and a first guess of the entrainment rate are ingested by the Explicit Mixing Parcel Model (EMPM), a one dimensional cloud parcel model that includes finite rate mixing and explicit droplet microphysics. EMPM then calculates the effective radius and liquid water path of the cloud and the results are compared to ground-based observations of the same, and the entrainment rate guess is adjusted iteratively until convergence.

Results: ERICA was initially developed for the retrieval of entrainment rates at the Southern Great Plains (SGP) site of the Atmospheric Radiation Measurement (ARM) program. Initial results show a mean entrainment rate for spring and summer cumuli of 0.90 km^{-1} with a mean uncertainty of 0.23 km^{-1}. Since then, ERICA has been extended for use at the Tropical Western Pacific (TWP) ARM site, which features deeper and more vigorous convection than the SGP site. The mean entrainment rate for the tropical clouds was found to be 1.21 km-1. However, the increased error associated with the TWP instrumentation resulted in almost twice as much uncertainty in the retrieved product.

Acknowledgement: This study was funded by the Creighton University Summer Faculty Research Fellowship.

4. THE JOURNEY TOWARDS A MUTUAL UNDERSTANDING: CREIGHTON PHILOSOPHY FOR CHILDREN (P4C) TRIP TO TIBET

Jinmei Yuan, Department of Philosophy, Creighton University, Omaha, NE.

From May 15-27, 2012, Dr. Jinmei Juan led a Creighton Philosophy for Children (P4C) team to Tibet, teaching Tibetan children logic and doing research on Tibetan Buddhism. This is a part of her book project, *The Journey towards a Mutual Understanding*. Using logic as a thread, this book project focuses on a historical and philosophical inquiry into the possibility of opening a discourse between Chinese and western philosophies and religions. She wants to explore the possibilities of creating a mutual understanding between the East and the West. A few successful cases, such as Buddhists' effort of letting go of logic and the contributions from Jesuits, like Mateus Ricci, S. J.in the 17th century, have shown that having an open mind for the unfamiliar is the hope for human knowledge and mutual understanding. Dr. Yuan believes that the efforts must be made from both sides.

The trip to Tibet had two research goals: 1) Testing whether western traditional logic could be understood by Tibetan children; and 2) how much Buddhist religion and philosophy, which emphasizes that the first principle for knowledge is "open mind," could impact on a mutual understanding. The group went into a Tibetan school with the help of Soong Ching-Ling Foundation (SCLF), and taught philosophy and logic for the Tibetan children. None of kids could speak English. None of the Creighton group members could speak the Tibetan language. Classes were taught in Chinese Mandarin since the majority of the TAs could speak Mandarin and the Tibetan childrens' official language at school was also Mandarin. The teaching itself is the best test of the journey towards a mutual understanding.

HADDIX RESEACH SCHOLAR ABSTRACTS

1. SOCIAL RECONCILITATION AND CATHOLIC ECCLESIOLOGY IN THE DIOCESE OF TSHUMBE, DEMOCRATIC REPUBLIC OF THE CONGO

James J. Carney, Department of Theology, Creighton University, Omaha, NE.

This project analyzes visions of Christian social reconciliation and reconstruction in the Diocese of Tshumbe in the south-central region of the Democratic Republic of the Congo. Drawing on the testimony of clerical leaders like Bishop Nicholas Djomo, justice and peace advocates, and Catholic small Christian community leaders, I develop a contextualized theological model of social reconstruction, focusing in particular on the contributions of lay-led *Communautes Ecclesiales Vivantes de Base* (CEVBs). The DRC offers an important setting for such research given its recent war, early commitment to small Christian communities, and the political and social influence of the Catholic Church. This is serving as a case study in a longer-term project on the communal, sacramental and ritual dimensions of Christian social reconciliation.

2. IGNATIAN PEDAGOGY ACTUALIZED THROUGH PROBLEM/PROJECT-BASED LEARNING WITHIN PHYSICS COURSES

Gintaras K. Duda, Department of Physics, Creighton University, Omaha, NE.

Although the Jesuit ideal of “magis" means in part that a Catholic and Jesuit education should be richer and fundamentally different than a secular education, it has proven difficult to apply the ideals Ignatian education to science and mathematics courses which are content driven. However, the educational framework of problem/project-based learning (PBL) offers the potential to fully realize and utilize Ignatian pedagogy in the science classroom. This work builds upon several years of experience with PBL in upper division physics courses and describes the melding and fusing of PBL and Igantian pedagogical approaches to truly bring the Jesuit ideal of education to physics courses at Creighton. This presentation describes an extension to the standard PBL pedagogy through the development and implementation of Ignatian reflection and metacognitive self-monitoring exercises that have been shown in the educational literature to be crucial for effectively acquiring new knowledge

3. MICROENCAPSULATED REMINERALIZING AGENTS

Stephen Gross, Mark Latta, William McHale, Ryan Cooper, Michael Davidson, Phil Elassal, Michelle Falbo, Josh Fulton, and Theresa Greving, Department of Chemistry, College of Arts and Sciences, and School of Dentistry, Creighton University, Omaha, NE.

Rationale: Tooth decay remains a significant global oral health care problem. A new technological approach to promote remineralization is described in this presentation.

Methods: An inverse emulsion is used to generate microcapsules that contain aqueous salt solutions. Microcapsules with these remineralizing agents were formulated into a few different dental materials to demonstrate the ubiquitous nature of this approach. The rate of release of calcium, phosphate or fluoride ions from these microcapsules was determined by potentiometry and uv/vis spectroscopy.

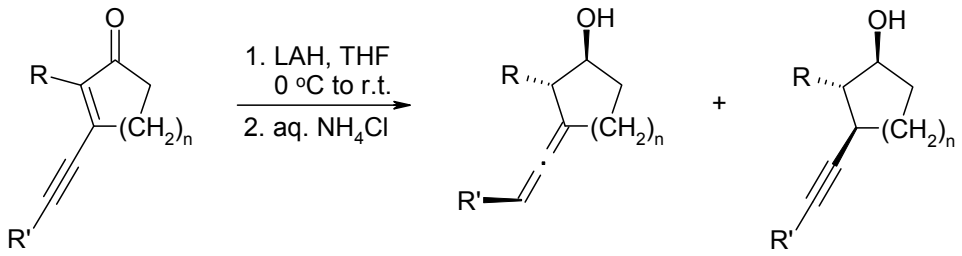
Results: The rate of ion release from dental materials containing microencapsulated remineralizing agents can be controlled through the variation of the microcapsule chemical structure, the initial salt concentration, the ion type and counterion used, loading percent in the formulation and the chemical composition of the continuous phase.

Conclusion: The inclusion of microcapsules containing aqueous salt solutions of calcium, phosphate and fluoride ions has the potential to promote tooth remineralization in the oral environment.

4. STEREOSELECTIVE SYNTHESIS OF EXOCYCLIC ALLENES BY DOUBLE HYDRIDE REDUCTION OF 3-ALKYNYL-2-CYCLOALKENONES

John M. Kum, Andrew K. Urick, and Martin Hulce, Department of Chemistry, Creighton University, Omaha, NE.

Exocyclic allene natural products and pharmaceutical agents are a rare but interesting compound class. Members include fucoxanthin, grasshopper ketone, and analogues of prostacyclins, cephalosporins, antithrombic agents and sterol biosynthesis inhibitors. Syntheses of exocyclic allenes commonly rely on extended conjugate additions to *e.g.* alk-2-en-4-ynones, syn S_N2'-like additions of alkynyl oxiranes, and Wittig reactions of ketenes. We report that the reaction of 3-alkynyl-2-cycloalkenones with 2 equiv. of various hydridoaluminates but not hydridoborates proceeds via diastereoselective reduction of a vinylogously propargylic intermediate alcoholate to provide exocyclic allenes as major products. Isomeric 3-alkynylcycloalkanols also are observed.



n = 1,2; R=CH_3, H; R'=TMS, Ph

5. THE CATHOLIC CHURCH AND HOPE FOR PEACE IN THE DEMOCRATIC REPUBLIC OF THE CONGO

The goal of this project is to make a short-form documentary about the Catholic Church's effort to build peace in the Democratic Republic of the Congo. The DRC is the site of the world's worst conflict since World War II: millions have been killed or displaced. We have been invited to the DRC by Bishop Nicolas Djomo of the diocese of Tshumbe, which is a remote region in the center of the country. Bishop Djomo has a connection to Creighton. Two of his priests were students in the Christian Spirituality Program, and he himself received medical care from Creighton physicians. This is a project of advocacy journalism involving a faculty member from the Department of Theology (John O'Keefe) and a faculty member from the Department of Journalism, Media, and Computing (Tim Guthrie).

6. **GENDER EQUITY AND CIVIC CAPACITY: INVESTIGATING POSSIBLE LINKS THROUGH THE LENS OF SWEDISH PRACTICE, LAW, AND CULTURE**

Palma Joy Strand, School of Law, Creighton University, Omaha, NE.

Two widely acknowledged principal values for democracy are ***popular control*** and ***equality***. This project, supported by a Haddix Faculty Research grant, begins an exploration of the connection between these two values in the particular context of democracy and gender equity, using Sweden as a touchstone. Sweden exhibits among the highest levels internationally of both popular control and gender equality.

7. **EXAMINATION OF SPERMINE RIBOSWITCH FUNCTION FROM DIFFERENT ORGANISMS FOR THE DEVELOPMENT OF ANTIBIOLOGICAL AGENTS**

Juliane K. Strauss-Soukup, Department of Chemistry, College of Arts & Sciences, and Garrett A. Soukup, Department of Biomedical Sciences, Creighton University School of Medicine, Omaha, NE.

Riboswitches are elements within messenger RNAs (mRNAs) that directly bind to cellular metabolites and modulate gene expression. Riboswitches are widespread among bacteria, but no riboswitches have yet been identified in animals. We have demonstrated riboswitch function of a mouse RNA element that is highly conserved among vertebrate genes required for spermine biosynthesis. The function of this mouse RNA element as a spermine riboswitch indicates a substantially broader distribution of riboswitches among eukaryotic organisms and represents a new drug target in a key metabolic process relevant to cellular and organism survival. Development of drugs that target spermine riboswitches from different organisms might therefore be used for wide-ranging purposes such as anticancer agents, antifungal agents, or pesticides. We have examined putative spermine riboswitches from various organisms - mouse, human and oyster. Moreover, we are using various analogs of the natural ligand that differ slightly in the polyamine structure and stereochemistry to investigate the specificity and affinity of binding between the riboswitch and ligand. We have used equilibrium dialysis and in-line probing to properly characterize this riboswitch. Our preliminary results indicate that the RNAs from diverse species possess similar binding affinity and specificity, however analogs of the natural ligand vary in their ability to specifically bind the RNA with high affinity. The identification and subsequent understanding structure and function of riboswitches in mammals could be useful as therapeutic targets for modulating gene expression, particularly in cancer growth.