

# 17<sup>th</sup> Annual Petersheim Academic Exposition Abstracts

Monday, April 22 – Saturday, April 27, 2013



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# POSTER PRESENTATIONS

## Molecular Bioscience Poster Session

Monday, April 22 11:45 AM University Center, Chancellor's Suite

### LONG-TERM TUMOR REGRESSION INDUCED BY AN ANTIBODY-DRUG CONJUGATE THAT TARGETS 5T4, AN ONCOFETAL ANTIGEN EXPRESSED ON TUMOR-INITIATING CELLS

Puja Sapra<sup>1\*</sup>, Marc Damelin<sup>1</sup>, John Dijoseph<sup>1</sup>, Kimberly Marquette<sup>2</sup>, Kenneth G. Geles<sup>1</sup>, Jonathan Golas<sup>1</sup>, Maureen Dougher<sup>1</sup>, Bitha Narayanan<sup>1</sup>, Andreas Giannakou<sup>1</sup>, Kiran Khandke<sup>1</sup>, Russell Dushin<sup>3</sup>, Elana Ernstoff<sup>1</sup>, Judy Lucas<sup>1</sup>, Mauricio Leal<sup>4</sup>, George Hu<sup>5</sup>, Christopher J. O'Donnell<sup>3</sup>, Lioudmila Tchistiakova<sup>2</sup>, Robert T. Abraham<sup>1</sup>, AND Hans-Peter Gerber<sup>1</sup>

<sup>1</sup> Oncology Research Unit; <sup>2</sup>Global BioTherapeutic Technologies; <sup>3</sup>World Wide Medicinal Chemistry; <sup>4</sup>Pharmacokinetics, Dynamics and Metabolism; <sup>5</sup>Drug Safety Research & Development, Pfizer Inc., 401N Middletown Road, Pearl River, NY

Presented by Michelle Mack

Antibody-drug conjugates (ADCs) represent a promising therapeutic modality for the clinical management of cancer. The authors have developed a novel ADC that targets 5T4, a tumor-associated oncofetal antigen. In preclinical models of non-small cell lung cancer, 5T4 was identified as a marker of undifferentiated tumorigenic cells that express properties of tumor-initiating cells (TICs), which are the most aggressive cell population in the tumor. Based on the biological properties of 5T4, the authors designed the ADC by conjugating an internalizing humanized anti-5T4 antibody, A1, to the tubulin inhibitor monomethylauristatin F via a maleimidocaproyl (mc) linker (linker-payload licensed from Seattle Genetics). The anti-5T4 ADC exhibited potent cytotoxicity *in vitro* and resulted in sustained tumor regression *in vivo*. The encouraging efficacy and safety data warrant clinical testing of this ADC. This paper demonstrates that ADCs have the potential to target the most aggressive cell populations within tumors, such as TICs.

### HIV-1 RATS DISPLAY IMMUNOPHENOTYPIC ALTERATIONS ASSOCIATED WITH AGING

Susan J. Abbondanzo, Xin Mao, Sraboni Sarkar, Eric Le Tellier and Sulie L. Chang  
Institute of NeuroImmune Pharmacology, Seton Hall University

Advances in antiretroviral therapy over the last two decades have allowed life expectancy in humans infected with HIV to approximate those of the general population. The process of aging in mammalian species including rats, results in changes in immune response, alterations in immunological phenotypes and ultimately increased susceptibility to infectious diseases. In order to study the effect of age to the immune cells responses in HIV-1 infected individuals, a transgenic rat model was utilized which possessed similar human viral genes, including the HIV-

1 provirus along with the deletion of gag and pol. This HIV type 1 (HIV-1) transgenic rat exhibits similar clinical manifestations to human HIV including wasting, skin lesions, cataracts, neurological and respiratory impairment. The HIV-1 rat was therefore chosen as an ideal small animal model for studying the immunological pathologies associated with chronic HIV-1 disease particularly in aged individuals. In this study, peripheral whole blood and spleenocytes from young adult and aged wild-type F344 and HIV-1Tg/F344 rats were analyzed using flow cytometry for changes in lymphocyte populations including B, T, NK, neutrophil and monocyte cells. Using an endotoxic tolerance test, immune cell responses were assessed for changes in immunophenotypes and cytokine/chemokine release related to age and genotype in each animal group. The results of this study may provide clues as to how the immune cell functions may be altered in mature populations in comparison to younger patients. This information may be effective in determining novel therapeutic treatments for HIV patients' dependent on individual's age.

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### **THE NEURODEGENERATIVE EFFECTS OF LEAD – AN OVERVIEW OF CURRENT UNDERSTANDING OF LEAD TOXICITY.**

Robert Newby<sup>1</sup> and Sulie L. Chang<sup>1,2</sup>

Department of Biological Sciences<sup>1</sup> and Institute of NeuroImmune Pharmacology<sup>2</sup>, Seton Hall University

Lead is a naturally occurring element most often used in industrial processes. Previously lead was used in a variety of consumer products dating back to the Roman Empire. Lead's use in consumer products in the western world decreased sharply once its usage was traced to a variety of neurodegenerative effects; which include memory loss, decreased cognitive function, and developmental defects if exposed during childhood. However, lead is still used in developing nations due to its cheap manufacturing cost and natural occurrence. Understanding how lead effects particular cell types which make up the neural network of the body opens up a wide variety of tools which may lead to better treatment and perhaps preventative medicine to decrease or inhibit the onset of lead induced neurotoxic events. In recent studies such as Liu *et. al.*, 2012, researchers have begun to look at individual cells in the brain which regulate immune functions such as inflammation and have determined what exactly long term exposure to lead does to these cells, and a potential way to restore the toxic effect of lead. These cells, known as Microglial, are exposed to lead over a long period of time, and the inhibition of a process called long term potentiation is shown to be inhibited. The inhibition of this process has huge impacts on neuronal processes and most likely contributes to many of the effects lead toxicity is shown to exhibit. Presented here is a review of what we have learned from this study and others and where medicine stands for treatment options for lead toxicity.

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### **AN INVERTED BLOOD-BRAIN BARRIER MODEL THAT PERMITS INTERACTIONS BETWEEN GLIA AND INFLAMMATORY STIMULI**

Lee Anne Talbot

Department of Biological Sciences, Seton Hall University

We all know that the human body is made of many functioning parts that allow us to do all we do in our daily life. The blood-brain barrier is a highly regulated part of our body that separates our peripheral body systems (blood, organs) from our central nervous system (brain, spinal cord). The problem with studying the blood-brain barrier is that it is very difficult to replicate out side of the body (*in vitro*). The blood-brain barrier within the body (*in vivo*) is a detailed network involving blood flow, endothelial cells, tight junctions and astrocytes with tight regulation between the peripheral body system and the central nervous system. This paper demonstrated an *in vitro* blood-brain barrier that monitors any changes in the “system” as reported through electrical impedance. The advancements in technology such as this can aid researchers with the discovery of how disease progression can happen in the brain.

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### **THE NEURODEGENERATIVE EFFECTS OF HIV: A REVIEW ON HIV INFECTION OF ASTROCYTES IN THE BRAIN**

Victoria Floriani

Institute of Neuroimmune Pharmacology, Seton Hall University

Human immunodeficiency virus (HIV) of the central nervous system (CNS) occurs soon after initial infection with HIV. Neurological complications occur such as dementia, behavioral changes, and cognitive impairment, despite antiretroviral therapy (ART). The main cells infected with HIV in the CNS are macrophages, microglia, and a small concentration of astrocytes. The role of these few infected astrocytes in neuroAIDS has not been examined extensively. In this review it was demonstrated that few HIV-infected astrocytes can compromise the blood-brain barrier (BBB) integrity. This BBB disruption is from endothelial apoptosis, misguided astrocyte end feet, and the dysregulation of various signaling pathways. Astrocytes communicate to each other through small, tightly regulated channels known as gap junctions. In recent studies by Eugenin *et. al.*, 2011, investigation into the spread of HIV from astrocyte to astrocyte revealed that gap junctions are heavily involved. These findings describe a mechanism behind understanding how CNS damage of the BBB is spread even with current ARTs.

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### **LIQUID EXTRACTION SURFACE ANALYSIS MASS SPECTROMETRY (LESA-MS) IN PRE-CLINICAL DRUG RESEARCH AND DEVELOPMENT**

Paul Moench

Department of Biological Sciences, Seton Hall University

Assessing drug distribution *in vivo* is an important aspect of pre-clinical drug research and development. Traditionally, this has been achieved using quantitative whole-body autoradiography (QWBA), an analytical method that measures the distribution of radioactivity following dosing of a radio-labeled drug in an animal model. While QWBA is indispensable in designing and ensuring the safety of human absorption, distribution, metabolism and elimination (ADME) studies, it is limited by its inability to differentiate between a parent compound and its metabolites. Thus, quantitative whole-body autoradiography is poorly suited to answering questions about the distribution of potentially active pharmacologic and/or toxic molecules.

Liquid extraction surface analysis mass spectrometry (LESA-MS) is emerging as an attractive analytical method to augment the traditional QWBA study. The ability to sample directly from a surface combined with the selectivity of mass spectrometry, enable the simultaneous detection of parent compound as well as phase I and phase II metabolites, thereby greatly increasing the quantity and quality of the data gathered from a typical QWBA study. Thus, LESA-MS has the potential to answer detailed questions about a drugs disposition *in vivo* without the need for additional dosing in laboratory animals.

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## **ANTIANGIOGENIC THERAPY FOR USE IN GLIOBLASTOMA MULTIFORME**

Cynthia A. Inzano

Department of Biological Sciences, Seton Hall University

Glioblastoma multiforme is one of the most angiogenic forms of cancer. Although antiangiogenic therapy has been studied for the past three decades, it has only recently gained ground for approval by the FDA for clinical therapy treatment of glioblastoma multiforme. Recent research has focused on specific targets relevant to the growth of blood vessels that are the hallmark of angiogenesis. These studies examine not only the mechanism involved in angiogenesis, but different ways to target those mechanisms. One avenue of research that has shown specific promise involves molecule inhibitors such as avastin have been used to target vascular endothelial growth factor (VEGF) and CT-322 inhibitor targets its receptor VEGFR2, resulting in antiangiogenic effects caused by the inhibition of astrocytoma (glioblastoma multiforme) cell growth. This presentation will focus on types of antiangiogenic treatment for glioblastoma multiforme by examining some treatments undergoing clinical trials as well as those targets currently in the research and development stage.

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## **THE ROLE OF FC RECEPTORS IN MODULATING IMMUNE RESPONSES AGAINST THE BACTERIUM PATHOGEN *FRANCISELLA TULARENSIS***

Zulfia Babadjanova and Constantine Bitsaktis

Department of Biological Sciences, Seton Hall University

*Francisella tularensis* is a Gram-negative intracellular bacterium that causes tularemia, a disease that could be potentially fatal in humans and animals. The Centers for Disease Control and Prevention designated it as a Category A biological agent. Since no licensed vaccine for tularemia is currently available in the United States, there is a need for development of an effective vaccine to protect from infectious tularemia. It has been shown previously, that targeting the antigen to Fc receptors (FcRI and FcRIII) using FcR subclass-specific monoclonal antibodies increased the binding, internalization and processing of the antigen by antigen presenting cells in the absence of an adjuvant, as well as increased protection *in vivo* against lethal *F. tularensis* challenge. Therefore, we hypothesize that FcR-targeting of inactivated *F. tularensis* (iFt) live vaccine strain (LVS) mediates protection by enhancing the innate immune responses and by-passing the immunosuppressive properties of *F.tularensis* LPS.

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## CYTOKINE RELEASE FROM ENDOTOXIN-INDUCED MACROPHAGES - A NOVEL DYNAMIC MODEL

Jeanette D. Walton and Allan D. Blake

Department of Biological Sciences, Seton Hall University

The tumor necrosis factor alpha (TNF- $\alpha$ ) is a proinflammatory cytokine released in response to innate, or non-specific immune response through toll-like receptor (TLR) signaling. TLRs, located on the surface of macrophages, initiate the cellular response. Previous studies in our lab demonstrated in a RAW264.7 cell culture model that TNF- $\alpha$  levels increased upon addition of agents that activate the innate immune response. On the other hand, small molecule chemical inhibitors decreased TNF- $\alpha$  levels in this model. The novel dynamic system presented here further elucidates the secretory behavior of immune cells as events occur. A perfusion system was utilized to examine the dynamic proinflammatory and anti-inflammatory cytokine release from endotoxin-induced RAW264.7 monocytes. Enzyme-linked immunosorbent assay (ELISA) was performed on the fractions collected using a fraction collector during the perfusion. Chronic expression of certain proinflammatory cytokines are a cause of numerous inflammatory and autoimmune diseases. Understanding the signal transduction, trafficking and dynamical output of these cytokines is an important area of research that may lead to improved therapy. Since TNF- $\alpha$  release occurs in chronic inflammation and autoimmune illness, these studies may offer insight into the mechanism and treatment of these chronic illnesses.

## A BIOINFORMATICS METHODOLOGY FOR THE IDENTIFICATION OF CHROMATIN CONDENSING PROTEINS IN *DROSOPHILA* TESTES

Zain A. Alvi, Tin-Chun Chu, and Angela V. Klaus

Department of Biological Sciences, Seton Hall University

The current study is aimed at identifying and analyzing proteins involved in chromatin condensation during spermatogenesis in several *Drosophila* (fruit fly) species. Chromatin condensation (and the transformation of the sperm nucleus) is facilitated by the interaction of three sperm nuclear basic proteins (SNBPs), transition protein (TLP94D), and CTCF (chromatin insulator and zinc finger binding protein). SNBPs found in *D. melanogaster* include a histone H1 linker-like protein termed Mst77F and the protamine-like proteins Mst35Ba and Mst35Bb. Using the reference sequences from *D. melanogaster*, we previously identified the putative sequences for these proteins in *D. simulans*, *D. sechellia*, *D. yakuba*, *D. erecta*, *D. ananassae*, *D. mojavensis*, *D. virilis*, *D. willistoni*, *D. grimshawi*, *D. pseudoobscura*, and *D. persimilis*. The advent of freely available RNA-Seq-SRA (Sequence Read Archive) data from testes of *D. simulans*, *D. yakuba*, and *D. pseudoobscura* on NCBI has allowed us to look for the mRNA expression of these genes. We have developed a method that forgoes the Unix environment for a user friendly method through the use of Biomatter's Geneious 6.0.6 software package and freely available bioinformatic tools from the Pennsylvania State University's Galaxy-Project. Our current work suggests that all of our putative matches are expressed in testes of our species of interest.

## **UTILIZATION OF FC RECEPTORS AS A VACCINATION STRATEGY AGAINST *STREPTOCOCCUS PNEUMONIAE***

Kari Wiedinger and Constantine Bitsaktsis

Department of Biological Sciences, Seton Hall University

*Streptococcus pneumoniae* is a gram positive pathogen that is responsible for bacterial pneumonia, meningitis, and sepsis. It is estimated that *S. pneumoniae* causes over a million deaths every year in children age 5 and younger; accounting for 11% of childhood mortality rates worldwide (Obrien 2009). The primary disease intervention is a pneumococcal conjugate vaccine consisting of capsular polysaccharides used in children, and carbohydrate/protein conjugate vaccine licensed for adults. Both of the current measures have serious limitations, such as a failure to generate memory (long-term) immune responses, lack of effectiveness in young children and individuals with compromised immune systems. In addition, hurdles such as cost and refrigeration make the conjugate vaccine less viable for use in developing countries, where the highest burden of disease is observed. An urgent need exists for the development of alternative vaccinations options which can be utilized in providing protection against *S. pneumoniae* infections. For this purpose, we are aspiring to utilize recombinant DNA techniques to produce fusion proteins comprised of the protective *S. pneumoniae* antigen, PspA, and the Fc portion(s) of the mouse antibody IgG. Linking of PspA to the Fc receptor will target the protective antigen to Fc receptors on antigen presenting cells (APCs), initiating a memory response that is vital for an effective vaccination strategy.

## **ALCOHOL-INDUCED CALCIUM DEPOSITION AND SPREAD OF BREAST CANCER, “REGULATION OF CALCIUM MEDIATED ALCOHOL-INDUCED METASTASIS”**

Shido K, Ryu S, Vahdat LT, Silver RB, Mittal V, and Chang S.L.

Department of Cardiothoracic Surgery, Weill Cornell Medical College of Cornell University, New York, NY 10065 and Department of Biology, College of Arts and Sciences, Seton Hall University, South Orange, NJ 07079

Alcohol consumption cause rapid loss of Magnesium which is primarily caused by renal excretion of Magnesium, and is up to 260% more Magnesium within minutes of drinking of alcohol. This rapid loss of Magnesium induces rapid up-modulation of Calcium, and results in the deposition of Calcium in the body, which induce pathological condition such as osteoporosis, liver cirrhosis, microcephaly, and cancer. Recent advance in cancer study revealed mechanisms involved in tumorigenesis. However, how the ethanol induced metastasis is not known. Here, this study demonstrates that alcohol induced calcium deposition is set to favor cancer cells to metastasize. Suppression of non-metastatic regulator miR-708 ( $Ca^{2+}$  suppressor) by polycomb repressor complex-2 (PRC2) reduces activation of ERD/FAK and suppress metastases. In non-metastatic state of cancer cells, miR-708 is up-regulated, and targets the endoplasmic reticulum protein neuronatin (Nnat) to suppress  $[Ca^{2+}]_i$  level. In metastatic breast cancer, transcription of miR-708 is down-regulated. Thus, it cannot suppress  $[Ca^{2+}]_i$  level, in turn  $[Ca^{2+}]_i$  deposition occur.

## COMPARATIVE ANALYSIS OF SKIN TRANSCRIPTOMES IN TWO *XIPHOPHORUS* INTERSPECIES MELANOMA MODELS

Frank J Zadlock IV

Department of Biological Sciences, Seton Hall University

Melanoma incidence is rapidly rising around the world and has become the most lethal form of skin cancer. *Xiphophorus* interspecies hybrids have gained attention as genetic models for melanoma since they are virtually identical to malignant melanomas in humans. The melanoma development in these interspecies hybrids is associated with the overexpression of the receptor tyrosine kinase *Xmrk* carried by *X. maculatus* Jp 163 B and the nonfunctional tumor suppressor *Diffc* carried by *X. couchianus* and *X. helleri*. To date, *Diffc* is the biggest myth in the *Xiphophorus* melanoma model and detailed data addressing this model are currently lacking. Also, melanoma biomarkers are of limited value as prognostic indicators for treatment and his study sought out to address these two areas. By using the SOLiD3 platform of next-generation sequencing, we sequenced cDNA from Hybrid 7 and Hybrid 1 skins. After assembly, mapping, and reads counting, 36,240 unique transcripts were detected in these skin samples. Three hundred and ninety five genes met the selection criteria that both tumor groups were either up-regulated or down-regulated compared to the parental groups from both hybrids and had a function potentially related to melanoma biogenesis. This study found one interesting *Diffc* candidate and revealed sixty genes related to the less aggressive *Xiphophorus* melanoma compared to human melanoma. The ground work has also been laid out to verify eleven biomarker candidates discovered in this study to increase the biomarker options to enhance the current diagnostic ability of melanoma.

## CAFFEINE AS A POTENTIAL THERAPEUTIC AGENT IN AGED ALZHEIMER'S DISEASED RATS

Aline de Oliveira<sup>1</sup> & Sulie L. Chang<sup>1,2</sup>

Department of Biological Sciences<sup>1</sup> and Institute of NeuroImmune Pharmacology<sup>2</sup>, Seton Hall University

Caffeine has received increased attention over the past years for its enhancing cognitive functioning capabilities. In this study, the Arendash et al. 2009 group investigated caffeine's ability to improve aged mice cognitive capabilities already exhibiting diminished functioning. The human equivalent of 5 cups of coffee per day reversed the effects of Alzheimer's disease (AD) in aged rats. The working memory of aged AD rats receiving caffeine was restored within 5 weeks of treatment. Amyloid- $\beta$  ( $A\beta$ ) deposition in hippocampus and entorhinal cortex commonly seen in AD patients was also decreased following caffeine treatment in AD rats. Caffeine seems to be able to suppress  $\beta$ -secretase 1 (BACE1), a precursor protein for  $A\beta$  through the Raf-1/NF $\kappa$ B pathway. The study suggests that caffeine may serve as a potential therapeutic agent in cases of AD.



## Assessment Posters

Monday, April 22 12:00 – 3:00 PM University Center, Chancellor's Suite

Faculty recipients of the CDI Assessment Grants will present posters highlighting the results of their projects at the Kickoff Luncheon on Monday April 22, 2013. The projects cover a wide variety of approaches to assessing student learning outcomes across campus.

Theresa Bartolotta, PhD – Director of Assessment for Academic Affairs, Office of the Provost

### **Mind Mapping in the Development of Critical Thinking Skills in Professional Students**

Project Directors: Genevieve Pinto Zipp PT, EdD, Department of Graduate Programs in Health Sciences, and Catherine Maher DPT, GCS, Department of Physical Therapy, School of Health and Medical Sciences

### **Assessment of the Undergraduate Concentration in Management**

Project Director: Karen Boroff, PhD, Department of Management, Stillman School of Business

### **An Assessment of the Reading/Writing Core Proficiency**

Project Director: Kelly A. Shea, PhD, Department of English, Director of the Writing Center, College of Arts & Sciences

### **Assessment Project Builds Excellence in the Asian Studies Program**

Project Director: Shigeru Osuka, EdD, Director, Asian Studies Program, Department of Language, Literature and Culture, College of Arts & Sciences

### **Evaluating the predictive validity of pre-requisite requirements and program courses in Occupational Therapy**

Project Directors: Thomas J. Mernar, Ph.D., OTR, and Ruth Segal, Ph.D., OTR

### **Developing a writing skills assessment tool for COPJ majors**

Project Directors: Dr. Kathleen Rennie & Dr. Amy K. Nyberg

## Interdisciplinary Poster Session

Monday, April 22 2:00 – 4:00 PM University Center, Main Lounge

### **CONFIDENTIALITY VS. DUTY TO WARN AS APPLIED TO COUNSELING HIV-POSITIVE/AIDS CLIENTS**

Michael Awad

Department of Professional Psychology and Family Therapy, Seton Hall University

An area of ethical concern that exists for counselors involves deciding when to maintain or breach confidentiality in cases where an HIV-positive/AIDS client is sexually active with an unsuspecting third party that is in clear and imminent danger of contracting the life-threatening disease. For this reason, counselors are sometimes forced to choose between upholding the client's right to confidentiality and their ethical duty to warn the unsuspecting third party. A vast body of work from mental health professionals exists on this subject, but there is great confusion and uncertainty as to what steps clinicians should take if faced with this ethical dilemma. The presentation will focus on outlining specific protocols and procedures counselors may use to address this dilemma.

### **THE SETONIAN**

Faculty Advisor: Amy Nyberg

Department of Communications & The Arts, Seton Hall University

Winner of 12 New Jersey Press Association awards, The Setonian provides the latest in campus news, sports and opinions to students, faculty, alumni and the surrounding community. The campus paper is currently on its 89th volume of publication and is developed by students with Dr. Amy Nyberg as the advisor. In October 2012, The Setonian celebrated its first Free Speech Week on SHU's campus and participated in Meet the Media Day with faculty administrators.

This year The Setonian presents its most captivating photographs to The Petersheim Expo. Showing its contribution to photojournalism, The Setonian presents photos that are a visual accessory to the publication and the eyes of the Seton Hall student body. New issues of The Setonian are available every Thursday during the academic school year in multiple locations around the Seton Hall University campus.

Find The Setonian on the web!

Site: <http://www.Thesetonian.com/>

Facebook: "The Setonian"

Twitter: @Setonian

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## **CORRELATING ROUGHNESS TO THICKNESS/TEMPERATURE IN PULSED LASER DEPOSITED PHOTOVOLTAIC THIN FILMS**

Michael C. Brown

Department of Physics, Seton Hall University

Using a technique called Pulsed Laser Deposition (PLD), different materials such as Cadmium Tellurium and Cadmium Selenium can be applied in a thin layer onto solar cells. Observing these cells with the help of a Scanning Electron Microscope (SEM) will be best method for viewing the layers on the cells and the thickness of those layers. The SEM uses high speed electrons to view objects, so in order to protect the layers on the cells and the cells themselves a thin layer of gold must be placed onto them. This will provide maximum protection and will also allow for maximum clarity of the picture. After a measurement with the SEM, the cells will be tested using X-Ray diffraction (XRD). The aim is to find if there is some correlation to roughness and thickness of a solar cell and to see if they become more efficient with the layers and if they do become more efficient with what material works best.



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## **SYNTHESIS AND CHARACTERIZATION OF ZnO/POLYMER PLANAR HETEROJUNCTION SOLAR CELLS.**

Leandro Gutierrez, Christopher Reehil, Anne Isah, William Manners, Jimmy Barrientos, Arya Nabizadeh, Patrick Albers, Jesus Duran, Mehmet Sahiner, and Weining Wang

Department of Physics, Seton Hall University

In this work, the studies on pulsed-laser-deposited (PLD) ZnO/Polyaniline (PANI) heterojunction and ZnO/PEDOT:PSS heterojunctions and their potential application as solar cells are reported. It was demonstrated that the performance of ZnO/polymer solar cells depends on the annealing condition of ZnO. X-ray diffraction (XRD) and scanning electron microscopy (SEM) were used to characterize the pulsed-laser-deposited (PLD) ZnO film. Spin coating techniques were implemented to coat samples with pulse-laser-deposited ZnO with either PANI or PEDOT: PSS polymer. The correlation between the solar cell electrical performance and the pulsed laser deposition conditions will be discussed. Data presented in the form of current density vs. voltage (J-V curves) will be presented to demonstrate the differences in electrical performance between cells coated with PANI and PEDOT: PSS.

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## **ELECTRICAL CHARACTERIZATION OF BORON IMPLANTED SEMICONDUCTING SINGLE CRYSTAL WAFERS**

Stacie Ballou, Ashley Sydlo, M. Alper Sahiner

Department of Physics, Seton Hall University

To achieve very high carrier concentration in small semiconducting regions of next generation computer chips is a challenging task. In order to study the thermal effects on the retained active carrier concentration germanium preamorphized silicon wafers were implanted with boron at various doses. We then thermally annealed these wafers at various annealing temperatures and times in order to recover the crystal structure and increase the active boron dopant concentration in the silicon lattice sites. The prepared as-implanted and annealed samples were then characterized by x-ray diffraction to probe the crystal structure recovery through annealing. For the electrical characterization Hall Effect and 4 point resistivity probe measurements were performed to investigate the active charge carrier concentration and spreading resistivity responses due to various annealing treatments. The crystal structural changes induced by thermal budget variation will be correlated with the electrical properties of these semiconducting wafers.

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### **RIP CURRENT SAFETY**

James Moorehead, Joy Nuzzi, Nicole Changaris, and Shaina Cafone  
Department of Physics, Seton Hall University

The purpose of the project is to inform the public about the negative effects of rip currents on the environment and our safety. Rip currents are formed when waves breaking near the shore push water inwards and then back out to sea along swift moving channels. These currents pose a serious danger for swimmers and are responsible for over 100 deaths every year. Beach management projects are a controversial issue related to rip currents because they can either increase or decrease the likelihood of rip current formation based on the amount of sand renourishment. It is important for a swimmer to know how to spot a rip current and know what to do if caught in one. Upon viewing our presentation, the public will not only learn more about the science of rip currents, but also gain practical knowledge about how to save themselves or other victims of rip currents.

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### **DOING BUSINESS IN INDIA 2013**

Arlene M. Jones  
Sponsor: A.D. Amar, Professor of Management, Stillman School of Business

The Stillman School of Business offers a number of Doing Business courses, graduate and undergraduate, that require students to travel abroad. For the course Doing Business in India, students spend 10 days in India, getting to know the business, society, culture and history of India with a view to understand its business environment by attending universities, business houses, and professional firms. In 2013, seven students from the School of Business, the College of Arts & Sciences, and School of Diplomacy traveled to India during the Spring Break of 2013. The Petersheim Exposition presentation is designed to share their experiences with Seton Hall community. Dr. Amar, Arlene M. Jones, MSC and some other students will be available to present their exhibits to the audience and answer their questions.

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## **EMPOWERING WOMEN, ONE AT A TIME FOR A HEALTHY LIFE WITH EDUCATION, MEDITATION AND EXERCISE.**

Samantha S. Singh

College of Nursing, School of Health and Medical Sciences, Seton Hall University

**Overview/Purpose:** The purpose is to provide women with current information regarding health risks factors associated with Stress, Heart Disease and Diabetes. Women will learn effective approaches in dealing with and reducing the risks. **Objective:** To empower women with the knowledge; and the tools needed to educate self, fellow colleagues, loved ones, students, and other women about the most common health risk factors affecting women's wellness and to learn effective and fun ways to prevent risk factors. **Background:** Research shows that work-related stress has a significant impact on women wellness. When placed in a stressful environment, the heart rate and blood pressure increases, signaling the increasing demand for oxygen. The increase in oxygen-carrying blood is sent to the heart (a muscle) which begins to work harder to meet the demand, placing women at greater risks for heart problems. If placed in high-demand jobs, they are two times more likely to suffer from heart disease. In addition, they are also at risk for diabetes because they are likely to turn to food higher in fat and sugar content, which can also lead to obesity. To help women lower their stress level, maintain mental wellness and physical wellbeing, women need to engage in yoga, meditation, exercise, and interact with friends and family. **Methodology:**

1. To provide an overview of current research on common health risk factors related to stress, heart disease, and diabetes
2. To discuss the importance of self-awareness and understanding the body signs and symptoms of illness
3. Addressing the importance of utilizing daily meditation and exercise (dancing )
4. Participants will learn a daily 1-2 minute meditation they can use when in a stressful situation(s) with work, family, friends and daily interactions
5. Participants will learn that they are irreplaceable while everything else is replaceable.

**Limitations:** Although the interventions discussed may be effective in helping reduce one's health risk factors, other areas including - a personal diet, daily routine, personal bias and area of comfort, are not addressed. This may have an impact on the success on the individual continuing the routine learned in the sessions. **Conclusion:** Research is replete with evidence base research indicating the benefits of meditation and dance. It has shown to improve an individual biopsychosocial wellness. Women are often place in situation where they forget to focus on their wellbeing as employee, professor, student, daughter, sister, mother, wife, and or friend. This will workshop educate women and teach them a fun exercise that they could go home and do independently in the privacy of their home or at a gym that is cost effective and fun and relaxation medication to use daily. Women leave the workshop knowing that they are primary and never secondary

## **School of Health and Medical Sciences Poster Session**

Tuesday, April 23 1:00 – 3:00 PM University Center, Main Lounge

### **A COLLABORATIVE EFFORT BY NURSES TO SUPPORT HISPANIC INDIVIDUALS LIVING IN THE COMMUNITY**

Alana Cueto, MSN-CNL student, Maria Torchia LoGrippo, RWJF NJ Nurse Scholar, PhD, MSN, RN and Eileen Toughhill, PhD, MSN, RN

College of Nursing, School of Health and Medical Sciences, Seton Hall University

Studies have identified cancer, heart disease, unintentional injury, diabetes, and stroke as the leading causes of death among Hispanic populations living in New Jersey (NJ DHSS, 2012). Nurses in communities across the State must focus on health promotion, disease prevention and supportive care in these communities. Health promotion and disease prevention provide a foundation for meeting the needs of Hispanics in a non-threatening, non-blaming manner enhancing social support and information exchange (Maurer & Smith, 2009). Through the use of community resources, collaborative efforts by nurses focus on awareness, prevention and education. Community health workers (CHW) also known as “promotores” disseminate information, foster healthy behavior, and provide education, advice, social support, and assistance to the community (Medina, Balcazar, Hollen, Nkhoma & Soto, 2007). The purpose of this poster is to present collaborative efforts by nurses and supportive care measures that address health promotion and disease prevention evidenced in the literature. These measures seek to provide culturally relevant care to Hispanic populations and to improve outcomes.

### **EFFECTS OF FOOTWEAR ON WALKING PATTERNS OF COLLEGE STUDENTS WHILE CARRYING BACKPACKS**

Chris Hegel, SPT, Dave Mistry, SPT, Erica Uzzell, SPT, & Doreen Stiskal, PT, PHD

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Backpacks are an everyday necessity for students who attend college during the fall, spring, and summer. As seasons change, so does students’ footwear. Research suggests that either loading a backpack or changing footwear will influence walking patterns. To date, no study has examined the effect of both on the common gait parameters in students. The purpose of this within-subject repeated measures study was to analyze gait when college students walk across a computerized gait mat with different footwear options while wearing a backpack. Volunteers aged 18-25 years old ambulated at self-selected speeds under 3 different footwear conditions: none, sneakers, and sandals. For each condition, subjects wore a traditional backpack with two shoulder straps, which was empty and then filled with 15% of body weight. Mean differences between the empty and weighted backpack were analyzed for each footwear condition, and then entered into with repeated measures ANOVAs to identify changes in gait for these dependent variables: velocity,

normalized velocity, cadence, step length, double support time, and stepping variability between right and left feet. We hypothesized that gait deviations will be greatest in subjects when wearing sandals compared to wearing sneakers or nothing due to the sandals' non-supportive structure that diminishes effectiveness of the lower limb in moving the body forward.

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## **TESTING THE HIERARCHICAL SUPPORT BETWEEN ORAL STRUCTURES: PEDIATRIC DYSPHAGIA**

Nina Capone Singleton and Victoria Petersen

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This study tests a hierarchical model of motor development in the jaw, face/lips and tongue for feeding. This hierarchy of postural control has essentially two components. First, development proceeds from proximal structures (e.g., the body or jaw) to distal structures (i.e., the jaw or tongue, respectively). In other words, development of the oral structures occurs sequentially, not in parallel. Second, stability in a proximal structure is necessary to support mobility in a distal structure. Few studies have tested this model for the task of feeding. The current study tested this motor-control hierarchy by examining breakdown in development of the system. If development proceeds proximally to distal then children who fail to achieve milestones in feeding should present with systematic impairments in the oral mechanism that follow this hierarchy. This was a retrospective analysis of 48 de-identified clinical reports of children who ranged in age from 4 months to 15 years of age and presented with a variety of medical and developmental disorders. Reports were coded for function as impaired (-) or unimpaired (+), for each texture presented. Participants were categorized into one of eight possible patterns of impairments; A Binomial test compared the number of participants who fell in the PREDICTED versus UNPREDICTED categories. Results support the hierarchical model of motor-control. Clinical and research implications are discussed.

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## **PEDIATRIC DYSPHAGIA: CONSIDERING THE DEVELOPMENTAL DATA**

Chelsae Quada, Nina Capone Singleton, and Victoria Petersen

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Speech-language pathologists are required to have knowledge of typical swallowing and feeding development when evaluating children with dysphagia. The Developmental Pre-feeding Checklist (Morris & Klein, 2000) is a common framework used to assess children with dysphagia yet it is problematic. First, it was developed from observations of only six typically-developing children, and only four of the six children had to demonstrate a behavior to be considered an age-milestone. Second, the data did not go through a rigorous peer review process of publication to ensure the validity and reliability of the data or the procedure. Our study evaluated this framework from a clinical and an empirical perspective. First, we described a clinical sample of children with dysphagia to determine which milestones are clinically relevant. A total of 48, de-identified, clinical evaluation reports were coded for relevant medical and developmental history, primary complaint, and the swallowing and feeding impairments found on exam. Impairments were used to identify the functional alternative and age-milestone in

typical development. Second, we evaluated those milestones for scientific evidence. Six empirical studies provide evidence that supported, refuted or added to the Morris and Klein (2000) framework. The results are presented in Table and Figure illustrations. We highlight behaviors that require future study.

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### **SURFACE ELECTROMYOGRAPHIC CHANGES OF THE PARASPINAL MUSCLES FOLLOWING THRUST MANIPULATION OF THE THORACIC SPINE: A CASE STUDY.** Phillips HJ, Bocian M, Kantzer L, Morris C, Mozia M.

Department of Physical Therapy. School of Health and Medical Sciences, Seton Hall University

**Introduction:** Spinal manipulation is a common modality employed by physical therapists, with thrust manipulation shown to be a safe and effective means of relieving mechanical spinal pain. Neuromuscular mechanisms underlying the observed benefits are not well understood. Our study focuses on the short-term surface EMG changes following manipulation of the thoracic spine. **Subject/Methods:** One subject met the inclusion criteria and qualified for the treatment phase of the study. Surface electrodes were placed at the right paraspinal muscles at the thoracic level of T4-T5. EMG measures were taken during relaxed standing posture, relaxed prone position, and maximal isometric contraction in prone. The subject then received thoracic manipulation at the T4-T5 vertebral level. A visual analog scale was taken and EMG measures were recorded immediately after and fifteen minutes post-treatment in all three positions. **Data Analysis:** Raw EMG data underwent linear rectification, with peak activity for each of the three conditions used as the final measure. Pre- and post-treatment were then expressed as a percent difference. **Results:** The relaxed prone post-manipulation EMG decreased 13.1% compared to pre-manipulation, and decreased further to 17.1% at 15 minutes, while the relaxed standing post-manipulation EMG activity decreased 10% and 9.5 % immediately and 15-minutes post, respectively. Visual analog scale decreased from 6cm to 3cm immediately after the manipulation, and remained at 3cm fifteen minutes post-manipulation. **Clinical Relevance:** Reduced relaxation as measured by sEMG may explain pain relief following thoracic manipulation.

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### **DIFFERENT BAG STYLES INFLUENCE GAIT IN COLLEGE WOMEN**

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Women college students have many options when choosing to carry educational materials along with personal items. Common bag styles, such as two-strap backpacks, cross body messenger bags, shoulder bags, and handheld briefcases, meet a variety of fashion and functional needs. However when loaded, each design influences walking patterns. Research suggests that ambulating with loads placed asymmetrically toward one side destabilizes the body more than when loads are centrally balanced. While recommendations for walking with heavy loads favor the use of two-strap backpacks, women often prefer other bag styles. The purpose of this within-subject repeated measures study was to evaluate how college-aged women walk while carrying



four different bag styles when empty and filled with 15% of bodyweight. Volunteers walked for twenty feet repeatedly across a GAITRite™ computerized gait mat. Mean differences between the empty and weighted bags were analyzed for each style condition, and then entered into with repeated measures ANOVAs to identify changes in gait for these dependent variables: velocity, normalized velocity, cadence, step length, double support time, and stepping variability between right and left feet. We hypothesized that subjects would walk slower, with greater frequency and variability of steps when walking with the three asymmetrical bag styles (cross body bag, shoulder bag, and handheld briefcase) when compared to the two-strap backpack.

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### **SPREADING THE SEEDS OF SERVANT LEADERSHIP**

Stanislav Brand, Elizabeth Leonhardt, Melodie MacPherson, Jessica Shremshock, Sejal Ved, and Chelsea Williams

College of Nursing, Seton Hall University

The Student Nurse as Servant Leader course focuses on the traits and qualities of servant leadership based on Robert Greenleaf's "Servant Leadership: A Journey into the Nature of Legitimate Power and Greatness". After identifying the characteristics of servant leaders, analyzing the development of servant leadership qualities, and assessing vulnerable populations, the student nurses in this course applied their knowledge of servant leadership to various DOVE volunteer efforts such as the Discovery Charter School, the Whitehead House Nursing Home, St. John's Soup Kitchen and other locations including a Safe House for battered women and children. This presentation is intended to bring awareness of the ability to combine servant leadership theory and clinical experience in a way that is attentive to the needs of others.

### **ERGONOMIC RISK FOR THE DEVELOPMENT OF UPPER QUADRANT WORK RELATED MUSCULOSKELETAL DISORDERS IN FORKLIFT OPERATORS**

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Forklift operators are at an increased risk for developing upper quadrant WMSDs as they are frequently exposed to sustained awkward postures, repetitive motions, and high forces. Forklifts are usually designed for operators of average stature. This may place shorter and taller operators at a postural disadvantage. The purpose of this study is to identify and quantify the risk of developing upper quadrant Work Related Musculoskeletal Disorders (WMSDs) related to posture, operator height, and perceived exertion in forklift operators. Data including a demographic information form, rate of perceived exertion and video/photographic images will be collected from 30 OSHA certified subjects, aged 18 years or older, previously engaged in an ergonomic initiative. The tools used to determine ergonomic risk will be the Rapid Entire Body

Assessment (REBA) and the Rapid Upper Limb Assessment (RULA), which are valid and reliable when used by experts to categorize levels of ergonomic risk. Dartfish software will be used to help quantify the postural angles needed for the REBA and RULA tools. Rate of perceived exertion is determined using the Borg CR-10 Scale as an indirect measure of muscle activity/local fatigue. Embedded within this study is reliability testing for non-expert novices and expert ergonomist using the REBA and RULA tools. This reliability component is included in order to investigate the ability for non-experts to use/interpret these tools appropriately, as well as track and control for potential threats to the internal validity of the study. The Pearson product moment correlation co-efficient “r value” will be used to determine if the REBA/RULA scores and the RPE scores are correlated. The Chi Square test of independence will be used to determine if operator height is significant in developing WMSDs. The Kappa statistic (k), will be used to determine the agreement of novice intra-rater and inter-rater reliability and expert to novice inter-rater reliability. We anticipate that the results of this study will provide additional evidence to the growing body of ergonomic literature pertaining to WMSDs in forklift operators.

### **KNOWLEDGE OF HPV IN COLLEGE AGED MALES AND FEMALES**

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**Purpose:** To determine the level of knowledge of college aged males and females, between the ages of 18 and 30, regarding transmission and adverse effects of the HPV virus. Additionally, to ascertain if a disparity in knowledge exists between genders. **Methods:** Students, ages 18-30, enrolled at small private university were asked to voluntarily complete an online survey, *College Aged Men’s Knowledge of HPV and Cervical Cancer*, developed by Lopez et al. The questionnaire gathered demographic information and 13 questions used a dichotomous-type scale to assess the knowledge of HPV and Cervical Cancer. Students were recruited anonymously to complete the survey via an online link using the Academic Survey System Evaluation Tool (ASSET). Chi-square analysis was used to analyze the responses regarding knowledge of HPV and Cervical Cancer. Analysis of the data was performed using SPSS 17.0; Inferential statistics were applied using a Chi-Square of association. **Conclusion:** Overall the study showed that college-aged students in the sampled population possess a basic knowledge about the Human Papillomavirus (HPV). No true disparity of knowledge exists between male and female college aged students regarding the knowledge of HPV and cervical cancer.

### **TYOLOGY OF EUROPEAN PORTUGUESE: CONSIDERATIONS FOR DEVELOPMENTAL INTERVENTIONS AND RESEARCH**

Melissa Felicio, Natasha Neves, Anthony D. Koutsoftas  
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In the United States there are approximately 1,177,112 people of Portuguese ancestry of which approximately 731,282 individuals over the age of 5 speak the language (U. S. Census Bureau,

2000; 2009). Although Portuguese is a commonly spoken language there is a lack of research that investigates its typology and normal development. This study is the first in a series of studies exploring normal language development for bilingual Portuguese-English speaking children reared in the United States. The current study consists of a literature review based on Taylor and Leonard's (1998) framework of language typology. The literature review includes the following: Distinctions between Brazilian Portuguese and European Portuguese; Morphological Uniformity; Inflectional Load; Syntax; Grammatical Distinctions; Phonology; Prosodic Features; and Other Properties of Language including syncretism, homophony across paradigms, redundancy, regularity, reliability, range of rule application, sentence and word position, and word length. This research is a contribution to the knowledge base regarding the normal development of the Portuguese language in monolingual speakers and provides a springboard for future studies of normal language development. If one understands Portuguese language typology and structure, then one will be able to better identify disordered language patterns. Findings from this review will provide bilingual speech and language pathologist's important information on how to design assessment and treatment plans for bilingual Portuguese-English speakers. Application of the typology findings to clinical practice and future directions for research will be discussed.

### **LACROSSE HELMET REMOVAL VERSUS HELMET FACEMASK REMOVAL: A COMPARISON OF TIME AND HEAD AND NECK MOVEMENT**

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**Context:** Cervical spine injuries are life threatening and can result from many contact sports, including lacrosse. Currently, lacrosse follows football protocols for on-field cervical spine emergencies. However, differences found in the equipment in the two sports make it essential to have a standard procedure specifically for lacrosse. **Objective:** To measure and compare time and head/neck movement during lacrosse helmet removal versus facemask removal. **Design:** Repeated measures design. **Setting:** Motion analysis laboratory. **Participants:** Six Certified Athletic Trainers (Age =  $45.5 \pm 3.54$  yrs, men's lacrosse experience =  $16.5 \pm 2.12$  yrs) **Interventions:** The IV was procedure type with two levels: helmet removal and facemask removal. **Main Outcome Measures:** Time (s) and maximum movement angles (deg) of the head relative to the trunk in the sagittal, frontal, and transverse planes. **Results:** Helmet removal ( $24.89 \pm 6.72$ s) was significantly faster than facemask removal ( $66.42 \pm 22.01$ s). There were no significant differences in maximum movement angles between the two procedures. The maximum movement angles in helmet removal were ( $6.90^\circ \pm 5.29^\circ$ ) sagittal, ( $3.77^\circ \pm 0.79^\circ$ ) frontal, and ( $4.52^\circ \pm 4.3^\circ$ ) transverse. The maximum movement angles in facemask removal were ( $6.7^\circ \pm 4.24^\circ$ ) sagittal, ( $6.43^\circ \pm 2.52^\circ$ ) frontal, and ( $6.77^\circ \pm 4.72^\circ$ ) transverse. **Conclusions:** Helmet removal took less time than helmet facemask removal.

### **THE INTERACTION OF VISUAL AND AUDITORY FEEDBACK ON SPEECH PRODUCTION IN NORMAL SPEAKERS**

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Research shows a close link between speech perception and production mechanisms. The role of the auditory mechanism in speech perception and production has been extensively tested. Over the last three decades, the role of visual information on speech perception has received a lot of attention with the demonstration of the McGurk effect. Likewise, few studies have demonstrated the role of visual information on speech production. Therefore, it is hypothesized that delayed visual feedback (DVF) should induce speech disfluencies in normal speakers similar to delayed auditory feedback (DAF). Previous studies have shown that unlike DAF, DVF on its own does not impact speech production. However, there is preliminary data that the DVF in combination with DAF influences the speech production of normal speakers. The current study was designed to further explore the interaction between visual feedback and auditory feedback. Specifically, the influence of no visual feedback, visual feedback at 0 ms, and visual feedback at 200 ms on speech production under 0 ms DAF, 200 ms DAF, and 200 ms DAF that was distorted, was tested. 10 right handed normal speaking adults participated in the study. Nine experimental conditions were tested. During each condition participants were asked to memorize 8-10 syllable phrases and verbalize it while listening to their auditory feedback and watching their visual feedback on a television screen. A total of 300 syllables were collected for each condition. Speech disfluencies for each condition were documented and the main effects and interactions between the auditory and visual modality was tested.

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### **THE EFFECT OF A 4-WEEK HOME BALANCE TRAINING PROTOCOL ON SENSORY ORGANIZATION AND FUNCTIONAL LIMITATION TEST SCORES**

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Recreational athletes typically train only in a straight-forward, single plane of motion which may leave them susceptible to a lower extremity injury. Objective: To determine the effects of a short-term four-week balance-training program. Design: Pretest-posttest control group design. Setting: University Human Performance Laboratory. Patients or Other Participants: 12 females, 2 males; mean age 20.8 yrs ( $\pm 1.99$ ); mean weight 64.44kg ( $\pm 13.05$ ); mean leg length 93.71cm ( $\pm 5.76$ ); mean height 163.83cm ( $\pm 8.26$ m). Subjects matched according BESS. Interventions: IV-2 levels- balance training and control (no-training) Main Outcome Measures: Balance Master - Sensory Organization test (SOT), Limits of Stability (LOS), Walk across (WA), Tandem Walk (TW), Step Quick Turn (SQT), and Step Up and Over, (SUO) Forward Lunge (FL). Tests administered pre/post 4-week intervention. Paired t-tests within balance and within control pre to post; Independent t-tests change scores between balance and control;  $p < 0.05$ , SPSS V18. Results: Control: SOT- Condition 2 ( $p = 0.03$ ); SUO- ImpIndexL ( $p = 0.044$ ); LOS- Tr1DCL ( $p = 0.037$ ), Tr1RT ( $p = 0.048$ ), Tr5EPE ( $p = 0.003$ ), Tr2MXE ( $p = 0.019$ ). Balance: SUO-MVMTL ( $p = 0.025$ ), MVMTL ( $p = 0.37$ ); LOS- Tr2EPE ( $p = 0.03$ ), Tr1MXE ( $p = 0.048$ ), Tr8MXE ( $p = 0.008$ ). Conclusions: Significant changes found in both the Balance and Control groups may be attributed to the learning effect of the balance testing protocol. Significant changes were not found when comparing change scores between the two groups. Potentially, the exercises may not have challenged this recreationally active population.

## **FACULTY PERCEPTIONS ON THE ROLE OF INTERPROFESSIONAL EDUCATION (IPE)**

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**INTRODUCTION** Today's health care system is moving toward a model of "patient-centered care." As an institution of higher education that prepares students to engage in evidenced-based patient-centered interprofessional practice (IPP) our focus is to create experiential learning opportunities that foster individual student development of quantitative and qualitative skills necessary for effective collaboration among health care providers to ensure the highest quality of patient centered-care. In order to meet this focus the Academy must understand the perceptions of faculty who create and support the learning environment with regard to the impact of IPE.

**PURPOSE** To understand faculty perceptions regard the role of IPE. **SUBJECTS** All SHMS full-time health science faculty were eligible to complete the survey. Of the 44 SHSM full -time faculty 11 voluntarily and anonymously completed the survey resulting in a 25 % return rate.

**PROCEDURE** Surveys were placed in faculty mailboxes with a letter of solicitation discussing the surveys voluntary nature and return instructions. The survey was completely anonymous and data was reviewed in aggregate form. **RESULTS** Faculty perceived that IPE learning experiences provide an opportunity for students to develop their skill set as an evidenced based health care professional who engages in interprofessional practice.

**DISCUSSION AND CONCLUSION** Information gleaned from this survey provides insight in to the perspectives of a major player in the success of any IPE endeavor, the faculty. Given that faculty create the learning environments for student development in the Academy, faculty development opportunities which address the role of and impact of IPE and IPP in the academic environment is paramount. Thus, the authors propose that an initiation step that must be taken to create a strong infrastructure for IPE to flourish is faculty development.

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## **THE CORRELATION BETWEEN AGE, GENDER, RACE, LEVEL OF EDUCATION, ACADEMIC CONCENTRATION AND KNOWLEDGE OF THE SIDE EFFECTS OF CAFFEINE USE IN COLLEGE STUDENTS**

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The purpose of this study was to investigate the knowledge of the side effects of caffeine use among college students. The survey was distributed to students in *Campus Digest* via email and contained 37 Likert-type scale questions that assessed individuals' knowledge of caffeine side effects. In addition, seven demographic questions were added to the survey that addressed age, gender, race, academic concentration, level of education, and academic concentration data. Results were analyzed by SPSS. A one way ANOVA test determined if there was a statistical difference between healthcare and non-healthcare students concerning knowledge of caffeine side effects. Ninety-two students, undergraduate and graduate, attempted the survey of which 58

(63%) were fully completed. Results showed there was no correlation found between gender, age, race, level of education and knowledge of the side effects of caffeine. Additionally, a one way ANOVA test was conducted. Data analysis revealed that there was no significant difference in the knowledge of caffeine side effects for graduate students versus undergraduate students, and healthcare versus non-healthcare majors. The results indicate that students with a higher level of education and those majoring in healthcare are not more knowledgeable about caffeine.

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### **A COMPARISON STUDY OF STANDARDS FOR PURCHASING, FITTING, AND MAINTENANCE PRACTICES FOR FOOTBALL AND LACROSSE HELMETS IN HIGH SCHOOLS**

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**Context:** Research demonstrates that there is a high incidence of head injuries in both football and lacrosse. There is anecdotal evidence that suggests that purchasing, fitting and reconditioning practices of helmets differ between the two sports. **Objective:** The purpose of this study is to determine if differences exist in standards for purchasing, fitting, and maintenance between football and lacrosse helmets in high schools. **Design:** This study used a cross-sectional survey design. **Setting:** Public and private high schools in the states of New Jersey and New York. **Patients or Other Participants:** Fifty-two Athletic Trainers currently working at high schools that had both football and lacrosse programs. **Interventions:** Subjects were contacted via email and were directed to a survey on the website [www.surveymbuilder.com](http://www.surveymbuilder.com). The 25 question survey instrument was found to have content validity by four athletic trainers prior to subject recruitment. **Main Outcome Measures:** The survey consisted of closed-ended questions with responses that were nominal or ordinal. Frequency data were calculated to describe responses to the questions. Wilcoxon Signed Ranks Test was used to evaluate differences in survey answers between football and lacrosse questions. **Results:** There were significant differences between football and lacrosse in the responses for questions related to the person responsible for fitting, purchasing, and reconditioning the helmets, and the frequency of reconditioning ( $p < .05$ ). **Conclusions:** The results showed differences in who purchases and fits helmets and how often helmets are reconditioned in football and lacrosse.

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### **THE INFLUENCE OF PRICE AND NUTRITION ON FOOD CHOICES IN COLLEGE STUDENTS**

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**Introduction:** Obesity is one of the leading epidemics our country is currently facing, with an increased number of young adults struggling with obesity and its associated premature complications such as coronary artery disease, hypertension, stroke, and diabetes. As a result of these complications, the health of young adults is deteriorating and subsequently, the costs of health care are increasing. The aim of this study is to determine contributing factors leading young adults into obesity, particularly the price of food choices. Many young adults today lack sufficient funds and may choose cheaper, less healthy foods as opposed to the more expensive, healthier foods, which could impact their future health. According to the American Heart Association, the atherosclerotic process leading to the cardiovascular complications associated with obesity begins in youth, which is why it is imperative to determine the underlying factors that contribute to food choices. **Methods:** This IRB approved study is a sample of convenience survey study comprised of students, within and including the ages of 18-23, to determine how influential price and nutrition are on food choices among the studied college student population. The survey study was created by the authors and consisted of 33 questions that were divided into sets assessing particular food choices from a McDonalds™ menu including price and nutritional value comparing choices in a variety of ways. A Likert scale was used ranging from -2 to +2 which included “always choose, choose most of the time, or equal” for both healthy options and unhealthy options (determined directly from McDonalds™ nutritional pamphlet). There were seven questions consisting of four possible answer choices yielding a total of 28 responses per participant. With 30 participants and a total of 28 responses per participant, 840 overall responses were received, as shown in Figure 1. The university’s online newsletter and student Facebook page displayed a link that led to the survey, which was administered using the Academic Survey System and Evaluation Tool (ASSET). Analysis of the data was performed using SPSS 18.0, inferential statistics were applied using the One-Way ANOVA test, with the set p value of 0.05. **Results:** Data analysis showed that students selected meal choices based on cost rather than nutritional value as shown in Figure 2. In comparison to the control (the control group served as the participant's initial food preference independent of nutritional value or cost associated with the items), when the healthier choice was lower in cost, 28.1% had a positive (healthier) change in response while 1.4% had a negative (unhealthier) change. When the unhealthier choice was lower in cost, 17.6% had a negative change in response while 8.6% had a positive change. When nutrition facts were provided and cost factor was minimized, 27.1% had a positive change in response while 4.8% had a negative change. Overall, cost resulted in the greatest positive change in responses compared to the control. Of these students, 63.3% depended on their parents as their main source of income. In addition, 69.2% of females (18/26) were more likely to choose the healthier option, while 30.8% (8/26) of females chose the unhealthier option. With regards to males, only 25% (1/4) chose the healthier option whereas the remaining 75% (3/4) chose the unhealthy option. From the results using one-way ANOVA, the p value calculated was greater than 0.05 showing that there is no statistical significance between group means (see Table 2). The results of this study supports the proposed hypothesis that cost has greater influence on meal choices in college students. Additionally, the results support the hypothesis that females are more likely to choose healthier options compared to males. **Conclusions:** This study demonstrates that cost had a slightly greater influence on college students’ food choices relative to nutritional value, although no definitive conclusions may be drawn. Future research may include application of a different method to increase response numbers and improve demographic distribution. Additionally, the use of online surveys is a quick and efficient way to obtain results; however, it is limited in that students may demonstrate

social desirability bias, which could skew the results as opposed to if participants took part in an actual real life demonstration of the proposed study.

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## **WILLINGNESS TO BE SEEN BY AND UNDERGO PROCEDURES PERFORMED BY PHYSICIAN ASSISTANTS AMONG A UNIVERSITY COMMUNITY**

Matt Danella, Tim Dowse, and Joseph Murphy

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**Introduction:** The physician assistant profession is one of the fastest growing careers in the country as PAs are being utilized to provide cost effective and quality patient care. As more and more tasks are being performed by PAs, it is important to determine if patients are willing to have PAs play a bigger role in their health care. In addition, a patient's previous experience with a PA might influence their willingness to be seen by a PA in the future. Answers to these questions would allow the PA profession to improve on patient perception and acceptance of PAs in specific aspects of health care. The purpose of the study is to assess the public's willingness to be treated by a PA, what tasks they are willing to have PAs perform, and whether or not a previous encounter with a PA has an effect on whether they would see a PA in the future. **Methodology:** The study employed a non-experimental, quantitative survey design. The survey instrument used in this research study consisted of was created by the authors and validated. A convenience sample comprising undergraduate, graduate students, and faculty belonging to a small private university was used. The survey was distributed utilizing a broadcast email to the students' and faculty's university email addresses using the Academic Survey System and Evaluation Tool (ASSET). Analysis of the data was performed using SPSS 17.0; inferential statistics were applied using T testing and Chi square testing, both with an alpha of 0.05. **Results:** Fifteen community members attempted the survey, of which eleven were completed (N=11). The Chi square test was conducted to determine if there was a relationship between having been seen by a PA previously and the willingness to allow PA's to perform certain tasks. Participants who had previously been seen by a PA were significantly more likely to allow PAs to perform injections ( $p=0.035$ ) and interpret diagnostic imaging ( $p=0.007$ ) than those who had not previously been seen. **Conclusion:** Having previously been seen by a PA appears to be favorable in terms of allowing a PA to administer injections and interpret diagnostics. However, being seen by a PA in the past seemed to have no positive effect on allowing PAs to perform other tasks such as suturing, managing chronic medical conditions, and performing pelvic/rectal exams. This may suggest that participants have a poor understanding of the role that PAs play in providing healthcare. More extensive research should be conducted in order to determine the true correlation between previous PA encounters and willingness of participants to allow PAs to perform healthcare related tasks.

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## **TEST-RETEST RELIABILITY OF UPPER EXTREMITY PEAK MUSCLE FORCE USING HAND HELD-DYNAMOMETRY IN MEN WITH SPINAL CORD INJURY**

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**Background:** Individuals with spinal cord injury (SCI) often present with strength deficits in the upper and lower extremity depending on the location and completeness of the neurological lesion. Clinical evaluation of strength has historically relied on the subjective assessment by the rater, which is dependent on skill and experience and may not be consistent between raters. Commercially available hand-held dynamometers (HHD) have emerged on the market and may serve as a complimentary measure to quantify muscle strength. **Objective:** The objective of this retrospective study was to determine test-retest reliability of peak upper extremity strength in persons with SCI using HHD. **Methods:** Eight medically-stable men with SCI (C5-L2, age 25-47) volunteered for participation. “Make” and “break” tests were performed on two separate visits to quantify peak muscle force for shoulder adduction, abduction, flexion and extension. Time to peak force was recorded. The intraclass correlation coefficient (ICC) was calculated within and between visits for all measurements using SPSS. **Results:** Intravisit reproducibility of peak muscle force was high for all measures (ICC 0.89-0.99). Time to peak force was less reliable in the non-dominant arm in both the make and break tests. Intervisit reproducibility was high (ICC>0.80) for all but one measure (shoulder abduction, ICC=0.73). For all measurements, the break test had higher reproducibility than the make test (ICC≥0.95). **Conclusions:** Our findings indicate HHD is reliable and provides reproducible measures of muscle force production of individuals with SCI.

## **PERIPHERAL HEMODYNAMIC RESPONSES TO STAND-RETRAINING THERAPY IN PERSONS WITH SPINAL CORD INJURY**

Michael F. LaFontaine, EdD, ATC  
Student Authors (DPT Class of 2014): Yasmin Abd Elhady, Jessica Moore, Maryan Nasralla, and Paulette Stone

Off-site collaborators: William A. Bauman, MD, Gail Forrest, PhD  
Department of Physical Therapy, School of Health and Medical Sciences, Seton Hall University

Clinical interventions focusing on ambulatory strategies are becoming more common for persons with spinal cord injury (SCI). Anecdotal observations suggest that hemodynamic adaptations occur as a result of this training and contribute to improved orthostatic tolerance. Reasons for these adaptations have yet to be fully described, but may be speculated to be the result of improvements to lower extremity vascular compliance and flow dynamics. The purpose of this retrospective study was to examine the effects of stand-retraining therapy (SRT) with functional electrical stimulation (FES) to lower extremity muscle groups on lower extremity arterial and venous blood flow. Lower-leg relative vascular resistance and venous volume variation were obtained by venous occlusion plethysmography (VOP) of both legs and blood pressure by auscultation at baseline and following 60 sessions of SRT-FES. Several metrics from the VOP technique will be presented and discussed to describe the vascular changes that are hypothesized to occur. Expected results from this study will contribute to our understanding of the vascular

changes that may occur during SRT-FES, which is one of many ambulatory strategies being explored to augment rehabilitation of persons with SCI.

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## **ASSESSMENT OF WOMEN'S KNOWLEDGE OF CURRENT ORAL HEALTH RECOMMENDATIONS DURING PREGNANCY**

Zarella C, Barone R, Brennan M, Comello J, and Rizzolo D

Physician Assistant Program, School of Health & Medical Sciences, Seton Hall University

**Purpose:** Oral health maintenance during pregnancy is important to ensure healthy fetal development and avoid adverse pregnancy outcomes such as preterm birth, low birth weight, and preeclampsia. The purpose of this study is to assess women's knowledge of the current oral health recommendations during pregnancy. **Methodology:** A non-experimental qualitative analysis was conducted using a 21-item survey that was created by the authors and validated. The survey was distributed amongst four Obstetric/Gynecologic clinics, gathered demographic information, and was composed of 12 knowledge-based questions. Data was analyzed using Chi-square analysis and descriptive statistics with an alpha of less than 0.05 considered as statistically significant. **Results:** 48 female patients of the selected Gynecologic/Obstetricians offices completed the survey. All met the inclusion criteria of age 18 and older. 66.5% of the questions evaluating knowledge were answered correctly and 33.6% were answered incorrectly. Data analysis showed significant differences in awareness pertaining to safety of diagnostic procedures during the 1<sup>st</sup> trimester, treatment of oral infections, and frequency of flossing. 83.3% correctly answered that urgent treatment is safe during any trimester. 91.7% correctly answered that pregnant women should floss daily. However, a significant lack of knowledge regarding safety of diagnostic procedures in the first trimester of pregnancy was demonstrated with 79% of women answering this question incorrectly. Responses to questions about the frequency of brushing with fluoride toothpaste, safety of chewing gum, and receiving necessary dental treatment before delivery, were answered correctly but the results were not significant. Only 18 participants reported discussing oral health issues related to pregnancy with their health care provider. After the survey, 40 women stated they are willing to follow the current oral health recommendations as part of their prenatal care. **Conclusion:** Results demonstrate women have limited awareness of current oral health recommendations, with a lack in knowledge on the safety of diagnostic procedures and dental treatment in the first trimester of pregnancy. Most reported not being advised on oral health issues during pregnancy, but agreed to follow recommendations in the future. This population would likely benefit from educational interventions and incorporation of oral health recommendations into routine prenatal care. Health care professionals across the prenatal spectrum must counsel and encourage women to maintain adequate oral health with dental care and treatment to improve hygiene practices as well as risk reduction.

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## **GLOBAL HEALTH ROTATION IN THE PHILIPPINES FOR A PHYSICIAN ASSISTANT STUDENT**

Natasha Greendyk, PA-S & Lauren Seavy, MPA, PA-C

Department of Physician Assistant, School of Health and Medical Sciences, Seton Hall University

Every clinical rotation allows for the opportunity to enhance a student's clinical acumen; however, some rotations can be a life changing experience. This poster is an opportunity to reflect and share about a global health rotation for a student in the Physician Assistant Program at Seton Hall University in collaboration with the College of Medicine at the University of the Philippines in Manila. By forming a partnership, the student was given the opportunity to experience medicine in a developing country where healthcare is administered in such a way as to conserve the available resources and still provide the best quality care possible. During this clinical rotation in the Philippines, the student learned the art of taking a thorough and intelligent history and physical exam with a patient population that demonstrates unequalled patience, resilience, and fortitude. As part of this rotation, the student was exposed to challenges unseen in the United States, and practices that differed, yet demonstrated high quality medicine. For example, despite financial constraints, doctors find ways to utilize what is available to the maximum. In some cases, the medical professional is faced with the dilemma of a sick patient who simply cannot afford treatment. It is a true experience to see how the medical professionals balance the patient's medical needs with their financial capabilities, and also strive to practice medicine at its best. Reflections as such along with other experiences gained as part of this rotation will be shared as part of this poster.

## **ANTI-INFLAMMATORY EFFECTS OF DEXAMETHASONE AFTER ITS WITHDRAWAL**

Viren Jadeja, Suzanne Abuhadba, and Heping Zhou

Department of Biological Sciences, Seton Hall University

Lipopolysaccharide (LPS), an endotoxin, is the principle component of the outer membrane of Gram-negative bacteria which is known to elicit an immune response. In response to such stress, microglia, the primary agents of immunity in the central nervous system (CNS), become activated and secrete cytokines. Previous studies established corticosteroids, such as dexamethasone, have inhibited the release of cytokines after stimulation by LPS. This study investigates how long the anti-inflammatory effects of dexamethasone treatment last after its withdrawal. Murine microglial cells were treated with 1 $\mu$ M vehicle or dexamethasone for 48 hours, rinsed, and cultured fresh media without dexamethasone for 0, 4, 24, and 48 hours. The cells were then stimulated with LPS for 4 hours and media was collected and examined for cytokine production. Results showed that the production of interleukin-6 and tumor necrosis factor-alpha was inhibited by approximately 90%, 50%, and 30% at 4 h, 24 h, and 48 h following dexamethasone withdrawal respectively. Our data suggest that at 48 h after dexamethasone withdrawal, the response of microglia cells to treatment with inflammagens such as LPS remained attenuated. Our results will help to understand the long-term effects of stress stimulus.

## **CORTICOSPINAL MODULATION OF IPSILATERAL PATHWAYS DURING MOTOR IMAGERY OF RHYTHMIC ANKLE DORSIFLEXION IN INDIVIDUALS WITH STROKE: A RETROSPECTIVE STUDY**

P. Nair, J. Gayed, N. Hauck, L. Tripodi, and L. Watts

Department of Physical Therapy, School of Health and Medical Sciences, Seton Hall University

**Background:** Neural processing that occurs when movement is imagined is similar to those evoked during actual movement performance. In the lower extremity, motor imagery has demonstrated temporal modulation of cortical excitability similar to the performance of the actual task in some individuals post stroke. Increasing cortical excitability could be a useful tool when working with post-stroke individuals in promoting beneficial cortical plasticity. This study examined whether motor imagery affected the modulation of excitability in the corticospinal pathways ipsilateral to the affected hemisphere of the cortex. **Participants:** Nine individuals between the ages of 18-75 with post-stroke unilateral impairment were recruited for the study. A low frequency transcranial magnetic stimulation (TMS) coil was applied over the central fissure and magnetic stimulation was delivered at set time intervals. The amplitude of the imagined motor evoked potentials (MEPs) of the affected limb were measured at the tibialis anterior, soleus, and first dorsal interosseus and compared to the amplitude of the actual task for the unimpaired limb. Participants were asked to perform dorsiflexion to a 1Hz metronome. Then, they were asked to imagine the movement on the affected side. **Results:** Trace patterns of cortical excitability were evident in six of nine individuals when asked to imagine the dorsiflexion movement. A comparison between motor evoked potentials during actual movement and imagining the movement, showed a positive correlation. **Conclusion:** These findings demonstrate that visual imagery may be useful to engage impaired fibers of the corticospinal tract that cross over at the pyramidal decussation. This technique may be useful in improving function of paretic limbs in post-stroke patients.

## **DIFFERENCES BETWEEN COLLEGE AGED STUDENTS WITH NORMAL BMI AND ELEVATED BMI IN IDENTIFYING APPROPRIATE PORTION SIZES.**

Tyson R, LoBuglio E, Macios S, Rappisi K, and Rizzolo D

School of Health and Medical Sciences, Seton Hall University

**Introduction:** Obesity has been an issue in the United States for the past several decades. It has been proposed that young adults are unaware of recommended portion sizes. The purpose of this study is to examine the relationship between college students' ability to recognize an appropriate portion size and body mass index. **Methodology:** A convenience sample consisting of undergraduate graduate students between the ages of 18 and 24 at a small private university was used. An online survey was developed by the authors of the study and consisted of demographic data, BMI (healthy vs. unhealthy), and 15 multiple choice questions. Analysis of the data was performed using SPSS 20.0, inferential statistics were applied using the ANOVA test. **Results:** A total of 25 surveys were attempted and 11 (42.3%) were completed. Seven students (63.6%) had a normal BMI whereas 4 (36.3%) students had an elevated BMI. Students with normal BMI answered an average of 7.85 (52.4%) questions correct while students with an elevated BMI had answered an average of 6.5 (43.3%) questions correctly. Using a p value < 0.05, there was no statistical significance in identifying portion sizes between students with normal BMI and elevated BMI (P = 0.907). **Conclusions:** Results show no statistical significance between the

two BMI groups in ability to select correct portion sizes. It may be beneficial to include nutrition education in the college curriculum to help students make healthy choices that will affect their future health. While this investigation was performed within a limited population, further research into the knowledge of appropriate portion size would be beneficial.

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## **EMPATHY CHANGE DURING PHYSICIAN ASSISTANT (PA) EDUCATION**

Ellen. D. Mandel, DMH, MPA, MS, PA-C and William Schweinle, PhD

Physician Assistant Program, School of Health and Medical Sciences, Seton Hall University

**Purpose:** This research investigated trends in PA student empathy through their PA education. This research partially replicates similar research on empathy among other health professionals' students. However, until the present findings, none exist that are relevant to empathy changes among PA students. Three hypotheses were tested: (1) Does empathy decline during PA training mimic other health professions students? (2) Are there gender differences, and (3) Is PA student empathy related to students' pre-PA training healthcare experience?

**Methods:** The Jefferson Scale on Physician Empathy (JSPE) was administered to PA students three times: (1) during matriculation, (2) near the end of their didactic training and (3) during their clinical training phase. Data were analyzed using both parametric (ANOVA) non-parametric (binomial) methods to test the three hypotheses.

**Results:** Results indicate that PA student empathy declines significantly during the didactic training period and remains stable through their clinical training. Women begin with higher empathy scores than men, yet both show similar decline across their didactic PA training. There was no association with students' expressed specialty interest or prior clinical experience.

**Discussion:** These findings illustrate that a decline in empathy appears to accompany PA training among both genders. This decline is similar to that seen among other health providers' educations and supports the need for dialogue

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## **KNOWLEDGE OF ORAL HEALTH PATHOLOGY IN PRACTICING PHYSICIAN ASSISTANTS**

Christine Corbin, Natasha Greendyk, Melissa Mills, Angela Monterosso, and Denise Rizzolo  
Seton Hall University, School of Health and Medical Sciences

Oral health is a vital part of overall systemic health. The purpose of this study is to determine whether or not Physician Assistants maintain sufficient knowledge to identify and refer oral pathology. This study is a quantitative survey analysis of the knowledge of oral pathology in practicing Physician Assistants. This survey asked eighteen questions on oral pathology and was created and validated by the authors of this study. A total of 133 respondents completed this survey. Fifty nine percent of Physician Assistants had a passing score on the survey suggesting Physician Assistants' knowledge of oral pathology is not satisfactory. This study suggests that Physician Assistants need more thorough education on oral pathology, both in master's programs as well as in continuing medical education classes. Limitations to this study include the low number of respondents and it was impossible to assess if respondents utilized outside resources or references to answer the questions. Future studies are needed to determine the appropriate

amount of time necessary to teach Physician Assistant students about oral pathologies, as well as the most successful method to maintain knowledge when in clinical practice.

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### **CONFIDENCE AMONG PHYSICIAN ASSISTANTS IN RECOGNIZING, DIAGNOSING, TREATING AND REFERRING COMMON DERMATOLOGIC CONDITIONS**

Francesca Cuttaia, Jillian Lagoa, Samah Morsy, Megan Steel and Mona Sedrak  
Physician Assistant Program, School of Health & Medical Sciences, Seton Hall University

The purpose of this study was to determine licensed PA's confidence in recognizing, diagnosing, treating, and/or referring 49 commonly seen dermatologic conditions as listed in the NCCPA Content Blue-print and the American Academy of Dermatology (AAD). This non-experimental, quantitative analysis included licensed PAs in eight states (NJ, NY, DE, MT, HI, UT, SC), who were sent a survey using the Academic Survey System and Evaluation Tool (ASSET) via e-mail by their respective state society. The results indicated that of the four most common dermatologic conditions, 55% of all participants (249 total) were confident in their ability to recognize, diagnose and treat, regardless of their experience (practicing and/or rotating in dermatology). There was no statistical significance found in PA's confidence in diagnosing or treating dermatologic conditions regardless of years of practice. The results of this study suggest that while PAs do possess confidence in recognizing and referring dermatologic conditions (69%), almost half of the PAs lack confidence in diagnosing and treating these conditions (45%). Therefore, incorporating dermatology into PA education and stronger advocacy for CME training is essential in producing confident PAs in both routine dermatologic conditions and dermatologic emergencies.

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### **THE EFFECTS OF MIND MAPPING ON THE DEVELOPMENT OF CRITICAL THINKING SKILLS IN PHYSICAL THERAPY STUDENTS USING THE HEALTH SCIENCES REASONING TEST: A PILOT STUDY**

Pinto Zipp, G and Maher C.  
School of Health and Medical Sciences, Dept. of Graduate Programs in Health Sciences and Dept. of Doctor of Physical Therapy

As educators, the question as to which teaching and learning strategies may assist us in effectively developing a student-focused active learning environment that promotes critical thinking is of paramount concern. One teaching and learning strategy which has recently emerged in higher education is Mind Mapping. The non-linear approach to learning used in Mind Mapping seeks to engage the learner in thinking and exploring concepts using visuospatial relationships and pictorial depictions. **PURPOSE:** To explore the effects of Mind Mapping on the development of critical thinking skills in physical therapy students using the Health Sciences Reasoning Test (HSRT). **METHODS:** Subject: 3<sup>rd</sup> Doctor of Physical Therapy students. The on-line link to the HSRT was provided to all students. Students were given two weeks at the beginning of the semester as well as the end to complete the HSRT test. Students immediately received their scores on the HSRT as a function of the online testing procedures. All HSRT data was voluntarily and anonymously collected. The PI accessed the aggregate data files composed

by Insight Assessment Inc. RESULTS: While, entry-level Doctor of Physical Therapy students demonstrated a higher total critical thinking skills score post mind mapping, however, their scores remained within the moderate range of critical thinking. Specifically, the emphasis of change was noted on evaluation and induction skills. DISCUSSION: While, in this small sample a positive change in critical thinking skills was noted future work is needed to truly assess the efficacy of mind mapping.

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## **WRITTEN COHESION IN CHILDREN WITH LANGUAGE LEARNING DISABILITIES ACROSS TWO GENRES**

Victoria Petersen and Anthony D. Koutsoftas

Department of Speech-Language Pathology, School of Health and Medical Sciences, Reading, Oral Language, and Writing Lab (ROW-Lab), Seton Hall University

Cohesion is defined as the linguistic elements that contribute to a text's continuity (Halliday & Hasan, 1976). Halliday and Hasan (1976) identified 5 categories of cohesive ties; two of which are referential and conjunctive cohesion and are most used by elementary school children (e.g., Bae, 2001; Fitzgerald & Spiegel, 1986; Haslett, 1983; Liles, 1987; Liles, 1985). Written cohesion is an understudied area in children with language learning disabilities (LLD) and could provide important insight into the linguistic underpinnings of writing quality. The present study examines referential and conjunctive cohesion in children's writing across two genres: narrative and expository. Fifty children with and without LLD participated in this study by completing a 4 day experimental protocol that included producing one narrative and one expository writing sample. Writing samples were segmented into minimal terminable units (T-units; Hunt, 1970) coded for conjunctive and referential cohesive ties, using measures adapted from prior research (Liles 1987). Between group differences for referential and conjunctive cohesion and within group differences by genre were identified and will be reported. Relationships between cohesion ratings and an external measure of quality will be discussed. Findings from this study provide important insight into the linguistic underpinnings of written language production and how these vary by genre and language disorder status. Implications for future research and clinical application will be discussed.

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## **REFLECTIONS OF A SPEECH LANGUAGE PATHOLOGY CLINICAL ROTATION IN THE PHILIPPINES**

Jamie Hyler & Anthony D. Koutsoftas Department of Speech-Language Pathology School of Health and Medical Sciences, Seton Hall University

This presentation is a narrative reflection of an international collaboration between the Department of Speech Language Pathology at Seton Hall University and the Speech-Language Pathology Program at The University of the Philippines', Manilla. A graduate student from SHU had the opportunity to spend a month in Manilla working side by side with speech-language pathologists and their students in a variety of clinical settings. These settings included an interdisciplinary therapy center for children with medically complex needs, a craniofacial unit in Quezon City, and an aural rehabilitation unit at Philippines General Hospital. Reflections will include observations of interdisciplinary approaches compared to the more familiar

multidisciplinary approaches utilized in the United States healthcare system; the development of home programs for speech and language interventions; and outreach efforts to an impoverished community in the province of Batangas. Highlighted will be reflections and observations that increased cultural sensitivity including clinical experiences and daily activities that broadened the student clinician's understanding of different cultures. Additionally, a comparison of key differences in healthcare systems, treatment modalities, patient populations, and cultural differences with regards to the clinician-client relationship will be discussed.

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### **THE EFFECTS OF COMMUNICATION COACHING DURING MEALTIME IN TWO ADULTS WITH RETT SYNDROME**

Amanda Russo, Jamie Hyler, Theresa E. Bartolotta PhD, & Patricia A. Remshifski, PhD  
Department of Speech-Language Pathology, School of Health and Medical Sciences, Seton Hall University

Rett syndrome (RTT) occurs primarily in females and is characterized by deficits in cognition, communication, hand use and ambulation. Individuals with RTT are reported to be noncommunicative and preintentional and not considered strong candidates for speech therapy or augmentative communication systems. This single-subject design explored the use of a coaching program to increase communicative interactions between two women with RTT and their communication partners during mealtime in their homes. It was hypothesized that training communication partners to recognize behaviors as intentional and communicative would result in an increased number of communicative bids and responses from the subjects. Data analysis revealed an increase in the number of communicative exchanges between the subjects and their partners over time. The total number of bids for communication made by the subjects, as well as the communication partners' responses to those bids, increased across sessions. The communication partners waited longer for the subjects to respond, used fewer conversational fillers and responded to their behaviors as if they were intentional. This study demonstrated that the communication partners in these dyads recognized bids for communication by the subjects with RTT. Subjects in this study produced behaviors that were attributed as intentional and their partners responded to these communication bids. These results suggest that modification of partner behavior can result in enhanced communicative effectiveness for individuals with RTT.

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### **READING COMPREHENSION ACROSS PAPER-BASED AND ELECTRONIC INTERFACES**

Stefanie Lederman and Anthony D. Koutsoftas  
Department of Speech-Language Pathology, School of Health and Medical Sciences, Reading, Oral Language, and Writing Lab (ROW-Lab), Seton Hall University

There has been an exponential increase in the use of personal computing devices like laptops and tablets for reading purposes; however, there is little evidence investigating reading comprehension skills when using computer-based technology. This is important because the increase in navigational commands and workload from computing devices can negatively affect reading comprehension. Computing devices are likely preferred when reading for lower level knowledge and understanding rather than reading to gain deeper levels of information,



suggesting that more in-depth comprehension occurs when reading print documents (Kintsch, 1994; Mayes et al., 2001). The purpose of this study is to compare reading comprehension across paper-based and computer-based formats allowing for an empirical analysis of reading abilities using personal computing devices. Twenty college freshmen participated in a two hour assessment battery whereby they completed a series of language and reading assessments. Participants were randomly assigned to one of two conditions: paper-based or computer-based reading platforms whereby the reading task was exactly the same allowing for equivalence across tasks. Comprehension measures included responding to comprehension questions and producing an oral retell about the read information. The dependent variables include the number of correct responses and the total number of words produced in the oral retell. The hypothesis is that participants in the computer-based group will score lower on both comprehension measures because as navigational commands and workload increase participants begin to read simply to understand not to learn.

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### **THE EFFECT OF ASYMMETRY IN UPPER AND LOWER EXTREMITY INTERACTION ON GROUND REACTION FORCES IN HEALTHY ADULTS**

Preeti Nair, PT, Ph.D.; Elisiya Gadsden, SPT; Paula Kamille Hernandez, SPT; Danielle Reilly, SPT; and Jennifer Walker, SPT

Department of Physical Therapy, Seton Hall University

**Background.** In normal walking, arm swing allows for decreased energy expenditure during gait. Therefore, in conditions (such as post-stroke) where arm swing is diminished or absent, it is presumed that diminished or absent arm swing will have a significant effect on lower extremity kinetics and kinematics. Past studies have tested the relationship of arm swing and lower extremity kinetics and kinematics when the walking pattern is normal or symmetrical. However, there is limited evidence on the relationship of arm swing and a walking pattern that is asymmetrical such as observed post-stroke. The purpose of this study was to examine the contribution of the upper extremity to the lower extremity kinetics during the asymmetrical stroke-like gait. Specifically, vertical and horizontal ground reaction forces associated with six different walking conditions simulating stroke like gait were studied. **Methods.** Participants included 10 healthy individuals in the age range of 18-23 years. Participants completed a one-minute trial each for six different walking conditions collected on the Bertec instrumented treadmill. Three of the six walking conditions involved maintaining, increasing and decreasing step length in the dominant lower extremity while swinging the upper extremity normally. The remaining three conditions involved restricting the arm swing on the dominant upper extremity while maintaining, increasing and decreasing step length in the dominant lower extremity. Vertical and horizontal ground reaction forces were calculated on the instrumented treadmill. **Results.** Vertical and horizontal ground reaction forces between the six walking conditions are presented and discussed. **Conclusion.** Results of this study will contribute to understanding the relationship between arm swing and lower extremity ground reaction forces in asymmetrical gait patterns.

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## **ADVANCE DIRECTIVE: MY CHOICE, MY END OF LIFE PLANNING.**

Samantha S. Singh

College of Nursing, School of Health and Medical Sciences, Seton Hall University

**Purpose:** Good communication is an important part of effective services delivery. However in order to provide effective communication, the health care professional must be empowered with the knowledge, current state regulations, area of expertise and confidence to address the subject professionally without personal bias. Advance Directives is an area that medical professionals often have difficulties in, when facilitating a conversation with clients. The purpose of this presentation is to provide medical professional with the tools needed to discuss this difficult topic with their clients and loved ones without fear. **Objective:** To empower medical professionals with the knowledge, comfort, and the tools needed to educate follow colleagues, loved ones and clients about advance directives. **Learning objective:** The learner will describe tools for health professionals when communicating about Advanced Directives and end-of-life planning. **Background:** Advance directives are in place to enable individuals to designate someone they would like to make medical decisions on their behalf when they are unable to do so. Unfortunately, individuals and their loved ones are often provided information about advance directives when they are required to make critical medical decisions and/ or they are unable to select a health care agent due to cognitive impairments. If an individual is provided with the information when able to process the information, he or she will be able to make a more informed decision. Healthcare professionals are the key in accomplishing this task. Healthcare providers are able to facilitate communication with clients because they have the requisite education and are comfortable with the subject content.

### **Methodology:**

1. To provide healthcare professionals with an overview of advance directives focusing on the process and execution of health care proxies and DNR's.
2. To discuss the importance of health care proxies in making crucial medical decisions
3. Addressing the importance of communication between "the healthcare professional(s) and client" and "the client and healthcare agent(s)".
4. Beginning conversation at well-care visits and follows up visits to establish reproach and trust
5. The importance to facilitating communication with clients while they are healthy and able to address concerns and ask questions
6. Help clients to understand the role of a healthcare agent(s) when selecting one.
7. The importance of conducting groups with professionals and clients, of all age while completing advance directives to establish a sense of commonality and ease.
8. Provide a complete packet with forms of health care proxy and DNRs to participants
9. Provide websites where individuals can record their wishes and/or complete health care proxies.
10. Provide knowledge and material to health care professionals to begin the conversation on/ with clients on the process and importance to communicate their health care needs.

**Limitations:** Although the interventions discussed may be effective in helping clients, everyone has their own personal bias and area of comfort, which is not addressed. This may have an impact on the success on the individual discussing end of life issues with their clients.

**Discussion:** Despite their discipline healthcare professionals are placed on the front line to advocate and educate clients, and to ensure that their quality of life and needs are met. Advance

directives are tools available to health care professional to help educate their clients on exercising their autonomy in handling their medical care under potential situations where the clients are unable to state their wishes. The more informed an individual has, the more equipped he or she will be to address theirs and clients' needs. Ongoing advance directives education is beneficial not only to the client and medical professional, but the organizations' (hospital, community clinic, insurance, Medicare...) budget.

## Biological Sciences Poster Session

Thursday, April 25 3:30 PM McNulty Hall Atrium

### **IDENTIFICATION OF THE INTERACTION BETWEEN RACK1 - PCBP1 AND CHARACTERIZATION OF THE FUNCTIONAL EFFECT OF THE INTERACTION.**

Pranjali Nahar-Gohad, Hamidah Sultan, Ysabella Esteban, Alyda Stabile and Jane L.Ko  
Department of Biological Sciences, Seton Hall University, South Orange, NJ, USA

PCBP1 is a single stranded DNA binding protein that belongs to the K Homology (KH) domain super family. Studies have shown that PCBP1 is involved in the regulation of  $\mu$ -opioid receptor and translational regulation of several other proteins. In order to understand the versatile functional roles of PCBP1, PCBP1 interacting proteins were identified by screening human brain cDNA library using the bacteria two hybrid system. One positive clone was sequenced and identified as RACK1 protein. The goal of this study was to characterize the physical interaction between PCBP1 and RACK1, and study the functional effect. The *in vivo* interaction between these two proteins was validated by the bacteria two hybrid system, and the physical interaction in the mammalian system was confirmed using the co-immunoprecipitation assay. RACK1 has seven tryptophan aspartic acid (WD) domains. Several WD truncated forms were constructed and the binding of PCBP1 with RACK1 constructs was mapped at the WD7 domain, using bacteria two hybrid system. RACK1's functional role was further examined by luciferase reporter assay where overexpression of RACK1 decreased the Mu opioid Receptor (MOR) promoter activity. In addition, a significant increase of MOR gene expression and MOR binding was found in cells transfected with RACK1 si RNA. In summary this study reports unique role of RACK1 physically interacting with PCBP1 and regulating the human MOR gene expression in neuronal NMB cells. This study may provide potential genetic approach of regulating the opioid receptor expression.

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### **EFFECT OF HYPOXIC MIMIC NICKEL COMPOUND ON GENE EXPRESSIONS IN NEURONAL CELLS**

Amy Gao\*, Siddhi Patel\*, Jennifer Candelora and Jane L Ko  
Department of Biological Sciences, Seton Hall University

Hypoxia is a condition where cells are deprived of the necessary supply of oxygen. Some symptoms of hypoxia found in patients are headaches, dizziness, etc., and in more extreme cases, seizures. Understanding hypoxia is an important step to prevent hypoxia-induced cell death,

especially for patients who suffer from cell damage due to the lack of oxygen. The hypoxic condition can be produced/mimicked by using a nickel compound because it is involved in regulating metabolism by substituting iron. Therefore, this study is to examine how human neuronal cells respond to a nickel induced hypoxic environment. The alterations of gene expressions linked to the cells' survival under hypoxic mimic conditions are investigated first. Based on the literatures, opioid receptors may be involved in facilitating cell survival. However, the effects of alteration of  $\kappa$ -opioid (KOR) and  $\delta$ -opioid receptors (DOR) gene expression under nickel induced hypoxia are unknown; therefore the expressions of these genes were tested in here. In order to study the effect of nickel, human neuronal cells were treated with the nickel compound at various time points. The RNAs were isolated and RT-PCR was performed. PCR products were separated by gel electrophoresis and visualized by ethidium bromide staining. The preliminary results showed that KOR message level was increased as the treatment time increased. Conversely, there was no significant change in DOR expression. Future immediate study will be able to confirm these findings and also further examine if the cellular hypoxic marker HIF-1 $\alpha$  expression is altered under hypoxic induced stress.

\* Authors contributed equally to this study.



## **COBALT INDUCED HYPOXIA DIFFERENTIALLY AFFECTS GENE EXPRESSIONS IN HUMAN NEURONAL CELLS**

Natasha V. Pavlichko, Lawrence Rasmussen, Jane L. Ko  
Department of Biological Sciences, Seton Hall University

Cobalt is a heavy metal found in the environment which can induce hypoxia, an inadequate supply of oxygen which may induce cell death. Therefore, the cobalt compound can result in devastating cellular damage due to the induction of hypoxia. However, a fraction of cells under such exposure still survive, which may be mediated by specific signal transduction pathways along with the alteration of gene expressions to aid in cell survival. JAK/STAT signal transduction pathway may be related to hypoxia. We therefore assessed the JAK/STAT signal transduction pathway by examining STAT activity in neuronal cells treated with the cobalt compound for 24 hrs. Using Western blot and confocal microscopy analyses, the decrease of STAT activity was observed. In the literature opioid receptors are also suggested to be able to aid in neuronal survival. Three different opioid receptor types are identified in humans: kappa opioid receptor (hKOR), mu opioid receptor (hMOR) and delta opioid receptor (hDOR). To examine if the gene expression of the receptors were changed during cobalt induced hypoxic conditions, human neuronal cells were treated with cobalt compound for 24 hours. The RNA was isolated, and the opioid message level was investigated using RT-PCR. The preliminary results showed an increase of hKOR expression upon treatment, and a decrease of hMOR expression, while DOR had no significant changes. In summary, this study showed the development of adaptive responses in neuronal cells under cobalt induced hypoxic condition.

## MALE ADOLESCENT AFRICA ELEPHANT (*LOXODONTA AFRICANA*) FEEDING BEHAVIOR IS CORRELATED WITH FORAGE STRATEGIES

Matthew Pennington

Department of Biological Sciences, Seton Hall University

Male and female African elephants, *Loxodonta africana*, do not co-reside in permanent social groups. A number of theories have been proposed to explain this sexual segregation. The assumption that males have different energy requirements than females due to their larger size underlies these theories. Two hypotheses have received much attention: the activity budget hypothesis, which proposes that the main force driving sexual segregation is differences in activity, and the forage selection hypothesis, which proposes that differences in foraging behavior drives segregation. This study aims to evaluate the two in differently sized elephants of the same sex. Using individualistic focal sampling of male elephants in the Pongola Game Reserve, South Africa, I found that as size increased, mouthful rate decreased while feeding bout length increased, indicating that there was little difference in feeding activity between the age groups, arguing against the activity budget hypothesis. In support of the forage selection hypothesis, I found that as elephants increased in size, they tended to eat more browse, be more destructive in feeding, and decrease the range of habitats in which they fed.

## HYPOTHALAMIC INSULIN-RECEPTOR SIGNALING COMPENSATION FOR IMPAIRED LEPTIN SIGNALING IN DIABETIC MICE

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Hypothalamic insulin and leptin signaling have been implicated in the development of obesity and Type 2 Diabetes. Previous studies have shown that mice lacking hypothalamic leptin receptors (*LeprNkx2.1*KO mice) develop obesity and impaired energy homeostasis, but demonstrate phenotypic stabilization beginning at 10 weeks of age. The purpose of this study is to assess the compensatory role of hypothalamic insulin signaling in this stabilization. We will cross mice with floxed leptin receptor (*Lepr*) and insulin receptor (*IR*) alleles to mice transgenic for *Nkx2.1*-Cre, which drives Cre recombinase expression in the hypothalamus, but not other brain regions, generating *Nkx2.1*-Cre; *Lepr*<sup>f1/f1</sup>; *IR*<sup>f1/f1</sup> KO mice. Phenotypic studies will include body composition analysis via MRI, and hormone level analysis via ELISA and RIA. To assess the impact of insulin signaling, hypothalamic signaling targets will include phosphoinositol 3 kinase (PI3K), which is up-regulated by leptin and insulin signaling, and the transcription factors forkhead box protein O1 (FOXO1) and FOXA2, which are both down-regulated by insulin and leptin signaling. Levels of these targets will be measured by qRT-PCR and IHC. We hypothesize that the hypothalamic double-KO mice will not demonstrate phenotypic stabilization at 10 weeks of age due to the additional impairment of hypothalamic insulin signaling. We also expect PI3K levels to increase in *LeprNkx2.1*KO mice but not in the double-KO mice and FOXO1/FOXA2 levels to decrease in *LeprNkx2.1*KO mice but not in the double-KO mice. *This project is proposed as part of our Senior Biology Seminar capstone course.*

## **SYSTEMIC LUPUS ERYTHEMATOUS: THE SCIENCE BEHIND THE DISEASE**

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Systemic Lupus Erythematosus (SLE) is an autoimmune disorder which causes various defects and gene disruptions in the immune system, thus leading the body's immune system to target its own tissue and cells. While the pathogenesis that targets the immune system in SLE is understood, the specific triggers, whether environmental or chemical, in which the clinical symptoms and onset of the disease begins, remains unknown. The purpose of this experiment is to determine a potential trigger for SLE based on suspected popular triggers a SLE patient would encounter in everyday activities. To analyze potential SLE triggers, a lupus mouse model will be used with the following conditions: two control mice (no trigger exposure), two mice exposed to two environmental triggers (sunlight and infectious agents), and two mice exposed to two chemical triggers (hair dyes and pharmaceutical drugs). After exposure to the triggers, the mice were examined for any differences in the time and severity in the onset SLE symptoms and a blood sample was taken to analyze for a difference in the presence of autoantibodies. Anticipated outcomes for this experiment are to finally find out what causes SLE, and note any similarities with SLE to other auto immune disorders. Another outcome would be able to find a treatment that is effective with a low amount of usage and low in cost. *This project is proposed as part of our Senior Biology Seminar capstone course.*

## **EFFECTS OF CONCUSSIONS ON HIGH SCHOOL AND COLLEGE ATHLETES**

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In the world of sports today, concussions have obtained extensive concern and media attention due to the long-term consequences and possible dangers. To date, however, there has not been a study done on the actual long-term effects a concussion can have on student-athletes. This study is a review of past literature on concussions' short-term ramifications. We analyzed a substantial set of data from previous studies with the purpose of deriving baseline data to compare to our long-term results. A total of 500 high school and collegiate student-athletes were administered a number of post-concussion neurocognitive tests at both six months and one year post-concussion. It was found that high school athletes demonstrate a more complete recovery than collegiate athletes. This matches our original hypothesis that the brain would still be developing and therefore, have a quicker recovery in the younger high school athletes. *This project is proposed as part of our Senior Biology Seminar capstone course.*

## **POTENTIAL NOSOCOMIAL PNEUMONIA REDUCTION BY ENFORCING COMPREHENSIVE PROTECTIVE MEASURES**

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Within a given year, millions of patients will be hospitalized for a variety of different ailments. Throughout the course of their time in the hospital, many of these patients become ill from something other than the cause of their initial problem. Despite constant effort from healthcare staff to combat these infections, according to the CDC, roughly 15% of these nosocomial infections are pneumonia or respiratory-based. Several changes to current infection prevention protocol can be tested to check for their efficacy in lowering the percentage of nosocomial pneumonia. Altering the positioning of patients in hospital beds could lower the risk of infection. Also, patient mobility following procedures is another variable that will be explored. Moreover, antiseptic and intravenous treatments can be utilized as preventative measures. Furthermore, patient to visitor contact can be limited in an attempt to restrict the transmission of the pathogen. This study was conducted in one hospital setting, using ten thousand patients over the course of two years. By significantly increasing the strictness of the comprehensive protective measures, including visitation, antimicrobial, sanitation, and general protocol modifications, it is evident that the prevalence of nosocomial pneumonia decreased significantly. In the future, it would be useful to examine the effectiveness of these new preventative measures in other geographical locations throughout the world. *This project is proposed as part of our Senior Biology Seminar capstone course.*

## **EFFECTS OF SLEEP DEPRIVATION ON METABOLISM OF THE COLLEGE AGE MALE**

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Weight gain and ill health are associated with sleep deprivation. As young men make their way into colleges around the world, the amount of sleep they get tends to decrease as their waistlines increase. One cause for their expanding waistlines has to do with their metabolisms being affected by the lack of sleep they receive. The reasoning behind their changes in metabolism is due to the changes in hormonal mechanisms resulting from sleep deprivation. Male athletes are affected more because of the amount of oxygen needed in order to compete in practices and games. Those who do not sleep enough had a tendency to eat more and most of the food eaten has empty calories which were burned before warm-ups. The aim of this study was to determine the correlation of male hormonal levels impacted by long term sleep deprivation focusing specifically on the male hormones of leptin, ghrelin, insulin, and testosterone. By following a group of males over the course of four months, we modeled what long-term sleep deprivation does to the body. Over time, the levels of leptin, insulin sensitivity, and testosterone decreased while the level of ghrelin elevated respectively. These results were backed up by the increased hunger rating of the test subjects over the study period. *This project is proposed as part of our Senior Biology Seminar capstone course.*

## POTENTIAL BRAIN TUMOR PROGRESSION BY SURROUNDING STROMAL AND IMMUNE CELLS

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Brain tumors are classified depending on the location of the tumor, the type of tissue affected, and whether they are benign or malignant. Macrophages are phagocytes that help initiate defense mechanisms. Glioblastomas are the most hostile type of brain tumor with estimated survival time between eleven and thirteen months after diagnosis. Tumor-associated macrophages are frequently found in glioblastomas and a high degree of macrophage infiltration is associated with a poor recovery for these patients. It is believed that macrophages support tumor growth and impact inflammatory microenvironment by secreting cytokines. We hypothesize that the specific environment affects tumor growth by producing macrophages that secrete cytokines which alter expression of the cadherins in glioblastomas. U-87 human glioblastoma cells were treated with cytokine IL-8 then their RNA was extracted. Gene expression of N-cadherin (N-cad) and E-cadherin (E-cad) was determined by qRT-PCR while GAPDH was used as a control. No E-cad expression was detected as E-cad is not expressed in majority of brain tumors. We anticipate that cells treated with the cytokine showed an increased expression of N-cad gene suggesting that IL-8 treatment could possibly alter the cellular adhesion process in glioblastoma cells. Further work should be done to understand the implication of increased N-cad expression in glioblastomas.

*This project is proposed as part of our Senior Biology Seminar capstone course.*

## OLIGODENDROCYTES: PROLIFERATION, DIFFERENTIATION AND REMYELINATION

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The nervous system controls all actions of the human body, both voluntarily and involuntarily. The transduction of nerve impulses via salutatory conduction of action potentials relies predominately on the myelination of axons. Myelination of axons is essential for normal neurological functions. Failure to myelinate can result in devastating demyelinating diseases including Multiple Sclerosis (MS) and Leukodystrophies. Oligodendrocytes in the central nervous system (CNS) and Schwann cells in the peripheral nervous system (PNS) are responsible for producing the myelin sheath that wraps the axon. During development, the precursors for these cells undergo a well-defined series of molecular and structural changes. This ultimately leads to the development of the highly complex myelin sheath. There are numerous studies that aim to determine the effect of various factors including microRNAs (miRNAs) and the ERK1/ERK2 MAPK signaling pathway on the myelination of axons. Recent studies also present the possibility of transplanting oligodendrocyte progenitor cells (OPCs) into myelin-deficient hosts as a means of remyelinating host axons. One significant study used human induced pluripotent stem cells (hiPSCs) as a transplant vector which showed a significantly decreased risk for donor cell rejection. The use of OPC transplantation shows a potential for use in the treatment of demyelinating diseases as mentioned above.



## **EFFECTS OF CALMODULIN-LIKE PROTEINS EXPRESSION IN CANCER CELLS**

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Calcium as well as altered expression of calcium pumps and channels are known contributors to tumorigenesis. Current research focuses on identifying novel targets for treatment, and markers for the development of diagnostic tests for early detection of cancer. Studies using oral mucosa tissue have shown that human calmodulin-like protein (CLP) is an epithelial-specific calcium binding protein whose expression is down-regulated in cancers. Using gel overlays, a study identified myosinX as binding specifically and in a calcium-dependent manner to CLP.

MyosinX, an unconventional myosin, is up-regulated as a result of the down-regulation of CLP. Human keratinocytes were used to study the correlation of CLP and myosinX expression *in vitro* and its effects on cell migration. Using stably transfected and inducible HeLa cell lines, a study found that the up-regulation of myosinX expression increases filopodial length, filopodial number and cell motility. A study on highly metastatic cancer cell lines showed that unconventional myosin Va is involved in the process of cell migration, which is a prerequisite for cancer metastasis. Suppressing the expression of myosin Va by lentivirus-based RNA interference in those cells impeded cell migration and metastasis capabilities both *in vitro* and *in vivo*. Additionally, the same study found that the levels of myosin Va are positively correlated with the expression of Snail which induces the activity of the myosin Va by binding to its promoter. These data suggest a novel target for Snail to regulate cancer progression and the potential for development of a diagnostic test for cancer using CLP.

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## **RISK FACTORS OF SKIN CANCER AND THERAPEUTIC OPTIONS FOR TREATMENT**

Christina Brady

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Melanoma skin cancer, as well as non-melanoma skin cancer, has become a major concern in today's society. Melanoma skin cancer is the fifth leading cancer in males and the seventh leading cancer in females. The cause of skin cancer varies from constitutive skin color, genetic factors, immunological factors, as well as the amount of Vitamin D the body is receiving. Along with these factors, UV light is the most common cause for melanoma and non-melanoma skin cancers. A case-control study was conducted and a questionnaire was administered to candidates between the ages of 18 and 80 asking questions based on their exposure to the sun. Results from this study showed that basal cell skin cancer and squamous cell skin cancer differs by the patterns and timing of sunlight received. Studies have also shown that inorganic arsenate in drinking water also plays a role when it comes to the formation of skin cancer tumors. Although this has not been found in the United States, it has been associated with skin cancer patients in Taiwan, Chile, Argentina, Bangladesh, and Mexico. Arsenate in drinking water is associated

with squamous cell carcinomas in the skin. Due to the rise in skin cancer patients, researchers have been analyzing therapeutic options for treatment. The two drugs that have shown survival benefits are ipilimumab and vemurafenib. The need to identify biomarkers for treatment strategies is imperative for the use of these drugs. We will review the major causes of skin cancer as well as the effects of patterns and timing of sunlight exposure. Then, we will look at different therapeutic strategies researchers have developed to prevent further outbreaks of this disease.

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### **DIRECT BACTERIAL INHIBITION AND ANTIBIOTIC SYNERGISM OF POLYMETHOXYLATED FLAVONES (PMFS)**

Franzie Edquilag and Tin-Chun Chu

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The polymethoxylated flavones (PMFs) tangeretin and nobiletin are compounds found in citrus fruits that are proposed to have anticancer, antioxidant, and cholesterol lowering effects. In this study, tangeretin and nobiletin were each tested to see if they could directly inhibit bacterial growth. Furthermore, they were each tested to see if they could either enhance or overcome antibiotic resistance when used in conjunction with antibiotics. The bacteria used in this study included four gram positive bacteria including *Bacillus megaterium*, *Staphylococcus epidermis*, *Streptomyces griseus* and *Sporosarcina ureae* and four gram negative bacteria including *Escherichia coli*, *Enterobacter aerogenes*, *Proteus vulgaris* and *Acinetobacter calcoaceticus*. To test if PMFs can help overcome antibiotic resistance against streptomycin-resistant bacteria, two different strains of *A. calcoaceticus* were used: streptomycin resistant (Strr *A. calcoaceticus*) and streptomycin-sensitive (Strs *A. calcoaceticus*). The Spectromax 105 microplate reader was used for cell growth monitoring and minimum inhibitory concentrations (MICs) determination. Both tangeretin and nobiletin showed significant direct inhibition of bacterial growth, with the lowest MIC being at 400  $\mu$ M for both PMFs. They were especially effective against *E. aerogenes* and *B. megaterium*. As for the antibiotic synergism study, both tangeretin and nobiletin showed greater bacterial inhibition when used with the antibiotic than when the antibiotic alone.

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### **TRACKING MENHADEN EXPOSED TO THE BP OIL SPILL USING DNA BARCODING**

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Menhaden (Genus *Brevoortia*) is one of the most ecologically and economically important marine fish species along the Atlantic and Gulf coast; however, it is also one of the least studied. For this project, menhaden will serve as a model organism for DNA barcoding. The menhaden that reside in the Gulf of Mexico; where the BP oil spill of summer 2010 took place, will be investigated. Menhaden are migratory fish that can possibly extend the damage of the oil spill to other areas in the ocean. DNA barcoding can help determine species type, track migration patterns, and tell how genetically related individuals in the same school are. DNA barcodes will be generated by using primer sets specific for regions in the menhaden genome containing microsatellite DNA. Primer sets were originally designed by Joel D. Anderson 2007. Long SDS-Page gels will be used to separate the microsatellite bands generated by PCR. Differences

between species and individuals of the same species will be detected by the presence and absence of bands as well as by band size, which is related to the number of microsatellite repeats. Comparison of menhaden collected from areas contaminated by the spill to those collected in areas less affected should provide information about how far menhaden might have migrated from the spill site. Microsatellite information will be compared to tissue concentrations of PAHs, a crude oil contaminate. The work presented here is on validating the microsatellite primer sets in the menhaden collected along the Gulf coast in 2010-2012.

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### **IN VITRO DIGESTION OF HEMOGLOBIN PROTEIN IN LARVAE OF 4<sup>TH</sup> INSTAR *CHIRONOMUS RIPARIUS* (DIPETERA: *CHIRONOMIDAE*) BY VARIOUS PROTEASES**

Jun Oh

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Larvae of 4<sup>th</sup> instar Chironomidae or chironomids are a convenient animal model for studying environmental quality. In order to generate a useful biomarker, we have been attempting to characterize various molecular responses exhibited by chironomid upon a change in their environment – especially upon exposure to heavy metals, which are frequent toxic pollutants found in urban environments. Previous results indicated that hemoglobin (Hb) proteins of chironomid – major proteins found in their hemolymph – are an appropriate biomarker for evaluating environmental quality because they are modulated by heavy metals like cadmium (Cd). Our data suggested that low molecular weight proteins (4-6 KDa), observed on sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) in the control group, were potentially representing normal degradation processes by indigenous proteases. However, upon exposure to low concentrations of Cd, varying Hb protein profiles were observed – either disappearance or decreased intensity of the low molecular weight proteins – suggesting that the normal degradation process might have been either inhibited or accelerated by the presence of Cd. In addition, it was evidenced by liquid chromatography-mass spectrometry (LCMS) that the low molecular weight proteins were identified as possible fragmented products of Hb genes IV and VII. In this study, we used three different proteases – cathepsin D (aspartic), pepsin (aspartic), and trypsin (serine) – to further investigate: 1) the presence of native proteases by comparing the compiled profiles generated by each protease and 2) the relationship between the degradation process of Hb proteins and effect of varying concentrations of Cd in larvae of *Chironomus riparius*.

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### **PROFILING GENE EXPRESSION DURING EMBRYOGENESIS IN SEA LAMPREY**

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The sea lamprey are one of the invasive species found in the great lakes and have caused a tremendous decrease of fish population in the past. As a jawless vertebrate, lamprey is thought to represent the out-group to the jawed vertebrates and may suggest the ancestral developmental programs shared by the common ancestor, as well as the changes introduced to form the jaw in gnathostome lineages. In most animals, the embryo-larval stage of life cycle is typically

considered as the most environmental stress sensitive life stage since the embryo consists of relatively few cells, most of which are still totipotent. Identification of key genes involved in embryogenesis in sea lamprey will provide new target genes for sea lamprey control and provide important insights into our understanding of the evolution of vertebrate traits. In this project, next generation sequencing platform (SOLiD3) is being used to profile gene expressions among 10 different stages of embryogenesis of the sea lampreys. Currently we have identified 14,476 unique transcripts from these samples. About 74 differential expression genes have been identified. We are mapping stages and patterns of expression of these genes during development. Real-time PCR methods will be employed to further validate the results.

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### **THEAFLAVINS AS POTENTIAL ANTIMICROBIAL COADJUVANTS FOR ANTISEPTICS**

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Black tea is the second most consumed drink in the world. It originates from the leaves of *Camellia Sinensis* plant and contains large amounts of theaflavin polyphenols, in particular theaflavin (TF1), theaflavin-3-monogallate (TF2A), theaflavin-3'-monogallate (TF2B), and theaflavin-3,3'-digallate (TF3). In this study, the antimicrobial effect of a combination of theaflavins was assessed using microplate bioassay. Different theaflavin concentrations (1.0, 2.5, 5.0, and 10.0 mg/ml) were used to determine the minimum inhibitory concentration (MIC). The bacteria tested include *Escherichia coli*, *Enterobacter aerogenes*, *Micrococcus luteus*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Bacillus megaterium*, *Bacillus cereus*, *Sporosarcina ureae*, *Staphylococcus epidermidis*, and *Streptomyces griseus*. A mixture of theaflavins with alcohol or non-alcohol based antiseptics were assessed to evaluate their possible collaborative antimicrobial effect using the disc diffusion method. Furthermore, several spore-forming bacteria were used to study the potential bacterial germination inhibition by theaflavins. The results demonstrate that theaflavins contain strong antibacterial activity and show significant synergism with both alcohol and non-alcohol based antiseptics on several of the bacteria tested. In this study, the theaflavin immensely inhibited spore germination in *B. megaterium*, *B. cereus* and *S. ureae*.

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### **EFFECT OF DESFERRIOXAMINE ON THE JAK/STAT SIGNAL TRANSDUCTION PATHWAY WITHIN NEURONAL CELLS**

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Hypoxia, or low oxygen conditions, can induce cell death due to oxygen's vital role as the final electron acceptor in the electron transport chain of oxidative phosphorylation. However, some cells activate certain pathways, which allow them to survive in conditions of oxygen deprivation, such as those that occur due to strokes and heart attacks. Our laboratory previously used DFO, an iron chelator, to generate a simulated hypoxic model system using a human neuronal cell line. Using this cell model system, RT-PCR analysis showed that the hypoxia inducible factor-1a mRNA level was increased in surviving neurons. Although the change of hypoxia inducible

factor-1a gene expression was examined, the activation of signal transduction pathway is not well understood in this system. The JAK/STAT pathway has been suggested to be involved in resistance to cytotoxic drugs such as doxorubicin, neuroplasticity, prevention of apoptosis, and axon regeneration. Therefore, this signal transduction pathway may have protective effects on neuronal cells and was investigated using this cell model system. Western blot analysis demonstrated an increase in levels of STAT. This is further confirmed using confocal microscopy analysis, which showed an increase of STAT staining in the nucleus as compared to control cells. In summary, this study suggested that the JAK/STAT pathway was activated under DFO induced hypoxic condition and provided insight of its functional role and potential medical implications.

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### **THE PRESENCE OF POLYCYCLIC AROMATIC HYDROCARBONS IN LIVER AND GONAD TISSUES OF MENHADEN FOLLOWING THE DEEPWATER HORIZON OIL SPILL**

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On April 20, 2010 BP Oil Company had an accident at the DeepWater Horizon oil platform that resulted in over 200 million gallons of spilled oil. The oil contained many polycyclic aromatic hydrocarbons (PAHs) that may have bioaccumulated in organisms exposed to the oil, including a marine fish species called menhaden. This project analyzed the existence of PAHs in liver, gonad, spleen, muscle, and gill tissues of menhaden collected two years after the spill, June to September 2012. Menhaden were collected from an area heavily impacted by the oil, Barataria Bay, Grand Isle, LA and from a less impacted area, Vermillion Bay, LA. These fish were compared to each other as well as fish collected from Delaware Bay, NJ. PAHs were extracted from tissues by homogenizing and diluting them with 75% ethanol. The diluted homogenates were then centrifuged and the supernatant was scanned for the presence of fluorescent aromatic compounds (FACs). Specific emission and excitation wavelengths established levels of 2-naphthol-like and 1-hydroxypyrene-like PAHs in supernatants, which were then normalized by pellet weights (RFU/mg). Emission/Excitation wavelengths were 280/350 and 340/450, respectively. Results showed PAHs were present in liver as well as gonad indicating that PAHs are still present in LA fish and that menhaden reproduction may be affected by the oil spill.

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### **ANALYSIS OF THE *DROSOPHILA PSEUDOOBSCURA* ADULT TESTIS STEM CELL NICHE BY TRANSMISSION ELECTRON MICROSCOPY**

Marcus Gerald, Cassandra Lawson and Angela V. Klaus  
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Spermatogenesis in males is maintained within the testes throughout the adult life of the animal. Key to the sustained production of sperm is a region called the stem cell niche where spermatogenic stem cells are produced and maintained. Such adult stem cell niches are present in mammalian as well as fruit fly testes. In fruit flies, the stem cell niche resides at the terminal apical end of tubular or elliptical testes. The stem cell niche has been well-characterized in *Drosophila melanogaster*, but has not been explored in other *Drosophila* species. The goal of

the current work is to characterize the structure of the stem cell niche in *D. pseudoobscura* adult, pupal and larval testes using serial sectioning and transmission electron microscopy. This species has an unusual elliptical testes morphology. Our hypothesis is that the structure of the stem cell niche in *D. pseudoobscura* will differ significantly from *D. melanogaster*. This work may lead to an understanding of the evolution of niche structure.

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## **A BIOINFORMATICS METHODOLOGY FOR THE IDENTIFICATION OF CHROMATIN CONDENSING PROTEINS IN *DROSOPHILA* TESTES**

Zain A. Alvi, Tin-Chun Chu, and Angela V. Klaus

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The current study is aimed at identifying and analyzing proteins involved in chromatin condensation during spermatogenesis in several *Drosophila* (fruit fly) species. Chromatin condensation (and the transformation of the sperm nucleus) is facilitated by the interaction of three sperm nuclear basic proteins (SNBPs), transition protein (TPL94D), and CTCF (chromatin insulator and zinc finger binding protein). SNBPs found in *D. melanogaster* include a histone H1 linker-like protein termed Mst77F and the protamine-like proteins Mst35Ba and Mst35Bb. Using the reference sequences from *D. melanogaster*, we previously identified the putative sequences for these proteins in *D. simulans*, *D. sechellia*, *D. yakuba*, *D. erecta*, *D. ananassae*, *D. mojavensis*, *D. virilis*, *D. willistoni*, *D. grimshawi*, *D. pseudoobscura*, and *D. persimilis*. The advent of freely available RNA-Seq-SRA (Sequence Read Archive) data from testes of *D. simulans*, *D. yakuba*, and *D. pseudoobscura* on NCBI has allowed us to look for the mRNA expression of these genes. We have developed a method that forgoes the Unix environment for a user friendly method through the use of Biomatter's Geneious 6.0.6 software package and freely available bioinformatic tools from the Pennsylvania State University's Galaxy-Project. Our current work suggests that all of our putative matches are expressed in testes of our species of interest.

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## **IMMUNOFLUORESCENCE ANALYSIS OF STEM CELL NICHE STRUCTURE IN *DROSOPHILA PSEUDOOBSCURA***

Megan Dunham, Ashley Alexandre and Angela V. Klaus

Department of Biological Sciences, Seton Hall University

The focus of the present study is to characterize the testicular stem cell niche in *Drosophila pseudoobscura*. Adult stem cell niches play key roles in maintaining adult tissues and in giving rise to a steady supply of sperm cell precursors during the adult life of male animals. *Drosophila* spermatogenic stem cells are self-renewing – this property is sustained due to interactions of the stem cells with somatic cells termed “hub cells” that make up the niche environment in adult fly testes. The niche is located at the apical end of the testes, and is anchored by integrins and other adhesion proteins. The structure of the niche is well understood in *Drosophila melanogaster*, but the characterization of the stem cell niche in *Drosophila pseudoobscura* is incomplete. Previous work in our lab has putatively identified the structure of the testis stem cell niche in *D.*

*pseudoobscura* using antibodies against a known hub protein, fasciclin III. The goal of the current work is to confirm this identification using antibodies against two additional hub proteins: DE cadherin and armadillo.

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### **TIME-LAPSE IMAGING OF NUCLEAR MIGRATION DURING SPERMATOGENESIS IN *DROSOPHILA PSEUDOOBSCURA***

Crystal Pristell, Amanda Quashie, and Angela V. Klaus  
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The goal of the current work is to image a phenomenon known as nuclear migration which occurs during the post-meiotic phase of fruit fly spermatogenesis. In *Drosophila pseudoobscura* spermatogenesis, 128 round spermatids arise via five mitotic and two meiotic divisions within an encapsulating cyst and then transform into mature, elongate sperm during a post-meiotic stage termed spermiogenesis. Prior to spermiogenesis, the 128 spermatid nuclei relocate to one side of the cyst, however the mechanism by which this relocation occurs is unknown. In the current work, cysts were cultured in glass-bottomed plates and exposed to 405 nm illumination with very low concentration of Hoechst 33342 (0.02 ug/ml) in the culture medium during 6, 12, and 24 hour confocal time-lapse imaging sessions to view the nuclear migration event. We hypothesize that an actin-based structure may be responsible for nuclear migration, and such a structure has been putatively identified in *D. pseudoobscura* in previous work from our lab. Our ultimate goal is to use the time-lapse imaging technique to visualize the effects of actin destabilization on nuclear migration during spermatogenesis.

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### **EVALUATING THE LEVELS OF POLYCYCLIC AROMATIC HYDROCARBONS (PAHS) AND CHLOROPHYLL IN THE STOMACH CONTENTS AND INTESTINE TISSUE OF MENHADEN EXPOSED TO THE BP OIL SPILL**

Therese Carluen  
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The BP oil spill is considered one of the largest marine oil spills releasing 4.9 million barrels of crude oil containing polycyclic aromatic hydrocarbons (PAHs), lasting approximately three months. Many PAHs are toxic and have been identified as carcinogenic, mutagenic and tetratogenic. Menhaden are a very important marine fish species that are prey to higher trophic level species such as tuna and blue fish. Menhaden eat phytoplankton, containing chlorophyll which can adsorb crude oil and other contaminants, exposing them to PAHs in their diet. The goal of this project is determine chlorophyll and PAH concentration in the stomach contents and intestine tissue of menhaden and to compare to those concentration of fish collected from different areas of the Gulf. Sites included Barataria Bay, LA which heavily impacted by oil, and Vermillion Bay, which was impacted less by the oil. Fish were collected in 2012, 2 years after the spill. The procedure for extracting PAHs involved dissecting out pieces of GI tract as well as the stomach contents. These samples were homogenized 5% ETOH, diluted 1/10 in 75% ETOH, and centrifuged for 20 minutes at 13,000rpms. The supernatant was separated and analyzed using scanning fluorescence spectroscopy. Results show major peaks at Em350/Ex280 (naphthol-like

PAHs) and Em450/Ex-350 (hydroxypyrene-like PAHs). Menhaden from Barataria Bay, LA had higher hydroxypyrene-like PAHs in their stomach contents and GI tissue than fish from Vermillion Bay. This indicates that menhaden from sties oiled by the BP spill in 2010 are still taking up higher levels of PAHs in their diet.

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### **DIMORPHIC SPERM IN DROSOPHILA: PROTAMINE-LIKE PROTEIN CHARACTERIZATION AND CHROMATIN CONDENSATION ANALYSIS**

Matthew Emery, Zain Alvi and Angela V. Klaus  
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Several species of *Drosophila* flies produce dimorphic sperm where a short sperm morph (parasperm) and a large sperm morph (eusperm) are both present in ejaculate. Only the eusperm are capable of fertilizing an egg. Parasperm appear to be targeted for destruction in the female sperm storage organ (spermatheca). The goal of the current work is to (1) characterize the sperm DNA binding proteins in two dimorphic sperm species, and (2) test the hypothesis that differences in sperm chromatin condensation may be a factor involved in parasperm targeting in the spermatheca. Protamine-like proteins are a type of sperm nuclear basic protein (SNBP) that bind DNA in the sperm nucleus and facilitate chromatin compaction during spermatogenesis. In the current work, we have confirmed the presence of two protamine-like protein genes (GE24787 and GG24235) in two species from the melanogaster species group that produce dimorphic sperm: *D. yakuba* and *D. erecta*. PCR amplification of these genes from genomic DNA and subsequent analysis of the PCR products confirms the presence of GE24787 and GG24235. Additionally, we aim to analyze the chromatin compaction status of parasperm and eusperm using reagents known to decondense mammalian sperm chromatin.

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### **CANNABINOID RECEPTOR 2: POTENTIAL THERAPEUTIC TARGET FOR MULTIPLE SCLEROSIS**

Joseph Gleason  
Department of Biological Sciences, Seton Hall University

Multiple Sclerosis is a disease of the central nervous system that results from the body's own immune system attacking cells that are responsible for providing the insulating myelin sheaths for the axons of neurons. Without these myelin sheaths, nerve signaling is significantly diminished. One of the cell populations that contribute to the neuro-inflammation seen in multiple sclerosis is the microglial cell. Microglial cells are derived from myeloid progenitor cells in the bone-marrow and are directed to the inflamed CNS in multiple sclerosis. The cannabinoid receptor is an extracellular receptor of the G-protein coupled receptor family (GPCR). Within the cannabinoid receptor family there are two sub-types: cannabinoid receptor 1 (CBR1) and the cannabinoid receptor 2 (CBR2). CBR1 is found predominantly on neurons while CBR2 is found on cells of the immune system, including myeloid progenitor cells as well as microglial cells in the brain. Research has shown that selective agonists for this receptor have improved an animal model of multiple sclerosis (experimental autoimmune encephalomyelitis - EAE). Additional experiments show that this receptor may control myeloid progenitor cells



trafficking from the bone-marrow to the CNS. Taken together, these results demonstrate the potential therapeutic role this receptor may play.

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## **PALMITATE AND NEURONAL CELL FUNCTION**

Ryan Gelsinger and Heping Zhou

Department of Biological Sciences, Seton Hall University

Many studies have shown that increased levels of free fatty acids (FAAs) are associated with impaired insulin signaling and apoptosis in hepatocytes, podocytes, myocytes, and pancreatic islet cells. However, the effects of FAAs on neuronal cell function are not well examined. In this study, we first treated mouse neuroblastoma cells with either bovine serum albumin (BSA) or BSA-palmitate (PA) and examined cell viability using MTT assay. We found that increasing concentrations of PA in the growth media were associated with a decrease in cell viability. We also stimulated the cells pretreated with PA with insulin and examined the activation of various mediators in the insulin signaling pathway. We found that Akt phosphorylation was attenuated in PA-treated cells as compared to vehicle-treated controls. These data suggest that PA may not only affect the viability of neuronal cells but also affect the insulin signaling in these cells.

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## **TYPE 2 DIABETES AND THE IMMUNE RESPONSE**

Lauren Clark

Department of Biological Sciences, Seton Hall University

The mechanisms that predispose Type 2 Diabetes (T2D) sufferers to become immuno-compromised and prone to infection are poorly understood. As the left hind paw of C57BL/6J-*Lepr*<sup>db</sup>/*Lepr*<sup>db</sup> Mice (db/db) and control non-diabetic mice (+/+) were inoculated with 10  $\mu$ l of bacterial suspension *S. aureus* PS80, the (+/+) mice healed the infection within 10 days, as compared to db/db that developed a purulent chronic infection. When, F4/80<sup>+</sup> resident peritoneal macrophages (RPMs) were extracted from the abdominal cavity of db/db, various imaging techniques proved F4/80<sup>+</sup> RPMs from the db/db were fewer in number as compared to the WT (+/+), deficiencies in the efficacy and rate of phagocytosis were significantly lower from the db/db, and the polarized state of the macrophages showed an increased percentage of M2 macrophages from db/db and reduced percentage of M1. Phagocytic activity of peripheral blood mononuclear cells were compared between 21 T2D patients and control 21 healthy volunteers via flow cytometric analysis in which venous blood was collected from the volunteers, after a 10 hour overnight fast, and exposed to *E. coli* for a half hour. The T2D patients exhibited a lower percentage of active phagocytic cells. Similarly, 13 diabetic and pre-diabetic individuals given a restricted diet for 6 months, underwent gastric banding after 3 months and showed improvement in immune activity. The mechanisms by which inflammatory pathways are activated were examined in adipose tissue, skeletal muscle, and the liver. Long-term T2D sufferers have a difficult time resolving infection, requiring further investigation, however immune damage in T2D can be reversible with proper diet and exercise.

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## **IMMUNOFLUORESCENCE AND ELECTRON MICROSCOPIC CHARACTERIZATION OF THE SPERM HEAD IN WHITE-TAILED DEER**

Deborah Hyland and Angela V. Klaus

Department of Biological Sciences, Seton Hall University

Mammalian sperm are characterized by the presence of a sperm head structure termed the equatorial segment (EqS). This region of the sperm head appears to be the site of fusion between the sperm and egg plasma membranes. The structure has been characterized in at least ten species of mammals and appears as a semi-circular region originating at the line of demarcation between the acrosomal and post-acrosomal segments of the sperm head. An additional structure called the equatorial sub-segment (EqSS) has been reported to be present within the EqS, however its function is unknown. The goal of the current work was to confirm the presence of and characterize the structure of both the EqS and EqSS in white-tailed deer (*Odocoileus virginianus*) using sperm obtained from the cauda epididymis. Additionally, we aim to further characterize the equatorial subsegment using immunofluorescence labeling of phosphotyrosines known to be present in the EqSS in other species. We also aim to determine the three-dimensional structure of the EqSS using the optical sectioning capability of confocal laser scanning microscopy.

## **ABDOMINAL AORTIC ANEURYSMS AND POSSIBLE CORRELATION TO THE CCR5 GENE AND CCR5 $\Delta$ 32 MUTATION**

Timothy Reidlinger

Department of Biological Sciences, Seton Hall University

The exact pathogenesis behind an abdominal aortic aneurysm (AAA) remains unclear to the world of science. However, many recent studies have attempted to illuminate some of the reasons and mechanisms behind the extremely dangerous and potentially deadly medical condition. Studies suggest that a chronic inflammatory process may contribute to an acute AAA. The pathogenesis behind an AAA may lie within the inheritance patterns of multiple genes and also mutations associated with them. The papers examined review the possibility of a genetic predisposition to being at risk for an AAA as well as if genetics may play a role not only in the occurrence of an AAA but the severity of the AAA once it occurs. Through the research conducted by various teams, conflicting data has been collected regarding the CCR5 gene and its  $\Delta$ 32 mutation. Certain studies have specified that the mutation plays a specific role in the occurrence of AAAs, while other studies have presented data that would seem to suggest the contrary. Contained within this article is the examination of the results of several studies that explore AAAs and the CCR5 gene, including its  $\Delta$ 32 mutation.

## **THE CONSEQUENCES AND DANGERS OF POLYCYCLIC AROMATIC HYDROCARBON (PAH) CONTAMINATION IN THE ENVIRONMENT**

Andreamarca Favero and Anna Ono

Department of Biological Sciences, Seton Hall University

Industrial waste presents a persistent environmental predicament in the United States, including organic toxicants such as polycyclic aromatic hydrocarbons (PAHs) The hydrophobic nature of

high molecular weight PAHs causes many to cling to particulates, plankton, and sediment within water. This increases the likelihood that the compounds will be ingested and bioaccumulate within organisms. The presence of DNA adducts, DNA breaks, liver lesions, cancers, and reproductive issues provide supportive evidence of the dangerous nature of PAHs. Each of these can have serious consequences, most commonly of a carcinogenic nature, that leads to illness and death. Several studies have taken careful records of organism in contaminated zones and completed analysis via bioassays and fluorescent aromatic compounds (FACs) to record pollution concentrations and evaluate hazards (Ferreira et al, 2005; Myers, et al, 2008; Herbstman et al, 2012; Park et al, 2007; Sabourin et al, 2012; Bravo et al, 2011). Research conducted by Herbstman et al, studied direct impacts on humans, specifically pregnant woman, to identify complications that may arise in reproduction (2012). Results from the studies proved that PAHs may be the cause of several other complications aside from cancer including, immune system strength, neonate health, reproductive abilities, and more. All of these are due to an excessive presence of PAHs in an organism that was introduced through the environment. Further studies of areas directly affected by waste, especially runoff into major water sources like at Eagle Harbor (Myers, 2008), is becoming a bigger priority among environmental scientific research.

### **EVALUATING THE EFFECTS OF COPPER ON *CHIRONOMUS RIPARIUS* THROUGH THE EXPRESSION OF THE FERROCHELATASE GENE AND HEMOGLOBIN PROTEIN**

Angelo B. Montero and Carolyn S. Bentivegna  
Department of Biological Sciences, Seton Hall University

The heavy metal, copper, has been described as one of the most hazardous heavy metals to aquatic ecosystems along with cadmium, chromium, and lead. However, little is known of the molecular effects it has on the aquatic larva of *Chironomus riparius*, a reference organism in aquatic toxicology. Particularly, little is known of its effects on chironomid ferrochelatase, the enzyme that catalyzes the addition of ferrous iron into protoporphyrin IX to make heme for hemoglobin. Thus, the aim of this work was to analyze the effects of copper on chironomid ferrochelatase gene (FECH) expression and see how it affects hemoglobin protein production. Previous studies have demonstrated that copper functions as an activator for ferrochelatase, a discovery that may indicate up-regulation of FECH expression and also hemoglobin. To test this hypothesis, transcription levels were evaluated by RT-PCR after a 96 hr exposure to varying concentrations of copper, and hemoglobin levels were analyzed using SDS-PAGE. The current data suggests that FECH does not appear to be affected by copper, as its low transcription level in the treated samples is similar to that of the control. The current data also suggests that hemoglobin protein band intensities did vary with different copper concentrations. Based on these overall results, it can be concluded that copper does not appear to affect FECH expression and that hemoglobin production is not affected by FECH transcription.

## **FORMING BIOMARKER PROFILES FROM THE MOLECULAR EFFECTS OF CADMIUM, COPPER, BISPHENOL A, AND DI(2-ETHYLHEXYL) PHTHALATE IN CHIRONOMIDS**

Angelo B. Montero

Department of Biological Sciences, Seton Hall University

Discovering biomarkers for aquatic toxicants is an active research area of molecular toxicology. Recent studies analyzing the molecular effects detected in *Chironomus riparius* and *Chironimus tentans* in response to four important environmental toxicants: the heavy metals cadmium and copper, and the organic toxicants bisphenol A (BPA) and di(2-ethylhexyl) phthalate (DEHP), have generated promising data for developing biomarkers for these toxicants. Cadmium, Copper, DEHP, and BPA, for instance, have all been demonstrated to increase the expression of the gene Hsp70, which codes for the stress-induced protein HPS70. On a more specific level, cadmium and BPA have also been proven to alter the expression of ribosomal genes and non-coding RNA sequences. According to the authors, most of these molecular alterations are believed to be results of mechanisms activated to cope with the stress induced by the toxicants.

Taken together, these results can be used to form biomarker profiles for each toxicant by integrating the known molecular effects of each chemical in toxicity analyses. This would facilitate chemical identification because the biomarker profiles would make it possible to differentiate between toxicants based on the molecular effects in their profiles. However, it is not possible to rely solely on them for toxicity analysis because other chemicals could also exert similar molecular effects after inducing stress in chironomids. Thus, it is necessary to combine these biomarkers with other analytical techniques in order to appropriately identify the toxicants of interest.

## **THE PHYSIOLOGICAL RESPONSE OF *CAULOBACTER CRESCENTUS* AND *ACINETOBACTER* SP. ADP1 TO ZINC STRESS**

Robert Newby Jr. and Tin-Chun Chu

Department of Biological Sciences, Seton Hall University

Microbial response to zinc toxicity is an important area of study. In some environments, such as freshwater and soil, the introduction of zinc pollution occurs by industrial byproduct or agricultural runoff. Zinc is an essential micronutrient used in a variety of enzymatic processes; however, excess of zinc results in hindered development in both plants and animals. To better characterize individual species responses in both environments, work has been undertaken with two model organisms. Zinc response has been carried out in *Caulobacter crescentus* and *Acinetobacter* sp. ADP1. *Caulobacter crescentus* is a freshwater oligotrophic bacterium which has been studied for its unique cell cycle. *Acinetobacter* sp. ADP1 is a non-motile soil bacterium that is heavily studied due to its genetic malleability. In this study, both bacteria have been exposed to zinc chloride at concentrations of 0, 5, 10, 15, 20, 25, and 50 mg/L. For *C. crescentus*, resistance to zinc has been demonstrated up to 15 mg/L. Initial results showed ADP1 is much more zinc tolerant (up to 50 mg/L), and further characterization is underway. In *C. crescentus*, zinc exposure results in the appearance of morphological defects such as elongation

compared to control and a decrease of cell viability as determined using LIVE/DEAD® Cell Viability Assays (Life Technologies). In both species, molecular assays are designed to determine genes related to zinc exposure response.

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## **RESPONSES OF CYANOBACTERIUM *SYNECHOCOCCUS* SP. IU 625 DURING NICKEL STRESS**

Brian Nohomovich and Tin-Chun Chu

Department Of Biological Sciences, Seton Hall University

Algal blooms are an increasing environmental concern for the developing world. Algal blooms can affect the natural environment and severely impact human health. Cyanobacteria are a major algal bloom former and thrive in nitrate and heavy metal enriched (polluted) environments. The goals of this research project include investigating the mechanism by which cyanobacteria confer defense in these polluted environments. The present study examines nickel resistance in a lab strain of *Synechococcus* sp. IU 625 (*S. IU 625*). Observation of cellular morphology and pigmentation are a proven way to showcase heavy metal induced damage. The growth of the cultures was monitored in nickel chloride concentrations of (0, 10, 25, and 50 mg/L) using a turbidity study and direct count. *S. IU 625* can tolerate nickel stress up to 25 mg/L while the cells exposed to 50 mg/L NiCl<sub>2</sub> showed complete inhibition of cell growth. Microscopic analyses indicated the morphological defect of cells under high concentration of nickel exposure. Intracellular and extracellular nickel concentration throughout study hinted the potential molecular mechanism of *S. IU 625* under nickel stress. qRT-PCR provided preliminary data regarding the expression of a heavy metal resistant gene, metallothionein, as a potential mechanism.

## **WOODPECKERS OF SOUTH MOUNTAIN**

Ian Keyser

Department of Biological Sciences, Seton Hall University

Although most birds display a love for life in trees, it seems the Woodpecker is the most arboreal of them all. Woodpeckers boast a wide range of traits and adaptations that allow them to thrive in greatly wooded habitats. This study is on the behavior and habitat of the species of Woodpeckers found year round in South Mountain Reservation in Essex County, NJ. This includes the Pileated Woodpecker, Red-Bellied Woodpecker, Downy Woodpecker, Hairy Woodpecker, and Northern Flicker. Through observation and library research we are studying the behavior and habitats of these Woodpeckers. Our results so far have indicated the woodpeckers are flourishing on South Mountain, and each species has shown similar, but yet different behaviors around the mountain.

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## **DIRECT EFFECTS OF GLUCOSE AND FRUCTOSE ON PROLIFERATION AND ACTIVATION OF JURKAT T-LYMPHOCYTES**

C.J. Urso\* and Vladislav Snitsarevs

\*Department of Biological Sciences, Seton Hall University

High-fructose corn syrup has been used with increasing commonality in recent decades. During this interval there is strong evidence of increased occurrence of autoimmune disease. We hypothesized that increased glucose and fructose concentration activates T-cells. Using Jurkat T-cells as a model, we found that increased glucose and fructose concentration decreased Jurkat T-cell proliferation and death rates at pH 7.4 (physiologic normal) while at pH characteristic of inflammation (7.2) the above effects did not reach significance. Cells in high glucose and fructose concentration formed clusters that were unbreakable by standard trituration techniques suggesting an increased expression of high-affinity adhesion molecules characteristic of T-cell activation; this effect was more prominent in fructose than glucose formulations. We suggest that chronic exposure of activated T-cells to sustained high sugar concentration may contribute to the development of autoimmune disease via a homeostatic proliferatory response.

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### **IDENTIFICATION OF BLOOM-CAUSING PHYTOPLANKTON IN BARNEGAT BAY**

Nicole Elia and Tin-Chun Chu

Department of Biological Sciences, Seton Hall University

Algal bloom formations are harmful to the environments in which they occur by causing oxygen depletion and releasing toxins. Also known as harmful algal blooms (HABs), these are a result of eutrophication due to high pollution and nutrient availability in the water. Water samples of sixteen sampling sites from Barnegat Bay, along the eastern coast of New Jersey, were obtained and filtered. Chelex® DNA extraction was conducted and specific primers were designed for PCR-based assays to detect the presence of marine phytoplankton species such as cyanobacteria, dinoflagellates, and diatoms. Microscopic observations were carried out to confirm types of marine phytoplankton in combination with PCR assays from previous study. Initial results indicated the two methods are compatible in regard to phytoplankton identification. Cyanophage are viruses that infect cyanobacteria, thus regulating cyanobacterial populations. The identification of cyanobacteria species allowed for further research of corresponding phage in order to better understand natural methods for algal bloom control.

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### **ANTIBACTERIAL EFFECTS OF SPICES ON SELECTED BACTERIA**

Kimberly Bernard, Annamarie Fernandes, Daniel Pinho and Tin-Chun Chu

Department of Biological Sciences, Seton Hall University

Some culinary herbs and spices are known to have antibacterial activity. Clove, cinnamon, garlic, mint, onion, and oregano are used in this study. Major active ingredients in those spices are eugenol, cinnamaldehyde, allicin, menthol, quercetin, and carvacrol, respectively. Stock solutions of spices were prepared with DMSO except for garlic and onion (in dH<sub>2</sub>O) with the range of concentration between 2.5-10%. A total of four bacteria, two gram positive: *Bacillus subtilis*, and *Staphylococcus epidermidis* and two gram negative: *Escherichia coli*, *Pseudomonas aeruginosa*, were used in this study. Disc diffusion method was used to evaluate the antibacterial activity of these spices. Among all spices, garlic showed the best antibacterial effect, followed by cinnamon, onion and clove in most of the bacteria tested. Synergistic antibacterial effects of

selected spices and antiseptics were also evaluated with disc diffusion method while synergistic antibacterial effects of selected spices and antibiotics will be assessed with Kirby-Bauer methods.

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## **NEURAL TUBE DEFECT PREVENTION**

Danielle Kojcevski and Maral Arslan

Department of Biological Sciences, Seton Hall University

Neural tube defect (NTD) is one of the most common birth defects which occur in about one in every 1,000 live births. It is an opening in the spinal cord or brain which occurs in very early human development phase. Even though there are no definite known causes of NTDs, it is believed to be due to a deficiency in folic acid and vitamin B12 and there are other certain risks such as cigarette smoking, maternal diabetes and obesity. Even though there have been studies that display periconceptional folic acid supplementation can prevent 50% or more of NTDs like spina bifida and anencephaly, there have also been experiments that included NTD cases from the National Birth Defects Prevention Study (NBDPS), in order to test diabetes and obesity-related genes and the risk of NTDs. The results suggest that a woman's risk of having an NTD-affected pregnancy may be adjusted as a result of the genetic variants linked with glucose metabolism. There have also been studies on 3 groups of women to determine dietary folate intake through the measure of folic acid, natural folate and total folate. Researchers have studied the effect of obesity, diabetes, and usage of folate supplement on NTDs and have not been able to draw a complete conclusion yet therefore further investigation of folate metabolism and vitamin B<sub>12</sub> and folic acid intake will considerably advise future NTD prevention strategies.

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## **ZINC-FINGER NUCLEASES: BLOCKING HIV'S ENTRANCE**

Jaliris G. Galarza

Department of Biological Sciences, Seton Hall University

Despite the decline in the deaths due to HIV/AIDS, it is still an epidemic that has no current cure. Present antiviral agents are expensive and have many adverse side effects and therefore the requirement for a more targeted approach is needed. With the introduction of ZFNs, researchers can now target genes at the genomic level and develop highly resistant CD4+ T cells to HIV-1. Analyzing two review and five experimental articles, a composite of ZFN activity and results with human cells were summarized. ZFN are promising tools as therapeutic agents; however, require further elaboration and development for its use within human trials. The ZFN could be one of the closest approaches to an actual cure of HIV/AIDS if successful in human trials.

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## **PRE-NATAL SCREENING FOR DOWN SYNDROME**

Olivia Feriozzi

Department of Biological Sciences, Seton Hall University

Prenatal screening in general is important for expectant mothers to be reassured that their fetus is healthy or advised of the health problems it might have. It is important to do studies of prenatal screening for Down syndrome because it is a very common disease and precautions for mothers are helpful during pregnancy. The studies focused on noninvasive screenings versus invasive screening diagnostics. Noninvasive screening has a lower risk factor for causing trauma to the fetus and mother, therefore the research was focused on discovering promising noninvasive techniques. There were five different studies that investigated the different types of noninvasive screening for Down syndrome, the cost efficiency, and the reliability of all the different types of tests. The results concluded that prenatal testing during the 2<sup>nd</sup> trimester of pregnancy can replace the use of invasive testing which is also usually done in the 2<sup>nd</sup> trimester but is more expensive and dangerous. Tests that were done searched for protein biomarkers that showed up in the plasma of women who had known Down syndrome fetuses that did not show as high in the plasma of women with known normal fetuses. The results found nine protein biomarkers used to identify Down syndrome, eight up-regulating proteins and one down-regulating protein. In conclusion, the prenatal testing for Down syndrome noninvasively is becoming more efficient and reliable to expectant mothers at a more efficient price and safer risk.

## **Department of Mathematics and Computer Sciences**

Friday, April 26 2:00 – 2:45 PM Jubilee Hall Atrium

### **STATISTICS FOR SCIENCE STUDENTS POSTERS: A PANEL OF THE TOP FIVE POSTERS PRESENTED FOR STATISTICS FOR SCIENCE**

Faculty advisor: Prof. Daniel Gross

Department of Mathematics and Computer Science, Seton Hall University

Researchers will use surveys as a tool of collecting data about attitudes and self-report experiences. This collection of posters is from one section of Statistics for Science in which the student teams develop a short survey, pilot the survey within the class, deploy the survey to their population of interest, and reporting results of the survey through a poster. The posters will cover topics of interest to health and medical science students.

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### **COMPONENT ORDER CONNECTIVITY OF CIRCULANTS**

Ahmed Arekat , Jonathan Arena, Joseph O'Connor, Joseph Rudinsky, Danielle Schultz, and Paul Sorranno.

Faculty advisor: Prof. Daniel Gross

Department of Mathematics and Computer Science, Seton Hall University



A network consisting of sites and links connecting some of the pairs of sites can be modeled by a mathematical structure called a graph. A graph  $G$  consists of a finite set of vertices  $V$  (corresponding to the sites) and a set of edges  $E$  (corresponding to the links). A graph is connected if it is possible to get from any vertex to any other vertex by following the edges, otherwise it is disconnected. In traditional vulnerability models, a graph is in a failure state if after the deletion of some vertices or some edges; the resulting graph has become disconnected. The vulnerability parameters, connectivity and edge-connectivity, are the minimum number of vertices or edges, respectively, that must be deleted to disconnect the graph. In our work we consider models in which a possibly disconnected graph has not failed as long as it contains at least one connected piece, called a component, containing  $k$  or more vertices, where  $k$  is predetermined. We consider three scenarios:

1. vertices fail and are deleted from the graph, along with incident edges;
2. edges fail and are deleted from the graph;
3. vertices fail and are deleted from the graph, along with incident edges, and when a vertex fails all vertices in its neighborhood are rendered useless (and thus deleted) as well.

Our three corresponding vulnerability parameters are component order connectivity, component order edge-connectivity, and component order neighbor-connectivity. We derive formulas for these parameters for the class of graphs known as circulants. In a circulant the vertices are arranged cyclically and there is an edge between a pair of vertices if their cyclic distance from each other is at most some value  $r$ .

## EVENTS and ORAL PRESENTATIONS

### College of Nursing

Tuesday, April 23 10:30AM – 12:00 PM Nursing Amphitheater, Room 113

#### **A SYMPOSIUM ON GLOBAL HEALTH PROBLEMS IN THE PHILIPPINES: PREVENTION AND TREATMENT STRATEGIES**

Undergraduate Students: Chester Baldonado, Anthony Baysah, Elizabeth Demott, Samantha Domingo, Catherine Jaramillo, Ashley Klangwald, Ashley Nguyen; Faculty: Mary Ann Scharf, ED.D, RN, Kathleen Sternas, PH.D, RN.

College of Nursing, Seton Hall University

Nursing students and faculty participated in study abroad educational experiences in the Philippines in January 2013. This was a collaborative endeavor between the College of Nursing, University of the Philippines and the College of Nursing at Seton Hall University. Nine undergraduate nursing students participated. Nursing faculty organized the study abroad program in collaboration with the Deans of the two Universities. The objectives for the study abroad experience were: to explore community health nursing in urban and rural settings; and explore

cultural experiences in the Philippines. Students learned about health problems and the health care delivery system in the Philippines. This symposium focuses on students' research on health problems in the Philippines, prevention and treatment strategies for health problems, and the students' clinical experiences in the Philippines. Through an independent study, students investigated selected health problems from a global health perspective. Health problems addressed in this symposium are: tuberculosis, malaria, maternal mortality, hypertension and malnutrition. **Presentations will focus on:** Tuberculosis in the Philippines: Prevention and Treatment Strategies and the Role of Nursing Students, Faculty and Health Professionals, Anthony Baysah; Tuberculosis- A Major Health Problem in the Philippines: A Case Study, Elizabeth DeMott; Malaria in the Philippines and Other Countries: Prevention and Treatment Strategies and Roles of the Nurse, Chester Baldonado; Maternal Mortality in the Philippines: Contributing Factors, Incidence and Interventions, Samantha Domingo; Prevalence of Hypertension Among Filipinos Related to Cultural Factors and Beliefs: Preventive Measures and Treatments, Ashley Nguyen; Malnutrition in the Philippines: Contributing Factors and Prevention and Intervention Strategies, Ashley Klangwald and Catherine Jaramillo. Through students' study abroad experiences in the Philippines, they gained a better understanding of health care problems and interventions utilized to solve these problems.

## Oral Presentations

### University Honors Program

Tuesday 4/23 - 10am - 10:45 Fahy Room 131

Thursday 4/25 - 10am - 10:45 Fahy Room 108

Thursday 4/25 - 9:45am - 10:15 Fahy Room 101

#### **THE EXAMINED LIFE: HONORS PROGRAM SENIOR THESES PRESENTATIONS**

Faculty Sponsors: Mary Mountcastle, Judith Stark, Marian Glenn and Drew Halden

University Honors Program, Seton Hall University

Fourth-year Honors students will provide an overview of their senior thesis projects.

Presentations will highlight:

- the various topics the students have been researching;
- their research methods;
- their findings.

Presenters will be encouraged to share their personal sense of the extent to which they succeeded in the original goals of their research and how the thesis process may have changed them or

changed their thinking.

Each student will present for approximately 5-7 minutes with 5 minutes for Q&A between presentations.

## **College of Education and Human Services**

Wednesday, April 24 8:00 AM - 2:00 PM Jubilee Hall Atrium (by invitation only)

**Seton Hall University College of Education and Human Services Welcomes Samuel R. Donald School Grade 4 of Bloomingdale, NJ to**

### *Literacy, Leadership and Learning*

**Wednesday, April 24, 2013**

Faculty: Dr. Paula R. Zaccone ; Dr. Lourdes Mitchel; Dr. Lauren Mc Fadden

Undergraduate students enrolled in courses of Literacy and Leadership will conduct lessons in anti-bullying protection, communication through sign language, and poetry for 4<sup>th</sup> graders who will visit the campus for a full day of activities. Dance Club members will perform and lead the visitors in rhymical movement. A guided campus tour with a stop at the recreation center is among the plans.

## **ORAL PRESENTATION**

### **Professional Psychology/CEHS**

Monday, April 22 3:00 – 4:00 PM Jubilee Hall Room 388

Thursday, April 25 3:00 – 4:00 PM Jubilee Hall Room 388

*Monday, April 22 3:00 – 4:00 PM Jubilee Hall Room 388*

### **FACILITATING COMMUNICATION AMONG SCHOOL-BASED PROFESSIONALS**

Peggy Brady-Amoon<sup>1</sup>, Pledger Fedora<sup>2</sup>, Thomas Massarelli<sup>1</sup>, Lauren B. McFadden<sup>2</sup>, Christopher Tienken<sup>3</sup> and students

<sup>1</sup>Department of Professional Psychology and Family Therapy, Seton Hall University

<sup>2</sup>Department of Educational Studies, Seton Hall University

<sup>3</sup>Department of Education, Leadership, and Management, Seton Hall University

The mission of the College of Education and Human Services (CEHS) at Seton Hall University is to prepare competent, socially conscious, and reflective professionals. For the most part, these

professionals will work in schools, albeit in a variety of ways. Research shows that schools, like other organizations, are more effective when key stakeholders work together well and form a community. The purpose of this presentation is to facilitate communication among school-based professionals, beginning at the student level. We envision this discussion as the first phase in improving interprofessional relations among school-based professionals. Improved interprofessional relations will enhance the sense of school community, which has been shown to enhance student well-being and performance. Given this goal, we propose to begin this presentation with a student panel representing school leadership and management, school counseling, school psychology, and teaching. To begin, panelists will introduce themselves and briefly describe the professional roles and responsibilities to which they aspire. In the second round, panelists will share what they would like other school-based professionals to know about their profession and suggest ways improve interprofessional relations among school-based professionals from their different perspectives. The panelists will then engage in a facilitated discussion about how they can work together better to reach common goals, including student success. Interested audience members will be invited to participate.

*Thursday, April 25 3:00 – 4:00 PM Jubilee Hall Room 388*

**DEFYING THE ODDS: SUPPORTING AT-RISK STUDENTS' BELIEFS, HOPES, ADJUSTMENT, AND ACADEMIC PERFORMANCE**

Peggy Brady-Amoon, Caryn M. Dambra, Taylor C. Sansbury, Denise A. Williams, and Tiara C. Brown, Department of Professional Psychology & Family Therapy, Seton Hall University

Children in far too many schools fail to meet minimum performance expectations, despite the good intentions and dedication of caring individuals both in and out of the school setting (NCES, 2011). Moreover, poor children of color – particularly boys – in urban middle schools are statistically most at risk for school failure (Fenzel, 2009; Noguera, 2008). The purpose of the current study is to examine the influence, individually and collectively, of ethnic identity development status, academic self-beliefs, hope, and adjustment, on the academic performance of a sample of at-risk urban middle school boys. Fifty-two boys enrolled at San Miguel Academy, an independent middle school located in the inner city of Newburgh, NY, participated in the study. Consistent with the mission of San Miguel, all participants are from low socioeconomic status families and identify as African American, Latino, or both. Preliminary results show significant positive correlations between self-efficacy, self-rated abilities, and hope, and between grade point average and standardized test scores. Significant negative correlations were found between ethnic identity and self-efficacy and hope but not between ethnic identity and self-rated abilities or adjustment. However, results of a series of multiple regression analyses do not support the hypotheses that ethnic identity development status, academic self-beliefs, hope, and adjustment account for a significant variance in academic performance for this sample. Our next steps, limitations, implications, and suggestions for future research will be discussed.

## **ORAL PRESENTATION**

### **Department of Mathematics and Computer Sciences**

Friday, April 26 1:00 – 1:45 PM Jubilee Hall Room 118

#### **BIFURCATION BEHAVIOR OF THE LOGISTIC EQUATION WITH FINITE PRECISION**

Stephanie Tokpe

Faculty advisor: Prof. Bert Wachsmuth

Department of Mathematics and Computer Science, Seton Hall University

This talk explores the dynamic properties of different population models including the iterative logistic model. That model, while well understood, is complicated enough to exhibit a number of interesting properties, including periodic and chaotic behavior. We will explore what happens if you restrict that model to a finite set of possible outcomes.

## **ORAL PRESENTATION**

### **Department of Political Science and Public Affairs**

Friday, April 26 4:00 PM Jubilee Hall Room 221

#### **POLITICAL ANALYSIS: A STUDENT JOURNAL**

Student Presenters: Subarna Saha, Andrew Casais, and Jarrod Crockett

Faculty Advisor: Robert Pallitto

This project is a student-run journal of political science and public affairs featuring the scholarly work of SHU students. All functions, from design to content selection to editing and production, have been performed by the student editors.

## ORAL PRESENTATIONS

### Psychology Department Research Symposium

Saturday, April 27, 12:00 – 5:00 PM Jubilee Hall Room 383

Session 1 - 12:00 – 2:00 pm

Session 2 - 2:20 – 5:00 pm

#### **SESSION 1** - 12:00 – 2:00 pm

##### **THE EFFECTS OF TRIPARTITE SELF-CONSTRUAL ON HELPING BEHAVIOR**

Nicole C. Ruser and Susan Teague

Department of Psychology, Seton Hall University

The current study primed participants' independent, collective, or relational self-construals in a between-participants design. Participants were then asked if they would be willing to stay and help with a simple task and if so, for how long. In a preliminary sample of 52 students, there was a trend towards an interaction between gender and priming type on how long participants were willing to help. Among students given the relational prime, women were willing to help longer than men. Among students given the collective prime, men were willing to help longer than women. These findings are consistent with past studies on when and why men and women offer help. Unprimed self-construals, empathy, and agreeableness were measured via self-report surveys administered before the self-construal prime. These variables did not influence the amount of help offered, nor did empathy or agreeableness influence whether or not participants agreed to help at all. Participants who did not agree to help had lower unprimed collective self-construals than those who did agree to help.

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##### **POTENTIAL EFFECTS OF HEMI-FIELD PATCHING ON WHERE BIAS**

Randall Miller and Kelly Goedert

Department of Psychology, Seton Hall University

Spatial neglect is a condition, common amongst stroke patients, that results in a failure to orient and attend to stimuli contralateral to the site of damage in the brain. Cases of neglect are not homogeneous—individuals may have difficulty with perceptual-attentional “where” systems, motor-intentional “aiming” systems or more commonly both in varying degrees. Previous research with neglect patients and healthy populations has shown that using prismatic goggles as treatment improves aiming bias, but has little to no effect on where bias. Conversely, hemi-field patching, another treatment for neglect, shows promise for acting upon the where bias directly. I will present the rationale and design of two experiments that I plan to conduct for my thesis. In both, I will test the effect of hemi-field patching on where and aiming bias in healthy young

individuals. I predict that hemi-field patching will selectively affect where bias. I will discuss potential implications of the results for the treatment of neglect.

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### **ACTIVATION AND SUPPRESSION OF THE INNATE IMMUNE SYSTEM: EFFECTS ON ALCOHOL INTAKE**

Marjorie Levinstein, Katherine Moen, and Michael Vigorito  
Department of Psychology, Seton Hall University

Prior research indicates that immune system activation with a single dose of the bacterial toxin lipopolysaccharides (LPS) causes increased ethanol intake in rodents even three months after an injection. This result suggests that immune system activation may induce a long-term change in behavior. Naltrexone is known to be a partial antagonist on the same toll-like receptors of immune cells that are targeted by LPS. This drug presumably would nullify the LPS effect. In this study, we attempted to replicate the LPS-induced increase in alcohol consumption in rats and investigated the impact of repeated naltrexone treatment on the effects of LPS on subsequent ethanol intake. The animals received one injection of LPS (or saline). For two weeks before and two weeks after LPS treatment, the animals received daily naltrexone or saline injections. LPS did not reliably increase alcohol intake as in previous studies, therefore an intermittent drinking schedule was introduced to further increase drinking rates in all groups. Interestingly, the results of this study indicate that the LPS and naltrexone have an additive effect as the group with both treatments drank the most alcohol.

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### **THE EFFECTS OF REM SLEEP DEPRIVATION ON THE ACQUISITION, EXTINCTION, AND REINSTATEMENT OF A METHAMPHETAMINE-INDUCED CONDITIONED-PLACE PREFERENCE**

Christopher J. Cagna and Amy Silvestri Hunter  
Department of Psychology, Seton Hall University

The present study utilized Sprague-Dawley rats in a conditioned-place preference (CPP) paradigm to investigate the effects of REM sleep deprivation (RSD) during conditioning on the acquisition, extinction, and reinstatement of a methamphetamine (METH)-induced CPP. Acquisition consisted of sixteen days of alternating injections of either METH or saline that were administered every other day and then subsequent isolation to a particular chamber in the CPP apparatus. After METH administration, rats were either deprived of REM sleep for six hours or were allowed to sleep undisturbed in a control condition for six hours. The day after conditioning was concluded, preference for the METH-paired chamber and its possible alteration by RSD was assessed. During the subsequent phase of extinction, all rats were given free access to the entire apparatus until no chamber preference was apparent. Finally, in order to measure the effects of a stressor on the reinstatement of a CPP, rats received either ten unsignaled low-voltage footshocks or no shock treatment. All rats were then tested for preference one final time to evaluate whether the stressor had facilitated a reinstatement of preference for the METH chamber. Data collection and analysis are currently underway, but visual inspection of the data suggests that RSD did not affect either acquisition or extinction. Effects of RSD on reinstatement in this study have yet to be determined.

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## **ENVIRONMENTAL EFFECTS ON WORKING AND REFERENCE MEMORY IN THE RAT**

Kimberly A. Ramos, Anna M. Calka, and Michael Vigorito  
Department of Psychology, Seton Hall University

Environmental enrichment (EE) is a combination of complex physical and social stimulation beyond that which would be received in standard or isolated laboratory housing. Continuous enrichment paradigms have been shown, among other influences, to reduce affective symptoms, protect against detrimental cognitive effects of aging, increase neurogenesis and dendritic branching, and enhance learning and memory. Recently, the preventative effects of enrichment have been considered, specifically relating to drugs of abuse such as amphetamine and opioids (Solinas, Thiret, Chauvet, & Jaber 2010; Stairs & Bardo 2009). This study assesses the effects of restricted daily environmental enrichment on reference memory and working memory, as assessed in the radial arm water maze. Sprague-Dawley rats (N=18) were exposed to either environmental enrichment or isolation for 4 hours/day for 4 weeks prior to and during training. Animals were first trained with non-spatial cues located at the entrance of the maze alleys (Phase 1) and subsequently tested with distal visual spatial cues (Phase 2). Reference and working memory errors were analyzed using a repeated measures ANOVA. The rats were unable to learn the maze when the non-spatial cues were available, but a main effect of days was found for reference memory errors during training suggesting that the animals did, in fact, learn the maze with the distal spatial cues. However, there were no benefits of restricted enrichment on learning.

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## **CONTEXT EFFECTS IN ASSOCIATIVE RECOGNITION MEMORY**

Zoe Ngo and Marianne Lloyd  
Department of Psychology, Seton Hall University

Associative recognition memory and context effects are two lines of research that exist in parallel with little cross talk. Associative recognition tasks ask participants to distinguish the studied associations of two or more items from novel or repaired associations (Cohn & Moscovitch, 2007; Craik & Schloerscheidt, 2011), whereas context effect studies have shown that the recognition of an individual object is improved when presented in its original context (Hollingworth, 2006; Hayes, Nadel, & Ryan, 2007; Kan et al., 2011). According to the dual-process theory, recognition memory can be supported by two processes: familiarity and recollection (for review, see Yonelinas, 2002). Our study investigated what processes support both associative recognition and context memory effects through the use of a speeded recognition test. In two experiments, speed did not have an effect on either memory task, indicating that both tasks might rely on familiarity. This occurred both when participants had to engage in associative recognition as it is traditionally studied (discriminating intact and rearranged pairings) and when the task asked to discriminate familiar and novel objects and backgrounds. In both studies, a reliable context effect was observed. The results suggest that a reinstatement of context facilitates object recognition, which indicates that object and background might be bound as one entity at encoding.



## **SESSION 2 - 2:20 – 5:00 pm**

### **CELL PHONE USAGE IN ANXIOUS SITUATIONS**

Deepak Gera and Susan Teague

Department of Psychology, Seton Hall University

The aim of this study was to determine if there is an interaction between anxiety levels and cell phone usage. What impact does the presence or absence of a cell phone have on anxiety? Participants were told that they would either soon have to give a five minute speech on their adjustment to college to a classroom full of people or that they would have to write a paragraph on the same topic. Then participants were either deprived of their cell phones or no mention was made about cell phone usage. Participants were left in a room to wait. After a period of ten minutes participants were given a state anxiety inventory. Data is still being collected in this study but results seem to suggest the presence of a cell phone in an anxious situation helps alleviate anxiety levels.

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### **THE EFFECTS OF MINDFULNESS ON MEMORY**

Angelica Szani & Marianne Lloyd

Department of Psychology, Seton Hall University

How can mindfulness meditation improve our memory? This study analyzes the impact of brief mindfulness meditation on memory. The study also examines the accuracy of remembering living words (baby, cat) in comparison to remembering nonliving words (slipper, purse). Participants were randomly placed into one of three conditions. All groups read through a study list of 100 words, listened to a 3-minute mindfulness exercise or an audio clip on the history of radio, and then completed a recognition memory task. The memory test consisted of living and nonliving words. Preliminary analysis suggests that mindfulness leads to a stricter criterion placement and thus more conservative responses on recognition tests. Preliminary analysis also indicates a bias towards saying yes to living words over nonliving words.

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### **THE EFFECT OF SELECTIVE ATTENTION ON RECOGNITION MEMORY**

Katherine Moen and Marianne Lloyd

Department of Psychology, Seton Hall University

Previous research focuses on how divided attention effects memory. Divided attention is characterized by completing two tasks simultaneously. Divided attention has been shown to impair memory performance. Dudukovic, DuBrow, and Wagner (2009) found that divided attention during retrieval is harmful to memory. Comparatively less research has been completed on the effect of selective attention tasks on memory, which is characterized by focusing on one stimulus or task while simultaneously ignoring another stimulus or task. The current study examines the relationship between selective attention and recognition memory. Undergraduates completed a recognition memory test with full attention and selective attention. The selective attention paradigm was used in conjunction with multiple test phases to measure the testing effect. Participants viewed 60 outlined objects and then completed a recognition memory test

over both full attention and selective attention objects. Upon completion of the test, participants completed a distracter task for ten minutes followed by a second recognition test. The objects in test two were then coded based on their status in test one (full attention, selectively attended, selectively ignored, untested). The preliminary results of this study will be presented to explain how selective attention effects memory and what factors of attention impair memory and aid or impair the testing effect.

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## **SEX DIFFERENCES IN MOTHER-INFANT INTERACTION**

Klaudia Kosiak<sup>1</sup> and Michael Lewis<sup>2</sup>

<sup>1</sup>Department of Psychology, Seton Hall University

<sup>2</sup>Institute for the Study of Child Development, Robert Wood Johnson Medical School and Rutgers University

Mother-infant interaction was examined in an en-face situation. The paradigm for en-face consists of interacting with infants for 3 minutes in phase 1. In phase 2 interaction ceases for 2 minutes. In phase 3 mothers again interact with infants for 3 minutes. This study involved a total of 122 male and female 2-month-old infants. Significant differences were found in infants' emotional reactions between phases 1 and 3. Infant happiness decreased between phases 1 and 3, while anger and sadness increased. Sex disparities were found such that boys' anger increased more than girls'. Significant differences were also found in maternal behavior between phases 1 and 3. Maternal smiling, direct eye contact, and positive vocalization decreased between phases 1 and 3. Moreover, maternal behavior differed depending on the sex of the child. There was a greater increase in maternal negative vocalization between phases 1 and 3 for boys.

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## **IMPRESSION FORMATION VIA FACEBOOK**

Kishi Patel and Paige Fisher

Department of Psychology, Seton Hall University

With over one billion users, Facebook is a forum through which many people interact daily. Some of these interactions are the only contact individuals have with one another, i.e. there is no face-to-face communication. Facebook and social networking in general offer users a highly controlled environment for self-presentation and an ideal platform for impression management. While previous research has shown correlational relationships between Facebook content, impression formation and narcissism, this study utilized an experimental design to assess how self-promoting content impacts participants' views of the Facebook user and of the participants' own quality of life. All participants received a print out of Facebook page for a sample Facebook user, which either contained self-promoting content in the quotes and interest section and a picture, or neutral content in the same sections and no picture. Once participants viewed the Facebook page print out, they completed the Big Five Inventory questionnaire regarding their impressions of the Facebook user and a self-report quality of life scale. We hypothesize that participants who see Facebook pages with more self-promoting content will rate the Facebook user more positively and their own quality of life less positively than those who see a Facebook page with less self-promoting content.

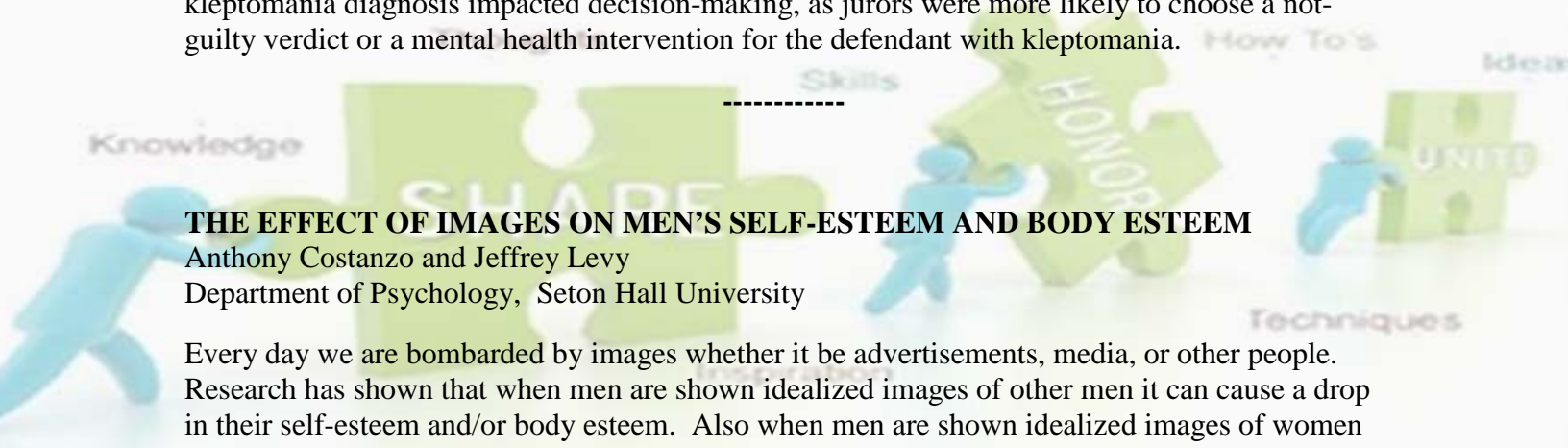
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## **JUROR BIAS IN A MOCK CRIMINAL CASE INVOLVING A DEFENDANT WITH KLEPTOMANIA**

Ally Reeves and Paige H. Fisher

Department of Psychology, Seton Hall University

Jurors should only consider legal factors when making verdict and sentencing recommendations, but their biases can still affect these decisions. For instance, research has found that jurors can be influenced by both the type of defendant mental illness and causal attributions regarding the mental illness, even if jurors have not explicitly been told to consider this information. Given that individuals with kleptomania often experience legal troubles, it is surprising that this mental illness has not received attention in the mock juror literature. The current study employed a mock shoplifting paradigm to investigate both the impact of a kleptomania diagnosis versus no diagnosis and related causal attributions (biological vs. psychological). Results suggest that the kleptomania diagnosis impacted decision-making, as jurors were more likely to choose a not-guilty verdict or a mental health intervention for the defendant with kleptomania.



## **THE EFFECT OF IMAGES ON MEN'S SELF-ESTEEM AND BODY ESTEEM**

Anthony Costanzo and Jeffrey Levy

Department of Psychology, Seton Hall University

Every day we are bombarded by images whether it be advertisements, media, or other people. Research has shown that when men are shown idealized images of other men it can cause a drop in their self-esteem and/or body esteem. Also when men are shown idealized images of women they can become either more anxious or more hostile. However, the research does not cover images that are not idealized or a mixture of gender (i.e. a heterosexual couple). This research seeks to clarify whether men's self-esteem and body esteem are being affected by the idealized image, gender, or both. Participants were asked to remember a series of advertisements for the experiment. These advertisements contained the images the men would be tested on. Men were shown either ideal or non-ideal male individuals, female individuals, or heterosexual couples in the advertisements. After seeing the images participants were given the State Self-Esteem Scale and Body Esteem Scale. They were told to fill it out to discourage rehearsal of the advertisements they just saw. The preliminary results will be presented.



## Department of Chemistry and Biochemistry

**17<sup>th</sup> Annual Departmental Symposium and Poster Session  
in conjunction with the Petersheim Academic Exposition**



**April 23, 2013  
5:00-9:00 PM**

**Science and Technology Center  
Seton Hall University  
South Orange, NJ 07079**

# **Final Presentation of Doctoral Research**

**By**

**Mohammed R. Elshaer**

**Mentor:**

**Dr. James E. Hanson**

**5:45 – 7:00 pm**

**The Helen Lerner Amphitheater, Science Center 101**

# Porphyrin Cross-Linkers for Generating Soluble Molecularly Imprinted Polymers from Polyethyleneimine

Mohammed R. Elshaer

Department of Chemistry and Biochemistry, Seton Hall University, South Orange, NJ 07079

Molecular recognition is vital to many biochemical processes and is at the heart of promising bio-medically related technologies. Molecular imprinting has a long-standing history as a successful method for mimicking the molecular recognition phenomenon exhibited by nature, whereby artificial receptors are prepared for a given target molecule based on synthetic polymers. The molecularly imprinted polymer (MIP) contains a three dimensional network with a memorized cavity specific to the shape and functionality of the templated target molecule. The utility of traditional MIPs has been limited due to an inherent lack of solubility. We have worked toward developing a system that allows for the preparation of soluble MIPs targeting quadruplex DNA, specifically the human telomeric repeat (TTAGGG)<sub>4</sub>. To do so we have synthesized a series of *meso*-substituted, water soluble, tetracationic pyridinium porphyrins which we have successfully coupled to polyethyleneimine (PEI) to form a condensation polyamide. We have demonstrated that one of these porphyrins can be used as an efficient polymer cross-linker forming a unique quadruplex DNA binding site in the polymer network. Unfortunately, the high cationic charge density found on PEI has been found to elicit potential dilemmas in the utility of this method. Attempts have been made to reduce this charge by increasing the cross-linking agent and partially acetylating the PEI. While the network structure of this soluble cross-linked polymer still requires optimization, it has shown promise and demonstrates the opportunities for new soluble molecularly imprinted polymer designs that include quadruplex binding sites.

## Posters of current research of the students of Chemistry and Biochemistry

Science Center Atrium, McNulty Hall, Seton Hall University

Tuesday, April 23, 2013, 7:00 – 9:00 pm

### List of Faculty Mentors

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## **Thermoelectric Cooler Project**

Patrick Albers and Jesus Duran, Weining Wang

Physics Department, Seton Hall University, 400 S Orange Ave, South  
Orange, NJ 07079

Solar Cells among other abundant sources such as wind and hydropower are the future of energy; however due to a multitude of factors, these forms of energy are currently not efficient enough to be used on a large scale. The goal is to determine how to increase polymer solar cell efficiency by manipulating temperature dependent parameters of the solar cell through changes in temperature, open and close voltage, as well as conductivity. Thermoelectric Coolers transfer heat from one side of the device to the other, with consumption of electrical energy, depending on the direction of the current. Essentially the project is to create a temperature regulating device with the heart of the cooling apparatus being the thermoelectric module. A housing also has to be built to setup a proper heat sink. By observing, recording, and manipulating the temperature how this electrical energy can be converted, solar energy may become more efficient in the future.

In order to test the created cells and to accurately compare differences in efficiency through different circumstances, measurement software must be used. A LabVIEW application was developed implementing a Keithley 2400 Sourcemeter which is able to measure the current and voltage readings of the cells over a specified period of time and plot them within the application. Each solar cell will be tested upon an apparatus where a light with properties similar to sunlight will shine upon it. The LabVIEW application will then measure the current voltage readings of the cell and plot them. Each graph will be saved and later compared with each other. This will determine which process creates the most efficient solar cells.

This data would determine the best and most cost effective method in creating a hybridized solar cell capable of self-sustaining energy on a much larger scale than their current use.



## **Binding of Porphyrins to Quadruplex DNA**

Nida Ansari, Ricardo Figueredo, Jonathan Daou, Angelo Marino,

James Hanson, Cosimo Antonacci, Mohammed Elshaer

Department of Chemistry & Biochemistry

Seton Hall University, South Orange, NJ 07079

The most common form of DNA is B-DNA, also known as duplex DNA. DNA is polymorphic and can adopt other structures based on solvent environment and sequence. **Quadruplex DNA** is one example of these non-canonical structures. They are formed by G rich sequences that allow four coplanar G-bases to interact via Hoogsteen base pairing. These interactions can occur in quadruplexes of varying strand stoichiometry: unimolecular, dimolecular and tetramolecular. These quadruplexes are viable drug targets, because they have been implicated in cancer and aging; **Porphyrins** are molecules with similar dimensions to that of a tetrad in the quadruplex. They have the potential to interact with quadruplex DNA through electrostatic interactions, end-stacking or intercalation. Progress towards determining binding of specific porphyrins synthesized by the Hanson group to quadruplex DNA is presented here. The long-term goal is to develop anti-cancer therapeutics and novel molecularly imprinted polymers.

**Ghazaryan, A.A. *Journal of the American Chemical Society*, 2006, **128**, 1914-1921**

**Hurley, H.H; Qin Y. *Biochimie*, 2008, **90**, 1149-1171**

# Substitution of methylene chloride for acetonitrile for the synthesis of rhenium tricarbonyl polypyridyl complexes

Bassir Baxter, Wyatt R. Murphy

Department of Chemistry and Biochemistry, Seton Hall University, South Orange NJ, 07079

Re(5-methyl-1,10 phenanthroline)(CO)<sub>3</sub>(TFMS) was prepared by a modification of literature methods. Earlier methods using acetonitrile and silver triflate led to highly fluorescent impurities. Methylene chloride was substituted for acetonitrile since the former solvent has no Lewis base properties. Physical characterization data for uv-vis, NMR, and fluorescence confirming the structure will be reported.

## References

1. Baiano, John, A.; Carlson, David, L. ; Wolosh, Glenn, M.; DeJesus, Doris, E. ; Knowles, Carla, F. ; Szabo, Edith, G. ; Murphy Jr. W. Rorer *Inorg. Chem* **1990**, *29*, 2327-2332
2. Baiano, John, A.; Murphy Jr. W. Rorer *Inorg. Chem* **1991**, *30*, 4594-4598

## Acknowledgements

1. L'Oreal

## A New Way to Perform Ozonolysis

Christopher Bossert, Christine Koestler, Daniel Guerrero

Jose L. Lopez, Ph.D., John R. Sowa Jr., Ph.D.

Department of Chemistry and Biochemistry, Department of Physics

Seton Hall University, South Orange, NJ 07079

The research was conducted to find better ways to perform an ozonolysis reaction that was less reactive under atmospheric conditions. The project investigated new ways to form ozone based off of Dr. Lopez's, from Seton Hall University's Physics Department, work with the ozone created from plasma generation. Dielectric barrier discharge (DBD) reactors were utilized to synthesize ozone for Ozonolysis reactions. Novel O<sub>3</sub> generation techniques were conceived and applied to improve upon existing Ozonolysis techniques. Potassium iodide and sodium thiosulfate titration techniques are performed to quantize ozone production values. The samples were titrated to quantitatively calculate the amount of ozone produced and to obtain more data. Efficiency of ozone genesis is tested by means of IR and UV spectroscopy. As the ozone was created, better and safer methods were formulated to create ozone. The new methods were tested to be more efficient and available for future experimentation. The outcome of this was to perform ozonolysis reactions on a laboratory scale under ambient and safer conditions.

### Reference:

1. Feiser and Feiser, Reagents for Organic Synthesis, Vol. 1, p. 773.
  2. Klein, D., Organic Chemistry, Wiley, 2011, p. 434-436.
  3. Mundy, B.P., Ellerd, M.G., Name Reactions and Reagents in Organic Synthesis, Wiley, 1988, p. 468.
  4. Mundy, B.P., Ellerd, M.G., Name Reactions and Reagents in Organic Synthesis, Wiley, 1988, p. 412.
- Note: 1 " Ozone is prepared in the laboratory by a special piece of equipment that allows dry oxygen to pass between two electrodes at high voltage.
- Note 2: Ozone can be absorbed on silica gel (4-5 %) by weight where it can be used for reaction.

## **Correlating Roughness to Thickness Temperature in Pulsed Laser Deposition Photovoltaic Thin Films**

Michael C. Brown, Dr. Mehmet A. Sahiner

Department of Physics

Seton Hall University, South Orange 07079

Using a technique called Pulsed Laser Deposition (PLD), different materials such as Cadmium Tellurium and Cadmium Selenium can be applied in a thin layer onto solar cells. Observing these cells with the help of a Scanning Electron Microscope (SEM) is the best method for viewing the layers on the cells and the thickness of those layers. The SEM uses high speed electrons to view objects, so in order to protect the layers on the cells and the cells themselves a thin layer of gold must be placed onto them. This provides maximum protection and also allows for maximum clarity of the picture. After a measurement with the SEM, the cells are tested using X-Ray diffraction (XRD). The aim is to find if there is some correlation to roughness and thickness of a solar cells and to see if they become more efficient with the layers and if they do become more efficient with what material works best.

References:

**Sharma, Bhupendra K., Neeraj Khare, and Shahzada Ahmad. "A ZnO/PEDOT:PSS Based Inorganic/organic Hetrojunction." (n.d.): n. pag. Web.**

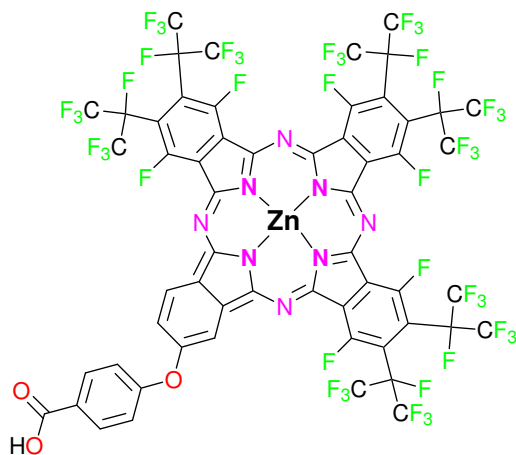
**Luque, Antonio. "Will We Exceed 50% Efficiency in Photovoltaics?" (n.d.): n. pag. Web.**

**Ozgur, U., Ya I. Alivov, C. Liu, A. Teke, and M. A. Reshchikov. "A Comprehensive Review of ZnO Materials and Devices." (n.d.): n. pag. Web.**

## Conjugated Phthalocyanine Biomolecules

Christopher Colomier, Emily Borland and Dr. Sergiu M. Gorun

We report the synthesis of a perfluorinated phthalocyanine functionalized with a carboxylic group for further attachments to other molecules.<sup>1</sup> 1,2-dicyano-3,4,5,6-tetrafluorobenzene, **1**, a precursor to phthalocyanine molecules, was reacted with 4-(3,4-dicyanophenoxy) benzoic acid,<sup>2</sup> **2**, to create the mono-substituted phthalocyanine (Pc) macrocycle with a carboxylic acid functional group, HOOC-Phenox-F<sub>48</sub>PcZn, **3**. The complex was characterized via UV-Vis, IR, Mass Spectrometry, Thin-Layer Chromatography and multinuclear NMR. The UV-Vis exhibited the characteristic Pc absorptions at 708, 670 nm. IR confirmed the presence of the carboxylic acid group, absorptions being noted at 2500, 3000 and 1710 cm<sup>-1</sup>. The absence of signals between 2210 cm<sup>-1</sup> and 2260 cm<sup>-1</sup> confirmed that nitrile groups are no longer present. Mass spectrometry confirmed the presence of the target molecule, MW =1830 g/mol. A chloride complex is also noted. The attachment of peptide to this molecule is reported in a separate poster.



Structural formula of HOOC-Phenox-F<sub>48</sub>PcZn, **3**

### References

1. H. Patel, unpublished results, 2013
2. **2** was prepared via the modification of a literature report, S. Siebel Erdem et al, *J. Org. Chem.* **74**, 9280 (2009)

## **CD Spectra of Quadruplex DNA Bound to Polyethyleneimine**

Nicholas Contey, Phil Penzo, Dr Hanson, Dr Antonacci and Mohammed Elshaer

Department of Chemistry & Biochemistry

Seton Hall University, South Orange, NJ

DeoxyriboNucleic Acid, better known as DNA, is the chemical that contains the genetic code for all organisms in the natural world. This genetic code is responsible for creation of another organism, the organism's features, and for maintaining its traits. DNA is regulated through the use of restriction enzymes, which can also change or "cut" the DNA to make a difference in the genetic code.

As a polymer, DNA can react or bind with many other polymers that are synthetic. Bonding with synthetic polymers, such as polyethylenimine (PEI), are based on the electrostatic attraction of positive and negative charges. This synthetic polymer can form the shape of the DNA and remember its sequence if it bonds correctly while preserving the DNA structure. This bonding makes it possible to begin creating artificial restriction enzymes, which allows DNA to be manipulated and created into desired DNA sequences. To inspect these reactions, Circular Dichroism spectra will observe DNA's chiral shape by measuring the absorbance of light through the DNA strands.

## Synthesis of Sugar Based Chromanes

Olivia (Becca) Dambrosia, Dr. Cecilia Marzabadi

Department of Chemistry and Bio Chemistry, Seton Hall University

The most well-known chroman is  $\alpha$ -tocopherol, which is also the most significant member of the vitamin E family serving as natural lipophilic antioxidant. Due to the medical important of chroman, our objective is the synthesis of molecule that contains carbohydrate fused heterocyclic (pyranochromanes).

Sugar based chromans are uniquely structured and can be manipulated to aid cancer cells in the process of deterioration. The deprotection of Tri- Acetyl D-Glucal adds as the first step to making D-Glucal itself. The benzylation step produces benzyl ethers which is more stable under acidic and basic conditions and their susceptibility to cleavage to the alcohols by hydrogenolysis and it will be used as starting material for the synthesis of pyranochromanes

### References:

- 1-Marimuthu Anniyappan , D. Mmuralidharan and Paramasivan T. Perumal Teyrahedron 2002,58,10301-10307
- 2- Senthil Kum ar, Ragagopal Nagarajan, ParamasivamT.Peerunal. J.Org.synth.2004, 6, 949-959

## Air as Carrier Gas for Gas Chromatography Using Ionic Liquids as Stationary Phase

Isaac D'Amico, Ramkumar Dhandapani, and Nicholas H. Snow

Department of Chemistry and Biochemistry, Center for Academic Industry Partnership, Seton Hall University, South Orange NJ 07079

An **ionic liquid** (IL) is a salt in liquid state. ILs contain a cation, an anion and a linkage group offering unique solvent properties. They are interesting as a stationary phase in gas chromatography (GC), as they have low volatility, can withstand high temperatures, contain no active hydroxyl, are highly polar and are resistant to damage caused by moisture and oxygen. In the present experiment, air is used as a carrier gas, with an SLB-IL100 column. To understand the kinetics and to justify the suitability of air being used as a carrier gas, Van Deemter plots were constructed. The study shows that the IL stationary phases not only offers unique selectivity, but also exhibited high stability and expected efficiency as a stationary phase, with the use of air as the carrier gas.

### Reference

- 1) Ahrens, C. Donald. *Meteorology Today: An Introduction to Weather, Climate, and the Environment*; Cengage Learning: 2007.
- 2) McNair, Harold M. & Miller, James M. *Basic Gas Chromatography: Techniques in Analytical Chemistry*; John Wiley & Sons Inc.: New York City, New York, 1998.
- 3) Supelco Ionic Liquid GC Columns  
[http://www.sigmaaldrich.com/etc/medialib/docs/Supelco/Posters/1/ionic\\_liquid\\_gc\\_columns.Par.0001.File.tmp/ionic\\_liquid\\_gc\\_columns.pdf](http://www.sigmaaldrich.com/etc/medialib/docs/Supelco/Posters/1/ionic_liquid_gc_columns.Par.0001.File.tmp/ionic_liquid_gc_columns.pdf)
- 4) Grob, Robert L. Ph.D. & Barry, Eugene F. Ph.D. *Modern Practice of Gas Chromatography*, Ed. 4; Wiley; New Jersey, 2004.
- 5) Chromedia: Chromatography Knowledge Base  
<http://www.chromedia.org/chromedia?waxtrapp=yqegzCsHqnOxmOIIecCbC&subNav=wnjedDsHqnOxmOIIecCbCmF>



## Binding of Porphyrins to Quadruplex DNA

Jonathan Daou, Dr. James E. Hanson

Research for Professor Dr. James E. Hanson

### Abstract

DNA are polymeric structures which includes a backbone. Its backbone is made up of phosphodiester groups and sugars. Bases are attached to the sugars. The bases are adenine, thymine, cytosine, and guanine. DNA is duplex, which means that it consists of two antiparallel polymers/strands. The strands are wrapped around each other forming a double helix. The bases are in the middle of the double helix. Porphyrins are a group of organic compounds. They are mostly made naturally.

If DNA is filled with guanine and adenine bases, it can form quadruple stranded structures. The structures can have multiple shapes. The shape depends on the number of separate DNA strands it was created from as well as the arrangements. For example, the structures can have been created from one, two, three, or four separate DNA strands. Their arrangements can be either oriented parallel, antiparallel, or mixed. The DNA's shapes can be changed by modifying the cations that are linked with the DNA. We will be investigating the binding of a variety of cationic porphyrins to different quadruplex DNA structures.

### References

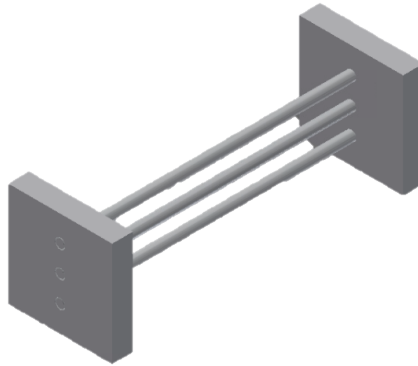
1. Stryer, L *Biochemistry*, W.H. Freeman, New York: 1986
2. "Imprinted polymer layer for recognizing double-stranded DNA" Slinchenko, O.; Rachkov, A.; Miyachi, H; Ogiso, M.; Minoura, N. *Biosensors and Bioelectronics* **2004**, 20, 1091.
3. "Porphyrin." *Wikipedia*. 12 March 2013. 18 March 2013. < <http://en.wikipedia.org/wiki/Porphyrin>>.

## The Reliability of Machined Microplasma Reactors

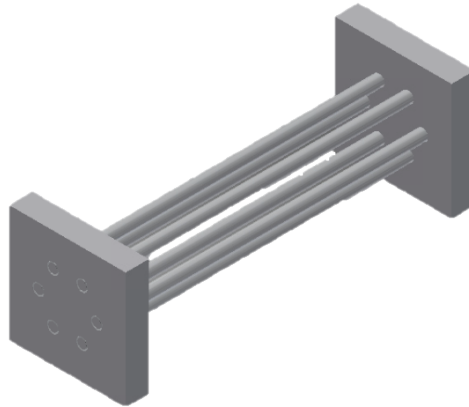
Zachary Darby, Dr. Jose Lopez

Seton Hall University

Since many microplasma reactors are made by hand, discrepancies occur between reactors very often. This experiment will be conducted to see what effect using a computer numerical control (CNC) milling machine in the construction of prototype microplasma reactors has on the performance of the identical reactors. Two designs will be used; a straight line design and a circular design. First, prototype microplasma reactors will be designed using a computer aided design (CAD) software. These CAD drawings will then be converted into machine code understood by the CNC milling machine through the use of a computer aided manufacturing (CAM) program. Next, the CNC milling machine will create the designs, according to the machine code it receives, in polyetheretherketone (PEEK) blocks. Thirty blocks of each design will be made, which will provide the shape of fifteen microplasma reactors. Tungsten rods, covered by quartz tubes, will be used as the cores of the reactors. Each reactor will be analyzed through electrical tests, digital imaging, and emission spectroscopy.



**Figure 1: Straight Line Design Reactor**



**Figure 2: Circle Design Reactor**

### REFERENCES

1. Jose L. Lopez. (2013). Microplasmas: An Emerging Field of Plasma Science & Technology. Presentation. Seton Hall University.
2. Marat Orazov, Yukinori Sakiyama, David B. Graves. (2012). Wound Healing Modeling: Investigating Ambient Gas Plasma Treatment Efficacy. Presentation. [graves-lab.cchem.berkeley.edu/upload/MRS%2520Modeling%2520of%2520Plasma%2520Assisted%2520Wound%2520Healing\\_Marat\\_Orazov\\_4\\_11\\_2012.pdf](http://graves-lab.cchem.berkeley.edu/upload/MRS%2520Modeling%2520of%2520Plasma%2520Assisted%2520Wound%2520Healing_Marat_Orazov_4_11_2012.pdf)
3. James Schultz. (2002). Cold Plasma Ignites Hot Applications. Article. <http://ww2.odu.edu/ao/instdv/quest/ColdPlasma.html>

## Synthesis and Evaluation of *p*-Dichloromethyl Anisole

Kristen Drake, Emi Hanawa, and Dr. Cecilia Marzabadi

Department of Chemistry and Biochemistry, Seton Hall University

Epilepsy is a brain disorder in which a person has repeated seizures over time, which can result in changes of attention or behavior. The problem with antiepileptic drugs is many patients have seizures that are resilient to the traditional drugs, which primarily target ion channels or postsynaptic receptors. Although antiepileptic drugs do ease some symptoms of epilepsy, some patients experience depression and other affective disorders. Previously we have shown that carbohydrate-based drugs can treat brain disorders, including epilepsy. Our lead compound contains a carbohydrate with a 4,6-benzylidene group. Unfortunately, established methods for the installation of the benzylidene group use acid conditions and our compound is unstable under these conditions. For this reason, we needed to develop a new method to prepare the 4,6-benzylidene derivative.  $\alpha,\alpha$ -Dihalo aromatic compounds (*gem*-dihalides) are widely used in synthetic organic chemistry. *p*-Dichloromethyl anisole is a very important reagent for basic benzylidenation of glycals such as D-glucal. However, *p*-dichloromethyl anisole is usually not commercially available in the United States. *p*-Dichloromethyl anisole will be synthesized a few ways, and purified using thin layer chromatography and column chromatography. The best preparative method will be determined. Compounds prepared using our methodology will be tested to screens for epilepsy.

### References and Acknowledgements

Kabalka, George W and Zhongzhi Wu. "Conversion of Aromatic Aldehydes to *gem*-Dichlorides Using Boron Trichloride. A New Highly Efficient Method for Preparing Dichloroarylmethanes." **Tetrahedron Letters**. (2000), 41, 579-581.

Matveeva, E.D., A.S. Erin, A.G. Osetrov, I.F. Leshcheva, A.L. Kurts. "Chemo- and Stereoselectivity of the Reaction of Aromatic Aldehydes with Triphenylphosphine and Trichloroacetic Acid Derivative." **Russian Journal of Organic Chemistry**. (2006), 42, 388-392.

## **Expression and NMR Characterization of TRPV1, TRPM8, and FADD**

Kimberly Esquerro and Francesca Romeo, Dr. Yufeng Wei

Department of Chemistry and Biochemistry

Seton Hall University, South Orange 07079

This research is designed to analyze the structure and dynamics of three proteins: TRPV1, TRPM8, and FADD. TRPV1 and TRPM8 are involved in the pain pathologies of the body, while FADD interacts with Caspase 8 to induce apoptosis. TRPV1 and TRPM8's C-terminal domains (CTD) are specifically being investigated as they are thought to be responsible for the channel's regulation. Their CTDs were isolated, grown in LB broth solution, and cloned into pET28b expression vectors. Further protein expression is currently under process; yet once completed, NMR inspection of the TRP channels' dynamics and structural homologies, which are currently lacking in knowledge, will allow for greater understanding of the proteins' properties dealing with body's pain pathologies. FADD 1-88 and FADD 6-His were cloned and successfully expressed in a minimal media using IPTG reagent. They were obtained and purified and are ready for study under NMR. Understanding the structure of FADD and its interaction with Caspase 8 to induce apoptosis will give way to further cancer research in respect to how FADD is affected by cancer.

### **Acknowledgements:**

A special appreciation is given to Dr. Yufeng Wei and Edward Twomey for their instructions and guidance throughout the project; their patience never failed. Without them the research would be nowhere.

# The Synthesis and Characterization of Rhenium Complexes to Determine the Nature of Excited State Processes

Kiersten Fowler, Dr. Wyatt Murphy (Mentor)

Seton Hall University and L'Oreal

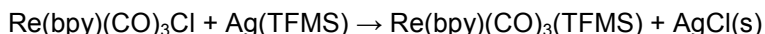
The photophysics of tricarbonylpolypyridylrhenium(I) complexes is of continuing interest in the inorganic community. By observing how they absorb and emit light in a steady state and in a time resolved fashion, one will be able to determine the nature of the excited state processes. This research may lead to the use of these complexes in photocells and solar energy.

The research has focused on the synthesis of a homologous series of complexes consisting of rhenium(I) with three carbonyls, a bidentate aromatic heterocycle, and an additional Lewis base. The starting material was prepared by the pyrolysis of  $\text{Re}(\text{CO})_5\text{Cl}$  and 2,2'-bipyridine (bpy) in toluene. The chloride was substituted with 4-methylpyridine and 4-ethylpyridine to increase the ligand field strength.

The basic synthetic pattern began by reacting pentacarbonylchlororhenium(I) with 2,2'-bipyridine (or a variant) in refluxing toluene.



(where bpy = 2,2'-bipyridine). The chloro ligand was exchanged for a substituted pyridine via double replacement with silver trifluoromethanesulfonate (TFMS) in methylene chloride.



The product was isolated by concentrating the sample on a rotary evaporator followed by a vacuum filtration. The subsequent derivatization with dimethylaminopyridine or 4-ethylpyridine was accomplished by reacting the TFMS complex with excess ligand in methylene chloride. The purity of the product was determined by thin layer chromatography.

The characterization of the products will be done initially by determining the electronic absorption properties, specifically absorption maxima and extinction coefficients will be measured. The NMR spectrum has been measured in deuterated acetone. The oxidation and reduction potentials will be measured on a BAS CV50W electrochemical analyzer. Luminescent properties will be determined on a Horiba FL111 with single photon counting capability for time resolved measurements.

The results obtained in the spectroscopic and electrochemical measurements will be analyzed graphically to determine 1). The extent of charge transfer 2). The energy of the absorption and emission 3). The excited state lifetime 4) and the non-radiative decay properties. This information will be used to help improve materials used to capture solar energy.

## References and Acknowledgments

1. Baiano, J. A. Ph.D. Dissertation, Seton Hall University, 1992.
2. Munley, Michael, Ph. Dissertation, Seton Hall University, 1994.

## **The Structural Determinants of Oncogene Overexpression in Acute Lymphoblastic Leukemia**

Lais Ghiraldeli, Cosimo Antonacci, PhD

Department of Chemistry and Biochemistry

Seton Hall University South Orange, New Jersey

In Acute Lymphoblastic Leukemia (ALL), literature indicates protein overexpression may be linked to disease progression. Our bioinformatics work indicates the promoter region of overpressed proteins are rich in sequences capable of forming non-canonical base pairing motifs leading to G-quadruplex DNA structures. Model oligomers representing these G-rich sequences have been obtained from commercial sources, treated to form quadruplexes and tested using biophysical methods including Native PAGE, UV-Vis Spectroscopy and Circular Dichroism Spectroscopy. The results presented herein provide a framework to engage in studies seeking to resolve the relevant structures. Once these structures are well defined, the research can be better directed at potentially identifying molecules to target the structures.

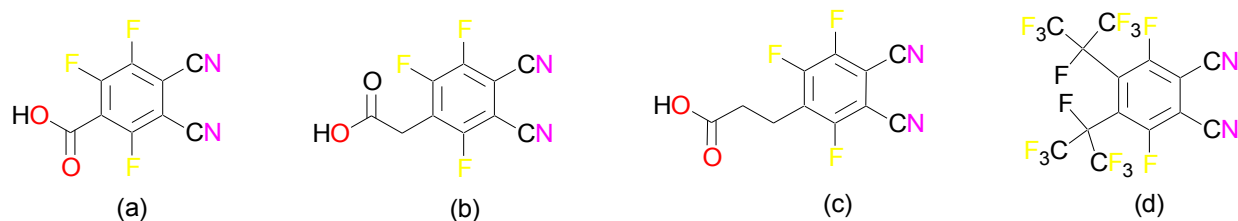
## Fluorinated Carboxy-Phthalonitriles, Functional Metallo-Phthalocyanines Precursors

Patrick Heintz, Hemantbhai Patel and Sergiu M. Gorun

Department of Chemistry and Biochemistry, Seton Hall University, South Orange, NJ 07079

Anchoring perfluorinated, metallo-phthalocyanines, catalytically active molecules could take place only via their metal centers, a process that may interfere with their catalytic properties. We report here the formation of new fluorinated phthalonitrile precursors building blocks, which provide functional anchoring points linked to the organic macrocycle. Carboxylic acid groups have been attached to fluorophthalonitriles using carbon chains of 0, 1 and 2 atoms lengths, as shown in Figure (a), (b)<sup>1</sup> and (c), respectively. These molecules have been characterized by <sup>1</sup>H and <sup>19</sup>F NMR, Mass spectroscopy, IR and single-crystal X-ray diffraction analysis.

The combinations of these functionalized precursor with a perfluorinated one, (d)<sup>2</sup>, will result in functionalized fluoro-phthalocyanines. Such materials may also exhibit enhanced solubility in water, as well as the ability to couple with other molecules.



### References

1. Ikeno, Ikuyo; Assignee Nippon Shokubai Kagaku; Kogyo Co., Ltd., Japan 2000. Nov 28, 2000; JP 2000327652 A (Japanese patent)
2. Gorun, S. M.; Bench, B. A.; Carpenter, G.; Beggs, M. W.; Mague, J. T.; Ensley, H. E. *J. Fluorine Chem.* **1998**, *91*, 37.

### Acknowledgements

The financial support of the National Science Foundation is gratefully acknowledged

## Understanding how *S*-Naproxen functions as a chiral auxiliary for stereochemical analysis of Alcohols

Anna C. Ivashko, Dr. John R. Sowa

Dr. John R. Sowa, Department of Chemistry and Biochemistry Seton Hall University, South Orange NJ 70079

### Abstract:

In this study, the precise effect of *S*-Naproxen (*S*<sup>\*</sup>) as a chiral auxiliary for stereochemical analysis of chiral alcohols. For example, NMR, GC, HPLC shows dramatic differences in chemical analysis of *R* and *S* enantiomers of alcohols when they are coupled to *S*-Naproxen (*S*<sup>\*</sup>). To better understand the dramatic effect diastereomerically pure samples of *R*-*S*<sup>\*</sup> and *S*-*S*<sup>\*</sup> isomers of 2 chiral alcohols was prepared and x-ray diffraction quality crystals was grown. X-ray diffraction studies were performed in collaboration with Prof. Roger Lalancette (Rutgers-Newark). Chiral alcohol 2-pentanol is then coupled with *S*<sup>\*</sup> using carbodiimide reagent EDCI and dimethylaminopyridine (DMAP). Diastereoseparation of a series of chiral alcohol-*S*-Naproxen(*S*<sup>\*</sup>) esters was performed on achiral HPLC columns with satisfactory resolutions. *S*<sup>\*</sup> was at first coupled with racemic mixtures of *R/S*-pentanol and then *R/S*-octanol which are two pairs of enantiomers to provide the respective *R*-*S*<sup>\*</sup> and *S*-*S*<sup>\*</sup> diastereomers.

### References and acknowledgements:

Li, Li,<sup>a,b</sup> Ruoqiu Wu,<sup>a</sup> Erin Sharp-Williams,<sup>a,b</sup> Thomas Kovach,<sup>a</sup> Jennifer Colsant,<sup>a</sup> Richard Thompson,<sup>c</sup> Peter W. Carr,<sup>d</sup> John R. Sowa, Jr.\*<sup>a</sup> "Direct Use of *S*-Naproxen as a Chiral Auxiliary for Stereochemical Analysis of Chiral Alcohols by RP-HPLC on C18 Modified Silica and Polybutyldiene Coated Zirconia Phases" <sup>a</sup>Department of Chemistry and Biochemistry, Seton Hall University, South Orange, NJ 07079 <sup>b</sup>Current address: Analytical Research Department, Bristol Myers Squibb, New Brunswick, NJ 08903 <sup>c</sup>Current address: Ben Venue Laboratories, Inc., Boehringer Ingelheim, Bedford, OH 44146 <sup>d</sup>Department of Chemistry, University of Minnesota, Minneapolis, MN 55414



# **Analysis of steroids in water using Solid Phase Microextraction coupled to Gas Chromatography Triple Quadrupole Mass Spectrometer**

Jin Kim, Shilpi Chopra, Nicholas H. Snow

Department of Chemistry and Biochemistry, Center for Academic Industry Partnership

Seton Hall University, South Orange, NJ 07079

Steroids have been the cause of acute problems in society both physically and psychologically. Moreover, they have an adverse impact on aquatic life when introduced into water systems via sewage. In this work, steroids in water were extracted using Solid Phase Microextraction (SPME) technique. SPME utilizes polymer coated fused silica fibers to isolate the steroid solutes from water. The steroids are then injected into Gas Chromatography Mass Spectrometer and Gas Chromatography Tandem Mass Spectrometer (GC-MS-MS), often known as Gas Chromatography Triple Quadrupole Mass Spectrometer (GC-QQQ) for analysis. The steroids were well separated with the help of the high sensitivity and selectivity of GC-QQQ. Validation parameters: calibration curves were generated and the precision, Limit of Detection and Limit of Quantification were evaluated.

## **References**

1. Harold M. McNair, James M. Miller. Basic Gas Chromatography, John Wiley&Sons, New York, 1997; pp.3-6
2. Shilpi Chopra. Analysis of designer steroids using SPME with GCxGC-TOFMS and GC MS/MS. Ph.D. Seton Hall University. 2013.
3. Edmond de Hoffmann, Vincent Stroobant. Mass Spectrometry Principles and Applications, Wiley, West Sussex, 2007

## **Acknowledgement**

1. Thermo Scientific
2. Supelco
3. Samefi – Aventis Foundation

## **Correlating Roughness to Thickness/Temperature in Pulsed Laser Deposited Photovoltaic Thin Films**

Authors: Arya Nabizadeh, Mike Brown, Dr. Sahiner

Department of Physics

This research correlated roughness of Photovoltaic Thin Films to thickness, temperature, and pressure, to produce a more effective Photovoltaic Thin Film. This will induce a larger energy yield in solar panel and will further advance the technology used in them. This was done by methods of Pulsed Laser Deposition using Cadmium Tellurium or Cadmium Selenium targets deposited on top of Zinc Oxide onto Indium Tin Oxide (ITO) coated glass. The temperature of the apparatus, the thickness of the thin film, and pressure was controlled. Methods of measurements were X-ray diffraction scaling (XRD); Ellipsometer for thickness; and Scanning Electron Microscopy for roughness. The data were conglomerated into a single statistic yielding the most optimum thickness, pressure, temperature, and roughness for solar technology.

## CD Spectra of Quadruplex DNA Bound to Polyethyleneimine

Phillip Penzo, Dr. Cosimo Antonacci, Mohammed Elshaer, Dr. James Hanson,

Seton Hall University South Orange, NJ 07079

This research is designed to collect and analyze quadruplex DNA strands bound with polyethyleneimine (PEI) using CD spectra. This produced results that involve the manner how PEI interacts with DNA. DNA can form quadruple stranded structures if the sequences are rich in guanine bases. These quadruplex structures adopt a variety of conformations, depending on whether they come from one, two, three, or four separate DNA strands, and if the strands are oriented parallel, antiparallel, or in a mixed arrangement. Changes can be made to this DNA by altering the configurations of cations. Since PEI is a positively charged polymer it bonds very well to the negatively charged DNA. The results are a DNA strand that has lipid chains attached to it, which the PEI adds when they react. This would then allow for the integration of DNA strands into cells. Results were recorded regarding the effects of the cationic polymer PEI on a variety of DNA quadruplex structures.

### References:

1. Stryer, L Biochemistry, W.H. Freeman, New York: 1985
2. "Recognition of the DNA minor groove" Dervan, P.B.; Edelson, B.S. *Current Opinion in Structural Biology* 2003, 13, 284
3. "Imprinted polymer layer for recognizing double-stranded DNA" Slinchenko, O.; Rachlov, A; Miyachi, H; Ogiso, M; Minoura, N. *Biosensors and Bioelectronics* 2004, 20, 1091.
4. "A comparison of the effectiveness of cationic polymer polylysine and polyethyleneimine for viral delivery of plasmid DNA to bone marrow cells" Farrell, L; Pepin, J.; Kucharski, C.; Lin, X.; Xu, Z.;Uludag, H. *European Journal of Pharmaceutics and Blopharmaceutics*, 2007 in press.
5. "Copolymers of N-vinylpyrrolidone as gene transfer agents" Wetering, P.; Schuuramns, N.; Steenbergen, M.; Crommelin, D.; Hennink, W. *Journal of Controlled Release* 200,64, 193.
6. Hyaluronan microspheres for sustained gene delivery and site-specific targeting" Yun, Y.H.; Goetz, D.J.; Yellen, P.; Chen, W. *Biomaterials*, 2004, 25, 147.
7. "Toward Artificial Developmental Regulators" Arndt, H.' Hauschild, K; Sullivan, D; Lake, K; Dervan, P.B.; Ansari, A.Z. *Journal of the American Chemical Society*, 2003,123,13322.

## **The Binding of DNA Quadruplexes to Porphyrins**

Ricardo Figueredo, Dr. Cosimo Antonacci, Dr. James Hanson, Nida Ansari

Seton Hall University South Orange, New Jersey

Department of Chemistry and Biochemistry

The most common form of DNA is B-DNA. DNA is polymorphic and can adopt other structures based on the solvent environment and its sequence. One example of the non-canonical structures is Quadruplex DNA. These DNA are formed by G rich sequences that allow four coplanar G-bases to interact through Hoogsteen base pairing. These interactions can occur in quadruplexes of varying strand stoichiometry: unimolecular, dimolecular and tetramolecular. These quadruplex DNAs are viable drug targets because they have been implicated in cancer and aging; Porphyrins are molecules with similar dimensions to that of a tetrad in the quadruplex. These Porphyrins can use electrostatic interactions, end-stacking, or intercalation to interact with quadruplex DNA. Progress towards determining binding of specific porphyrins synthesized by the Hanson group to quadruplex DNA is the short-term, experimental goal. The long-term goal is to develop anti-cancer therapeutics and novel molecularly imprinted polymers.

# Synthesis and Characterization of C-H Bonds Free Aluminum Fluorophthalocyanines

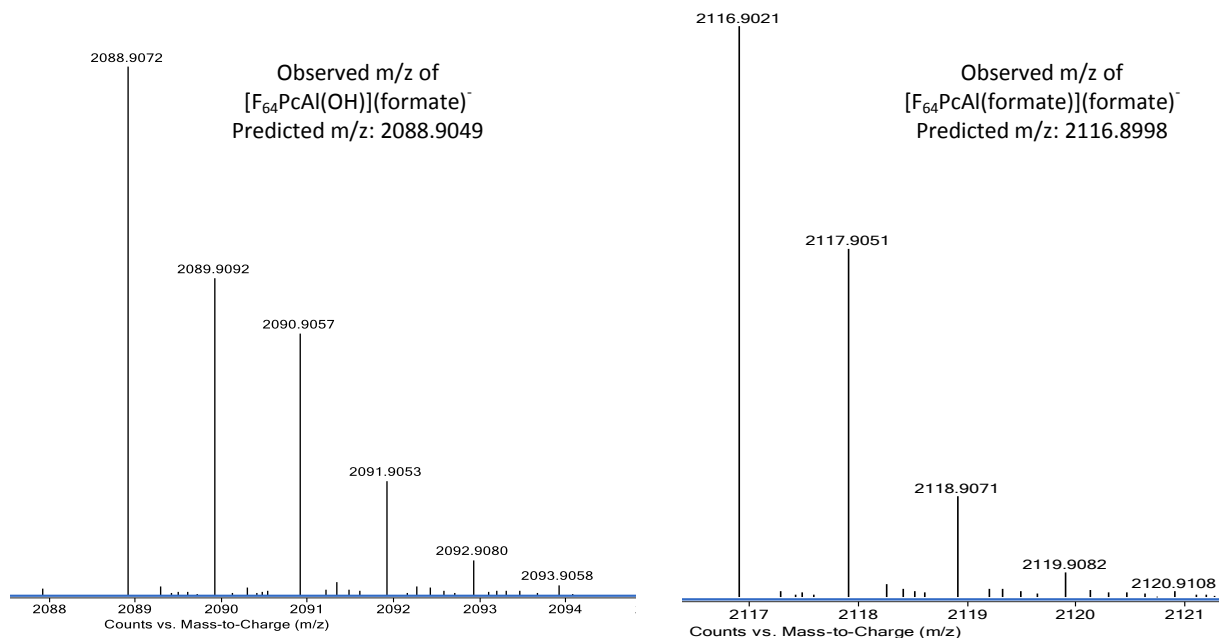
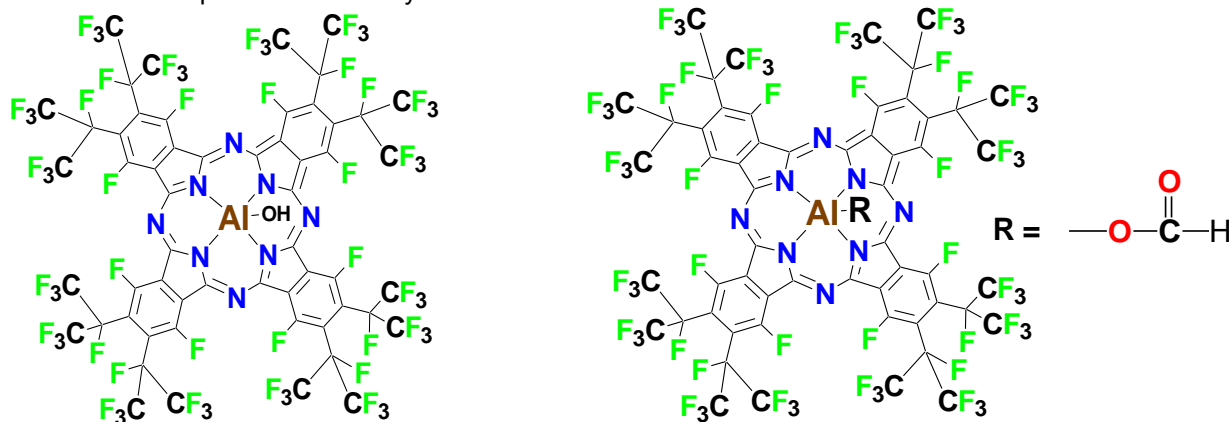
Jessica L. Thomulka, Shannon V. Dugan and Sergiu M. Gorun

Department of Chemistry and Biochemistry

Seton Hall University South Orange, NJ 07079

Aluminum (III) based fluorinated phthalocyanines are the first representatives of a new class of molecules, distinguishable from previously published complexes that contained M(II) metal centers: M = Zn, Co, Cu. Such diamagnetic complexes could be used for photocatalysis as well as photodynamic therapy.

We report here the first two examples of aluminum fluorophthalocyanines,  $[F_{64}PcAl(\text{anions})]$  synthesized using microwave technology by reacting a fluorinated phthalonitrile precursors with  $Al(OH)_3$  in nitrobenzene. The reaction is catalyzed by ammonium molybdate,  $(NH_4)_2MoO_4$ . The complexes exhibit UV-Vis spectra diagnostic of phthalocyanines, with Q bands at approximately 684 nm. The mass spectra confirm the identity of both the hydroxy complex as well as the formate one. The latter is formed *in situ* when the hydroxide complex is dissolved in acetonitrile spiked with formic acid, in preparation for the mass-spectrometric analysis.



## Acknowledgements

The Department of Defense and the Clare Booth Luce Foundation are thanked for the support of this work. The mass spectrometry facility of the University of Michigan is thanked for the mass-spec data.

## **DNA-binding Phthalocyanines**

Janelle Zulueta, Dr. Cosimo Antonacci, Dr. Sergiu M. Gorun

Department of Chemistry and Biochemistry  
Seton Hall University, South Orange, 07079

Cancer cells grow at a rapid rate which makes them hard to contain and treat. To make treatment of this mutation more non-invasive, photodynamic therapy was created. This type of therapy involves the specific targeting of the DNA. When light of a specific energy irradiates the compound, it has potential to create singlet oxygen and degrade DNA its vicinity. These compounds called phthalocyanines are have this capacity to create singlet oxygen and are possible compounds for this therapy. To test these compounds, samples of DNA were tested to determine their compatibility with each other. The focus of this research is the determination of the specificity for a given type of DNA secondary structure and to discover the effects that the photo-generated singlet oxygen will create on the targeted DNA. The research group present here the progress toward assessing the binding of new phthalocyanines to a variety of DNA structures in order to assess the utility of these compounds for photodynamic therapy.

**Progress Toward the Development of a Promoter Assay for an Overexpressed Acute  
Lymphocytic Leukemia Protein**

**Ahmed Osman, Taryn Heiser, Cosimo Antonacci, PhD**

**Seton Hall University, Department of Chemistry and Biochemistry**

Acute Lymphocytic Leukemia (ALL) is a type of cancer in blood tissue and bone marrow that is more prevalent in children. One protein of interest is overexpressed and may be correlated to ALL disease progression. Related to this research, quadruplex DNA is formed from Hoogsteen base pairs in G-rich sequences. Quadruplex DNA has been implicated in a variety of eukaryotic oncogene promoter sites. We present here our efforts to create a reporter plasmid which will be used to test the importance of these possible quadruplex structures in the overexpressed protein promoter.

## **DNA-binding Phthalocyanines**

Janelle Zulueta, Dr. Cosimo Antonacci, Dr. Sergiu M. Gorun

Department of Chemistry and Biochemistry  
Seton Hall University, South Orange, 07079

Cancer cells grow at a rapid rate which makes them hard to contain and treat. To make treatment of this mutation more non-invasive, photodynamic therapy was created. This type of therapy involves the specific targeting of the DNA. When light of a specific energy irradiates the compound, it has potential to create singlet oxygen and degrade DNA its vicinity. These compounds called phthalocyanines are have this capacity to create singlet oxygen and are possible compounds for this therapy. To test these compounds, samples of DNA were tested to determine their compatibility with each other. The focus of this research is the determination of the specificity for a given type of DNA secondary structure and to discover the effects that the photo-generated singlet oxygen will create on the targeted DNA. The research group present here the progress toward assessing the binding of new phthalocyanines to a variety of DNA structures in order to assess the utility of these compounds for photodynamic therapy.



## Preparation of silica core-shell particles with ordered mesoporous silica thin films.

Kyle W. Eckenroad and Alexander Y. Fadeev

Seton Hall University

In this work, we developed preparation methods for particles that consisted of a solid silica core and a mesoporous silica shell, core-shell particles. These particles are of interest for applications in adsorption, separations, and chromatography. We prepared core-shell particles using a polymer-templated sol-gel synthesis that closely mimicked the synthesis initially proposed by Stucky et al.<sup>1</sup> A series of SBA-15 thin films were prepared through the condensation of tetraethoxysilane (TEOS) in the presence of Pluronic 123 and nonporous silica seed of different sizes (0.5  $\mu\text{m}$ , 1.0  $\mu\text{m}$  and 10  $\mu\text{m}$ ). The radius of curvature of the particles will create different pore structure which may be more energetically favorable with decreasing radius. The isolated materials have been characterized by nitrogen adsorption and TG. The preliminary data demonstrated the formation of core-shell particles based on the increased BET surface area and the presence of hysteresis loops in the adsorption/desorption isotherms. The effect of P123 concentration, the initial age time, and reaction age time have been investigated. The concentrations of P123 and seed have both shown to have significant effects possibly increasing film thickness with decreasing P123 concentration and seed loading.

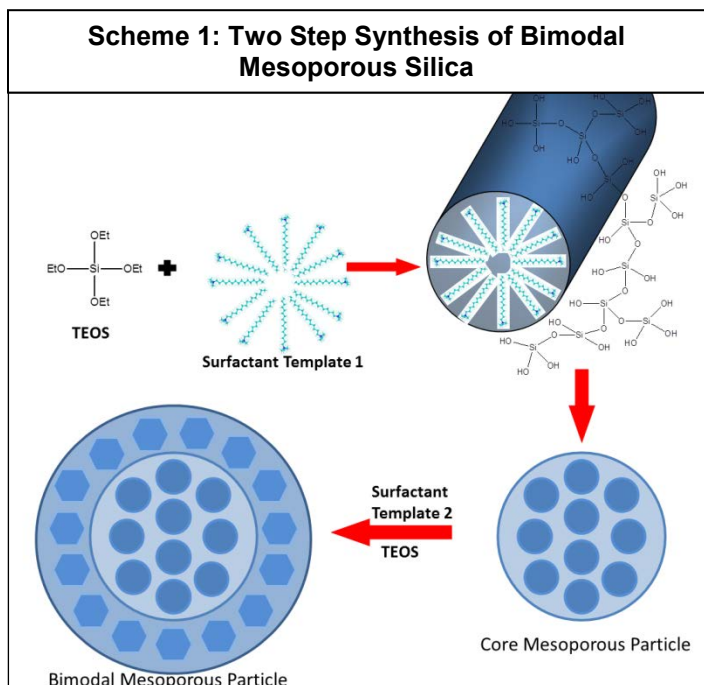
<sup>1</sup> Zhao, D.; Huo, Q.; Feng, J.; Chmelka, B.F.; Stucky, G.D. *JACS*, 120, **1998**, 6025-6036.

I. Preparation of Bimodal Mesoporous Silicas and  
 II. The Use of Inert Polydimethylsiloxanes for Surface Functionalization

G. Graffius and A. Y. Fadeev

Seton Hall University

I. The properties of MCM-41 and SBA-15 mesoporous silicas have been extensively studied. However, there has been very little research on mesoporous materials with bimodal pore morphology or a mesoporous shell. This is important in the context of adjusting pore structure, size and overall morphology. The proposed research will primarily focus on a two-step synthesis produce unique bimodal mesoporous materials.

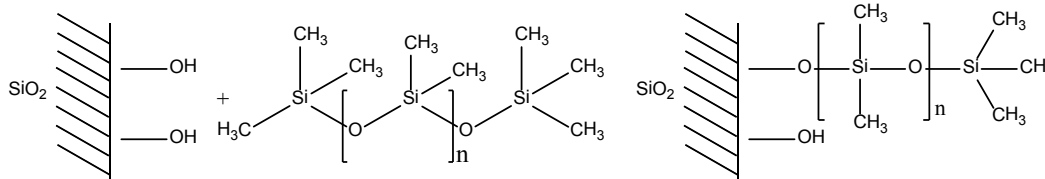


SBA and MCM silica were chosen for our preliminary studies because they have characteristic nitrogen adsorption isotherms and are synthesized by very different mechanisms. MCM-41 silicas are synthesized in an alkaline solution with the cationic surfactant CTAB while SBA type silicas are synthesized under acidic conditions with the non-ionic triblock polymer, Pluronic P123, as a template [1,2]. MCM and SBA are first synthesized to serve as seed materials that will form the core particle around which the second material's film forms in a subsequent synthesis (see Scheme 1). The key techniques to characterize these particles will be nitrogen adsorption, to monitor the surface area and pore morphology changes, and particle size distribution (PSD) to differentiate the bimodal particles from pure particles.

II. Modifying mesoporous silica with alkylsilanes has been used for a number of years to create a hydrophobic surface by reacting a hydrolysable group with surface silanols to obtain functionalized material. Polydimethylsiloxanes (PDMS) are generally considered to be inert, but this is due to faulty understanding of silicone reactivity. PDMS has potential as an alternative reactant for surface functionalization

and could allow unique functionalities under more easily controlled conditions [3,4].

**Scheme 2: Reaction of PDMS with Silica Surfaces**



The proposed research will thoroughly study new procedures for surface functionalization of porous silicas with often considered inert polydimethylsiloxane (Scheme 2). The research will begin with conditions that produce uniform surface coverage with linear PDMS and then expand to several derivatives of PDMS such as alkyldisiloxanes, fluorinate disiloxanes, cyclosiloxanes, and copolymers. Results will be compared to traditional synthesis techniques with characterization by TGA and percent carbon analysis to obtain the grafting density of each PDMS. Particles will be further characterized by contact angle measurements, a very sensitive technique that will detect variations in the surface coverage of the particles. Finally, nitrogen adsorption isotherms will confirm changes in the surface energy of the particles as well as estimate the thickness of the grafted layer.

1. Stucky, G.D., et al., *J. Am. Chem. Soc.* **1998**, *120*, 6024-6036.
2. Kruk, M.; Jaroniec, M. *Chem. Mater.* **1997**, *9*, 2499-2506.
3. Zheng, P.; McCarthy, T. *Langmuir.* **2010**, *26* (24), 18585-18590.
4. Krumpfer, J.; McCarthy, T. *Langmuir.* **2011**, *27*, 11514-11519.

## Synthesis and Characterization of Fluorinated Mesoporous Silica

Karthik Jayaraman and Alexander Y. Fadeev

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Fluorinated mesoporous silicas have attractive features for engineering of superhydrophobic and superoleophobic surfaces for wetting and adhesion control, adsorption and separations, and for several other applications in materials science and technology. In this work, SBA-15 silica was prepared using a previously established procedure and the surface area, pore size and pore volume were determined using the Nitrogen adsorption/desorption method. Thermo Gravimetric Analysis was used an indirect method to determine the number of silanols groups present in the SBA-15 silica. Due to very low surface silanols, the SBA-15 silica was hydroxylated and further characterized to evaluate the feasibility of using it as a starting material to obtain fluorinated mesoporous silica. The SBA-15 silica were functionalized through the covalent attachment of organosilanes with perfluorinated alkyl groups of various sizes (-CF<sub>3</sub>, -C<sub>4</sub>F<sub>9</sub>, - C<sub>6</sub>F<sub>13</sub>, -C<sub>8</sub>F<sub>17</sub>). The materials obtained were characterized using Elemental Analysis, Thermo Gravimetric Analysis and Nitrogen adsorption/desorption method. In addition water sorption isotherms were also generated for the various fluorinated mesoporous silica to determine the level of surface hydrophobicity.

### References:

1. Zhao, D.; Huo, Q.; Feng, J.; Chmelka, B. F.; Stucky, G. D. *J. Am. Chem. Soc.* 1998, 120, 6024.
2. Gregg, S. J.; Sing, K. S. W. *Adsorption, Surface Area, and Porosity*; Academic Press: London, 1982.
3. Fadeev, A. Y.; Kazakevich, Y. V. *Langmuir* 2002, 18, 2665.

## C-H bond free Ruthenium Fluorophthalocyanines

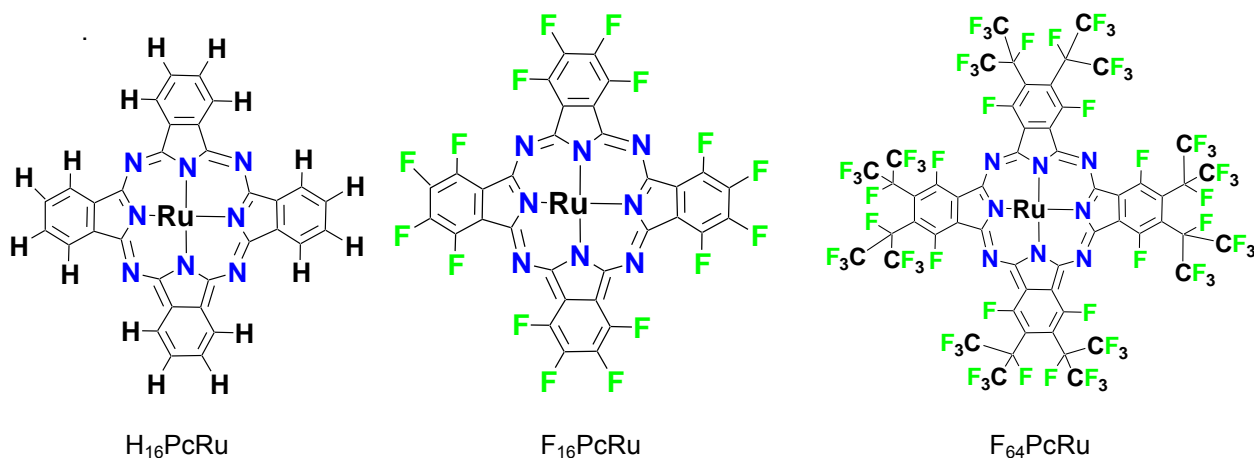
Dy-Anni Austin, Brianna Monti, Hemantbhai Patel and Sergiu M. Gorun

Seton Hall University, South Orange, NJ 07079

Ruthenium fluorinated phthalocyanines may constitute a new class of homogeneous catalysts. Containing a heme-like metal center and being devoid of C-H bonds, these molecules exhibit a high thermal stability. Their complex redox properties are potentially imparted by both the metal center and the conjugated macrocycle. We have recently reported the low-temperature aerobic oxidation of methane using the parent, unsubstituted ruthenium phthalocyanine,  $H_{16}PcRu$  [1], i.e. the material containing C-H bonds. Considering the potential deactivation of the C-H during oxidation chemistry and the importance of the direct oxidation of hydrocarbons, the replacement of the phthalocyanine C-H bonds with C-F bonds to produce a fluorinated catalyst is of interest. As a first step toward investigating the effect of fluorination upon the oxidation of unactivated C-H bonds, efficient methods for the synthesis of perfluorinated Ru complexes are needed.

The synthesis of  $H_{16}PcRu$  via both conventional and microwave assisted pathways has been reported [2,3].  $F_{16}PcRu$  [4] and  $F_{64}PcRu$  [5] have been produced only via conventional methods.

We report here the microwave-assisted synthesis of fluorinated phthalocyanines. The identity of the products was verified using UV-Vis, FT-IR, and NMR spectroscopy. The complexes will be used for further hydrocarbon oxidation studies.



### References

- [1] Y. Zhu, A. I. Loas, H. Patel, R. Barat and S. M. Gorun, "Methane Partial Oxidation Over a Phthalocyanine Catalyst", *2013 NY Catalysis Society Symposium*, Princeton University, NJ.
- [2] Villemin D., Hammandi, M., *International Electronic Conferences of Synthetic Organic Chemistry*, **2001**, 6, 831
- [3] Shaabani, A., Rezayan, A. H., *Journal of Porphyrins and Phthalocyanines*, **2005**, 9, 617
- [4] Christendat, D., David, M., *Journal of Porphyrins and Phthalocyanines*, **2005**, 9, 626
- [5] H. Lee, S. M. Gorun, to be published.

### Acknowledgements

Financial support from the National Science Foundation is gratefully acknowledged

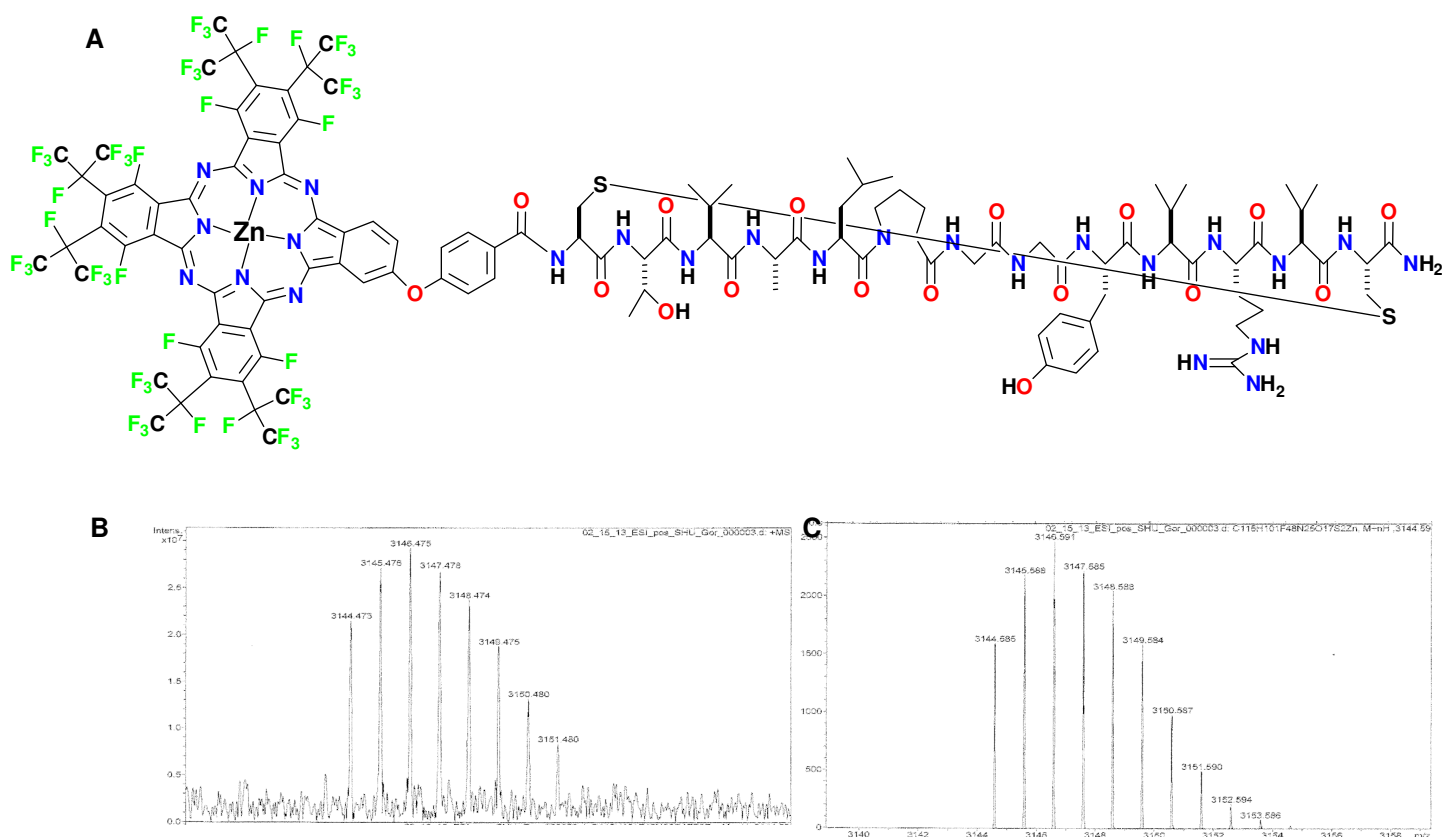
# Fluorinated Conjugates for Cancer-targeted Photodynamic Therapy

Emily Borland, Hemantbhai Patel, David Sabatino and Sergiu M. Gorun

Seton Hall University Department of Chemistry and Biochemistry 400 South Orange Avenue, South Orange, NJ 07079  
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The photodynamic therapy (PDT) of cancer relies upon the cytotoxicity of singlet-oxygen, produced upon light-induced activation of a photosensitizer. Phthalocyanines (Pcs) constitute an important class of photosensitizing agents due to their ability to absorb light strongly in the near-infrared region (650-750 nm), consequently stimulating singlet oxygen production in an aerobic microenvironment. Despite their potent biological activity, Pcs suffer from poor tissue localization and short half-lives due to their degradation by the singlet oxygen they produce.

In an effort to overcome these limitations, we report here a robust fluoro-derived Pc that lacks most of its C-H bonds, thus being resistant towards singlet oxygen-based degradation. Importantly, the Pc contains a carboxylic group that allowed its coupling to a cancer-targeting peptide (CTP). The conjugate, **1**, Figure 1A, whose identity was confirmed by High Resolution Mass Spectrometry, Figures 1B, C is proposed to exhibit enhanced tissue selectivity by targeting cancer-cell types that exclusively express the cell surface glucose-regulated protein 78 GRP78.



**Figure 1.** (A) The structure of the phthalocyanine linked to the CTP. (B) Observed and (C) calculated mass-spectrum for phthalocyanine linked to the CTP.

## References:

- Gorun, S.M., Bench, B.A., Carpenter, G., Beggs., *J. Fluorine Chem*, **1998**, 91, 37  
Nesterova IV, Verdree VT, Pakhomov S, et al. Metallo-phthalocyanine near-IR fluorophores: Oligonucleotide conjugates and their applications in PCR assays *Bioconjug Chem*. 2007;18(6):2159 <last\_page> 2168.  
S. Sibel Erdem, Irina V. Nesterova, *J. Org. Chemistry*, **2009**, 74, 9280-9286

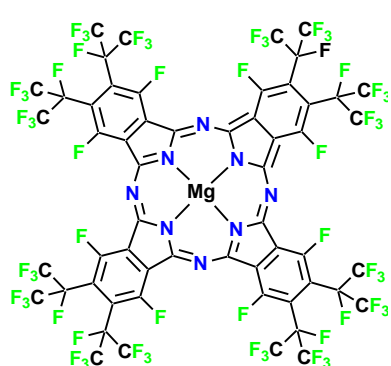
## Electron-Deficient Fluorescence Sensors

Shannon Dugan, Hemantbhai Patel and Sergiu M. Gorun

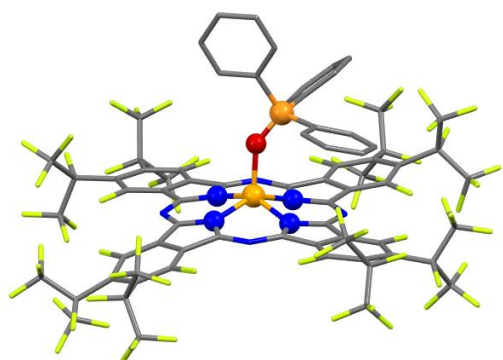
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Fluorescence sensors have recently found numerous biomedical applications due to their high sensitivity, versatility as well as temporal and spatial reporting capabilities. Electron-accepting molecules, considered for photoinduced electron transfer within the class of phthalocyanines are of interest.

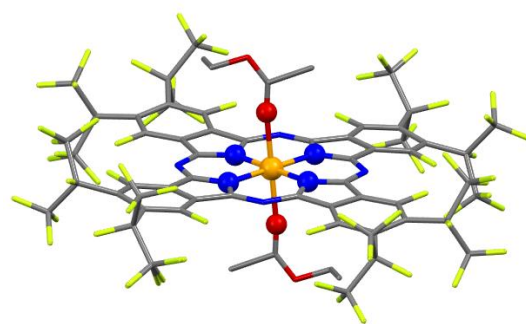
We report here the first magnesium complexes of a perfluoroalkylated phthalocyanine scaffold,  $F_{64}PcMg(\text{ligand})_n$ . For  $n=1$ , ligand = triphenylphosphine oxide; for  $n=2$ , ligand = ethyl acetate. The parent complex was produced using a microwave-assisted method. Its axially ligated complexes were crystallized and their structures elucidated by single-crystal X-ray diffraction. Concentration-dependent electronic spectroscopic studies as well as the overlapping excitation and absorption spectra of the parent complex indicate the absence of aggregation, as anticipated by the presence of sterically bulky peripheral substituents. The fluorescence quantum yield, an important parameter for fluorescence probes, of the Mg complex is significantly higher relative to that of the analogous Zn complex, consistent with the Zn heavy-atom effect.



Structural formula



Triphenylphosphine oxide complex



Bis ethyl acetate complex

### Acknowledgements

This work was carried out in collaboration with:

Łukasz Łapok *NJIT, Newark, NJ 07103*

Petr Zimcik *Department of Pharmaceutical Chemistry and Drug Control, Charles University in Prague, 50005 Hradec Kralove, Czech Republic.*

Veronika Novakoya *Department of Biophysics and Physical Chemistry, Charles University in Prague, 50005 Hradec Kralove, Czech Republic.*

Alexander Tochtenhagen, Marius Hintsche, Christian Litwinski and Beate Röder *Institute of Physics, Humboldt-Universität zu Berlin, Germany*

The financial support by the Department of Defense of the work carried out in the USA is gratefully acknowledged. Roger Lalancette, Rutgers University (Newark) is thanked for the raw X-ray data.

## Heterogenized Fluorinated Metallo Phthalocyanines

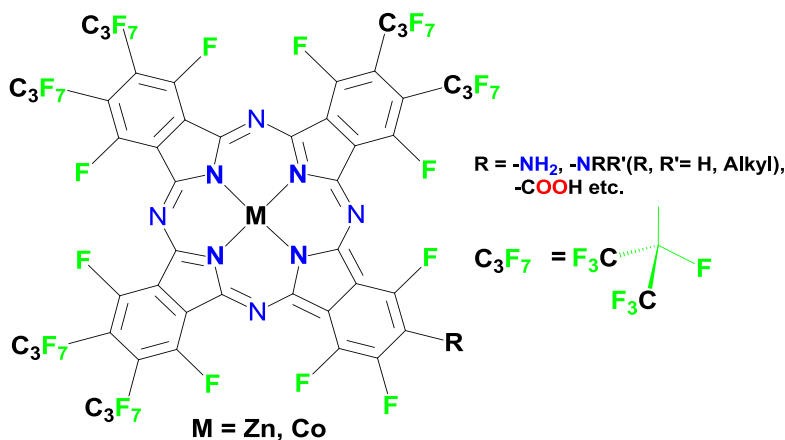
Hemantbhai H. Patel and Dr. Sergiu M. Gorun

Department of Chemistry and Biochemistry, Seton Hall University, South Orange, NJ 07079

The rational design of oxidation catalysts based on organic molecules is hindered by the presence of labile C-H bonds. We have shown recently that replacing all C-H bonds by a combination of fluoro- and perfluoro-groups in a bioinspired Cytochrome P450 model based on a phthalocyanine scaffold results in a stable yet reactive oxidation catalyst. Its cobalt complex catalyzes, for example, the aerobic oxidation of thiols to disulfides, a reaction of both biological significance and industrial importance.<sup>1,2</sup>

The presence of robust C-F bonds, however, renders the catalyst unsuitable for attachment to solid-state supports, except via van der Waals bonds or via the metal center. The first pathway provides only weak interactions, while the second may result in undesired modifications of the catalyst active site. Covalent links that do not interfere with the catalyst reactivity while maintaining its robustness are, therefore, desired.

We report here the grafting of mono functional groups, such as  $-NH_2$ ,  $-NRR'$  ( $R = H$ ,  $R' = \text{alkyl}$ ),  $-COOH$  etc. on the perfluorinated phthalocyanine scaffold and demonstrate that this new class of molecules retains their oxidation catalytic activity both in solution as well as when supported on various solid-state supports, such as silica gels. The latter materials, when incorporating cobalt, are efficient heterogeneous catalysts for the "green", aerobic oxidation of thiols to disulfides.



Functionalized metallo fluorophthalocyanines

### References

1. Loas, A.; Gerdes, R.; Zhang, Y.; Gorun, S. M. *Dalton Trans.* 2011, 40, 5162.
2. Gorun, S. M.; Loas, A. I.; Griswold, K. A.; Łapok, Ł.; Patel, H. H.; Gerdes, R. US 012/0283430 A1 / WO 2012/061344 A1

### Acknowledgments

The financial support of the National Science Foundation is gratefully acknowledged

## **Polysaccharide Gels as Time Release Matrices**

Magne Saba, Cosimo Antonacci PhD, James E. Hanson PhD

The release of active molecules over time is a technique of great utility in many fields. We have evaluated the use of gels prepared from algal polysaccharides, such as carrageenan and seaweed flour, as matrices for the release of active molecules into marine environments. Gels were prepared at different concentrations in water, and infused with the dye Rhodamine WT to follow release.



## **Synthesis, Modification, and Characterization of n-Alkyldimethylsilanes and n-Fluorinated-Dimethylsilanes Adsorbents for HPLC Applications**

*Margaret Figus, Yuri V. Kazakevich, and Alexander Y. Fadeev, Department of Chemistry and Biochemistry, Seton Hall University, NJ 07079*

A series of covalently attached monolayers of alkanes and perfluorinated-alkanes was prepared via solution – phase reactions of  $C_nH_{2n+1}Si(CH_3)_2N(CH_3)_2$  ( $n = 1, 4, 8,$  and  $18$ ), and  $C_nF_{2n+1}C_2H_2Si(CH_3)_2N(CH_3)_2$  ( $n = 1, 4,$  and  $8$ ) with well characterized silica substrate adsorbent. One step synthesis that enable efficient and highly pure preparation of perfluorinated – (N, N-dimethylamino)-silane is described using  $C_nF_{2n+1}C_2H_2Si(CH_3)_2Cl$  as starting material. The energies of adsorption and surface area of modified materials were calculated using the Brunauer-Emmett-Teller (BET) method using low temperature adsorption of nitrogen. In addition the number of unreacted and reacted silanols groups was assessed by means of thermo-gravimetric analysis and using deuterium exchange method by means of NMR.

## **Stacking geometry of modified Phthalocyanines**

David Demianicz, Stephen Kelty  
Department of Chemistry and Biochemistry  
Center for Computational Research

It is well known that materials containing extensive pi-conjugation undergo intermolecular stacking. The details of the preferred geometries of stacked molecules are less well understood. This study is aimed at determining the preferred stacking geometries of per-fluorophthalocyanine in bulk crystals and amorphous films. Our results indicate that there are a limited number of preferred stacking orientations, including diagonal, lateral and rotational shifts. Bulk crystal structures are compared with structures derived from classical molecular dynamics to determine the intermolecular distance between stacked molecules as a function of geometry. We also suggest the nature of the relevant molecular interactions that lead to the preferred structures such as electrostatic, dipole and H-bond interactions. The outcomes of this study will help elucidate the bulk structural properties of crystalline and amorphous bulk materials and how these properties are manifest at the bulk surface.

## **Bulk and Thin Film Simulations of Modified Phthalocyanines**

Patrick Dwyer and Stephen Kelty

Department of Chemistry and Biochemistry  
Center for Computational Research

Perfluoro- substituted zinc phthalocyanines (ZnPc) F16, F40, F34, and F64 systems exhibit novel properties that make them technologically significant in a number of application areas. A key property of these materials involves the intermolecular interactions in bulk and thin films. Classical forcefields within the CHARMM (Chemistry at HARvard Molecular Mechanics) parameterized model have been developed for each system. Pair correlation function analysis is employed to measure the degree of stacking as well as the orientation of stacked ZnPc's for all bulk and thin film systems. It will be shown that the stacking of ZnPc's increases in thin film simulations compared to bulk simulations. The hydrophobicity of the ZnPc thin films will also be analyzed through water diffusion studies. The simulation and analysis methods will be discussed.

## STACKING INTERACTIONS IN MODIFIED PHTHALOCYANINES

Erik Fernandez & Stephen Kelty

Department of Chemistry and Biochemistry  
and Center for Computational Research (Seton Hall University)

Modified Phthalocyanines in which all hydrogen atoms are replaced with fluorine exhibit novel properties that make them technologically significant in a number of application areas. A key property of these materials involves the variation of intermolecular interactions that occur among these molecules. Computational methods have been developed to explore the stacking patterns between similar molecules. Furthermore, conducted Phthalocyanine computer simulations reveal a consistent set of stacking orientations among a large scale bilayer. Simulations were conducted using in-house developed force fields within the CHARMM (Chemistry at HARvard Molecular Mechanics) parameter set. Stacking orientations and bond energies between target molecules were quantified using VMD (Visual Molecular Dynamics). The simulation and analysis will be discussed.

## Optimization and Validation of CHARMM Force Field Parameters via Ab Initio Quantum Mechanics Calculations

Rory Vander Valk and Stephen P. Kelty

Department of Chemistry and Biochemistry  
Center for Computational Research

Molecular Geometry can be optimized from minimizing the intramolecular forces as determined from *ab initio* calculations. Much more important for bulk chemical simulations are the intermolecular forces. *Ab initio* methods are computationally cumbersome in comparison to classical methods and so we are developing new classical methods to determine intermolecular interaction parameters for large molecules with limited or no use of experimental results. Molecular orbitals, ionization potentials, polarizabilities and other chemical properties acquired through *ab initio* methods are currently being used to develop intermolecular interaction parameters based on the well-known London equation. The methods developed will permit the efficient investigation of large assemblies of molecules.

## Variation of Peak Tailing in Chromatography

Authors: Raffi M. Manjikian, Nicole Charles, Antonio Macaluso

Mentor: Dr. Joseph Maloy

We have recently reported the development of novel finite difference simulation software for computing chromatographic peak asymmetry when both partition and adsorption simultaneously control the distribution on the column [1-3]. This software uses four dimensionless input parameters (representing the number of theoretical plates; the equilibrium constants for partition and adsorption; and the relative mass balance between partition and adsorption) to compute the numerical representation of the peak. Analysis performed upon each peak yields its retention factor and its USP tailing factor (defined as the ratio of two extensions from the maximum point of a peak measured at 5% of the peak height). Variation of these input parameters allows the output to be varied between partition and adsorption and any combination between these extremes.

In this paper we compute the retention factors and the tailing factors for peaks resulting from partition in the absence of adsorption using an exact representation of the partition chromatographic peak shape developed by Onwubuya [4]:

$$f(t, t_0, t_R, N_0) = [t_R^2 / 2\pi N_0 (t_R - t_0) t]^{1/2} \exp[-N_0 (t - t_R)^2 / 2t(t_R - t_0)]$$

where  $t$  is time,  $t_0$  is the holdup time of the column,  $t_R$  is the retention time of the band maximum, and  $N_0$  is the number of theoretical plates of a column.

When expressed in terms of the dimensionless input parameters used in the simulation, these exact values may be compared with the results obtained in the finite difference simulation both in the partition extreme and under adsorptive control when high values of the adsorptive mass balance parameter,  $\Gamma_0 A / C_0 V_m$ , produce peak shapes indistinguishable from partition peaks. The results of this work help to confirm the validity of the original simulation and assist in the identification of the experimental conditions that require both partition and adsorption considerations to describe peak shape more accurately.

### References

1. Maloy, J.T., Macaluso, A., Hao, F. "Finite Difference Simulation of Adsorption Effects in Partition Chromatography," Pittcon'11, Paper #860-6.
2. Maloy, J.T., Macaluso, A., Charles, N. "Finite Difference Studies of the Relationship Between Peak Tailing and Capacity Factor in Partition-Adsorption Chromatography," 2011 Eastern Analytical Symposium, Paper #294.
3. Macaluso, A., Charles, N., Maloy, J.T., Finite Difference Studies of Capacity Factor Variation in Adsorption Chromatography," Pittcon'12, Paper #810-5P.
4. Onwubuya, A.E. , "Assessment of Chromatographic Efficiency Through Statistical Bandshape Analysis," Ph.D. Dissertation, Seton Hall University, 1991.

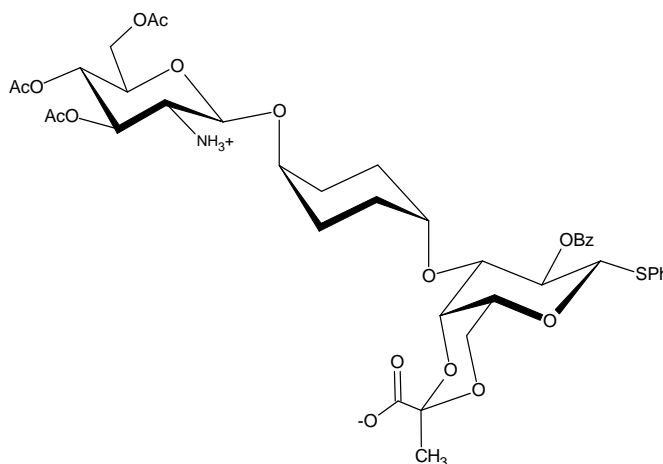
## Synthesis of a Potential Immunomodulatory Zwitterionic Polysaccharide

Vikram Basava\* and Cecilia Marzabadi

Department of Chemistry and Biochemistry  
Seton Hall University  
400 South Orange Ave  
South Orange, NJ 07079

Zwitterionic polysaccharide A1 (PSA1), isolated from the capsule of the anaerobic bacterium *Bacteroides fragilis*, has been shown to stimulate both innate and adaptive immune responses in mammals and is believed to be important in establishing a balanced immune system which is mediated by T-lymphocytes. The immunologic property is because of its zwitterionic character and any attempts in neutralizing either of the charges results in a strongly reduced biological activity of the polysaccharide.

In order to better understand the mechanism of immunological activity, attempts are being made to synthesize the charged sugar moieties and attach them together by PEG resins or cycloalkane diol chains. Evaluation of the polysaccharide's ability to produce cytokines and chemokines in antigen presenting cells and T-cells using sandwich ELISA assay tests will be carried out on the molecules synthesized. The results obtained will aid in the development of agonists and antagonists for the treatment of asthma and allergies, as well as, other immunological disorders.



### References:

1. Van den Bos, L. J.; Boltje, T. J.; Provoost, T.; Mazurek, J.; Overkleef, H. S.; van der Marel, G. A.; *Tetrahedron Letters*, **2007**, *48*, 2697-2700
2. Tzianabos, A.; Wang, J. Y.; Kasper, D. L.; *Carbohydrate Research*, **2003**, *338*, 2531-2538

## The Synthesis of Carbohydrat Fused Benzopyrans

Seton Hall University Department of Chemistry and Biochemistry

Sumiea Eltayeb and Cecilia H. Marzabadi

Carbohydrates comprise the most abundant natural product molecules. Carbohydrate chemistry has been a topic of interest and is attractive for drug design because of these molecules' unique structures and biological activities such as recognition, fertilization and signal transduction. Glycals are unsaturated sugars that contain a double bond between C1 and C2. Manipulations of this double bond have been the focal point of many syntheses that use glycals.

The goal of this research is to synthesize carbohydrate-fused chromanes as potential anticancer drugs by using [4, 2] cycloaddition reactions (Diels-Alder reactions). Much of this research has focused on reacting unprotected D-glucal or tri -O- substituted D-glucal with benzaldimine or its derivative in either organic solvent or ionic liquids in the presence of an acid catalyst. Results from ongoing optimization studies will be presented.

### References:

- 1- J.S. Yadav, B. V. Sybba Reddy, Ch. Madhuri, G. Sabitha, S.Kiran Kumar. *TetrahedroLett.***2001**,*42*,6381- 6384
- 2- J.S. Yadav, B.V.S. Reddy, L Chandraiah, B Jagnadh, S.Kiran. *Tetrahedron Lett.* **2002**,*17*, 4527-4530
- 3-Thisbe K. Lindhorst. In *Essentials of Carbohydrate Chemistry and Biochemistry.* Wiley New York. **2007**,1-304
- 4-Fang D.Chen J.Gong K. *J. Fluorine Chemistry.* **2008**,*17*, 108-111
- 5-Hong C. Shen. *Tetrahedron.***2009**, *65*, 3931



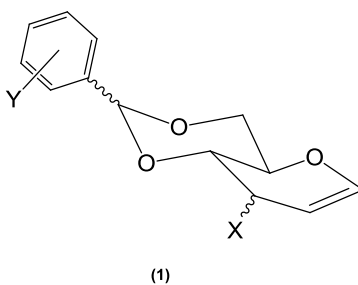
# Improved Synthesis of CNS-active D-glucal-based Benzylidene and Its Derivatives

Emi Hanawa, Jamie Talisman and Cecilia Marzabadi

Department of Chemistry and Biochemistry, Seton Hall University

Epilepsy is the fourth most common neurological disorder in the U.S. and it affects 2.2 million people.<sup>[1]</sup> Like other central nervous system (CNS) disorders, epilepsy is a chronic disorder and cannot be fully cured. There are many antiepileptic drugs (AEDs) available and help people with the disorder to control their seizures for minimizing limitation to have quality life. The first generation of antiepileptic drugs (AEDs) control seizures by manipulating Na<sup>+</sup> channels, Ca<sup>2+</sup> channels or GABAergic neurotransmission.<sup>[2]</sup> Yet, some seizures are resistant to those AEDs<sup>[3]</sup> and therefore a second generation of AEDs has been developed. The second generation of AEDs is designed to act by several different mechanisms instead of just targeting an ion channel or postsynaptic receptor. Despite their potency, both generations of AEDs have severe side effects and therefore the development of alternative AEDs with fewer side effects is highly needed.

Previously, we prepared a D-glucal-based benzylidene compound (**1**) with a specific X and Y group. This lead compound was tested in receptor-based epilepsy assays and showed nanomolar affinity for GABA<sub>A</sub> and mGluR2 receptors. It was also tested in rodent models of epilepsy and gave satisfactory results. We have set out to optimize anticonvulsant activity by modifying one or more functional group(s). Currently established methods of D-glucal benzylideneation give only low yields and the reactions do not reach to completion. In addition, (**1**) is very acid sensitive, which leaves a concern upon oral intake. Several modifications have done on the vinyl ether double bond and yields were significantly improved. Unfortunately, the resulting derivatives did not show the anticipated receptor binding affinities. Modifications were also done at position X and/or Y and these compounds need to be tested.



## References

- [1] Epilepsy Foundation: <http://www.epilepsyfoundation.org/index.cfm> (cited 3/14/2013)
- [2] Rogawski, M. A. *Epilepsy Res.* **2006**, *69*, 273-294.
- [3] Hauser, W. A. *ibid.* 234-239.

## Acknowledgements

We thank Seton Hall University for providing facilities and PDSP (<http://pdsp.med.unc.edu/>) for testing specific receptor binding affinities of our compounds.

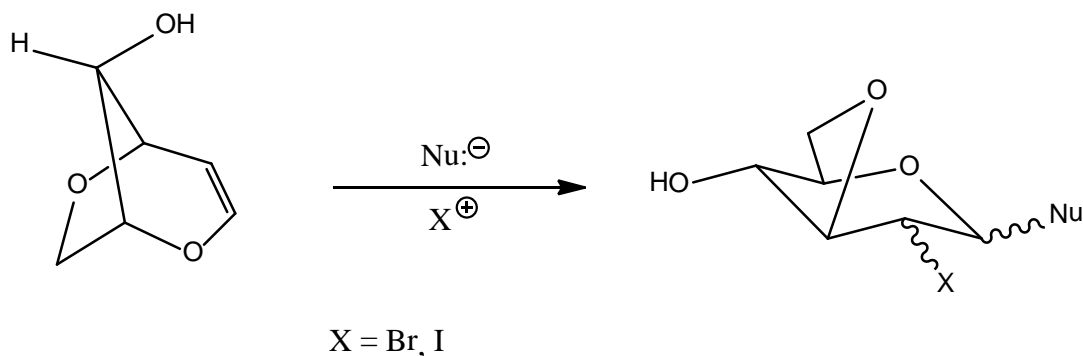
## The Unusual Chemical Reactivity of 3,6-Anhydro-D-Glucal

Corey Kientz\*, Vikram Basava, Cecilia Marzabadi

Seton Hall University, 400 South Orange Ave, South Orange, NJ 07079

Anhydro sugars have unique properties that allow them to serve as both protecting groups as well as readily accessible reaction sites. They are formed by the removal of one or more molecules of water from the hydroxyl groups of the parent sugar. They are extensively used in carbohydrate chemistry for the preparation of C-glycosides, nucleosides, heterocycles, and complex enantiomerically-pure products in which the chirality is restored.

In a reaction previously conducted by Vikram Basava, the reduction of 6-O-tosyl-D-glucal using excess  $\text{LiAlH}_4$  produced the anhydro sugar 3,6-anhydro-D-glucal as a major product "in good yield". This product will be used as the starting material for subsequent reactions exploring its unusual chemical reactivity. Addition reactions happen across the double bond, with or without the breakdown of the anhydride ring. One such addition reaction is given below, wherein a nucleophile adds up to the double bond in the presence of a halonium ion.



### Acknowledgements:

1. Jarosz, S.; Zamjoski, A.; *Curr. Org. Chem.* **2003**, 7, 13
2. Saito, H. K.; Takaya, J. K.; Nahakata, S. H.; Oshima, A. I.; *J. Org. Chem.* **2001**, 66, 6982
3. Rees, D. A.; *Advan. Carbohydr, Chem. Biochem.* **1969**, 24, 267
4. Hrebabecky, H.; Dockal, J.; Holy, A.; *Collect. Czech. Chem. Commun.* **1994**, 59, 1408-1419

## Effective Cyclization of Thiosemicarbazone lead to highly biological Active Anti-cancer drug

George Sarkis and Cecilia Marzabadi

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High glucose influx utilization or the so-called "Warburg effect" is one of the ways in which cancer cells persist in the body. For this reason, the selective inhibition of glycolysis in cancer cells is important. We are interested in synthesizing hexokinase inhibitors to inhibit cancer cell metabolism. Starting with commercially available glucosamine hydrochloride, in a series of steps it can be converted to 2-(((2R,3R,4R,5S,6R)-2,4,5-trihydroxy-6-(hydroxymethyl)tetrahydro-2H-pyran-3-yl)carbamoyl)benzoic acid. Incorporation of a known, active, thiadiazole unit into this molecule could lead to a promising new anticancer agent

Synthesis and Characterization of  $[\text{Re}(\text{CO})_3\text{L}]_2(\text{dpp})^{2+}$  ( $\text{dpp} = 2,3\text{-di-(2-pyridyl)pyrazine}$ ) Complexes: The Quest for Bimetallic Luminophores.

Chelsea DeFelice and W. Rorer Murphy, Jr.

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The development of materials that can engage in efficient photocatalysis are an important goal in the green economy. As most important reactions have multielectron demands and/or structural demands that quench excited states, multimetal systems that can engage in such processes are important targets as they can address both needs. The first useful polypyridyl bimetallic luminophore was  $[\text{Ru}(\text{bpy})_2]_2(\text{dpp})^{4+}$  ( $\text{dpp} = 2,3\text{-di-(2-pyridyl)pyrazine}$ ) developed by Gafney and Strekas.<sup>1</sup> This system has been extensively developed by a large number of research groups, but little work has been done on the related  $[\text{Re}(\text{CO})_3\text{L}]_2(\text{dpp})^{2+}$ . Apart from the initial report of the synthesis of the parent compound  $[\text{Re}(\text{CO})_3\text{Cl}]_2(\text{dpp})$  by Murphy, et. al.<sup>3</sup>, few studies of this system have been published. Derivatives where the sixth ligand L of  $\text{Re}(\text{bpy})(\text{CO})_3\text{L}$  is a chloride are the mostly weakly luminescent members of the series. Clean replacement of the  $\text{Cl}^-$  by stronger field ligands such as 4-methylpyridine or  $\text{P}(\text{CH}_3)_3$  should yield complexes with greater radiative quantum yields and longer lifetimes, as observed in the monometallic analogs.<sup>4</sup>

Two methods for substitution of chloride have been developed – metathesis by  $\text{AgX}$  ( $\text{X} =$  either trifluoromethanesulfonate (TFMS) or perchlorate) in acetonitrile,<sup>5</sup> or evolution of HCl by treatment with concentrated trifluoromethane sulfonic acid.<sup>6</sup> The former method has the problem of highly luminescent acetonitrile impurities,<sup>7</sup> and the latter method degrades any polypyridine ligand other than 2,2'-bipyridine.<sup>8</sup> We have developed a method utilizing  $\text{AgTFMS}$  and dichloromethane, which avoids both of these issues. Preliminary characterization and spectroscopic results will be reported.

- 1). Hosek, W.; Tysoe, S. A.; Gafney, H. D.; Baker, A. D.; Strekas, T. C. *Inorg. Chem.* **1989**, *28*, 1228.
- 2). Murphy, W. R. Jr.; Brewer, K. J.; Getliffe, G.; Petersen, J. D. *Inorg. Chem.* **1989**, *28*, 81.
- 3). Baiano, J. A.; Carlson, D. L.; Wolosh, G. M. DeJesus, D. E.; Knowles, C. F.; Szabo, E. G.; Murphy, W. R. Jr. *Inorg. Chem.* **1990**, *29*, 2327. Baiano, J. A.; Murphy, W. R. Jr. *Inorg. Chem.* **1991**, *30*, 4594.
- 4). Baiano, J. A.; Kessler, R. J.; Lumpkin, R. S.; Munley, M. J.; Murphy, W. R. Jr. *J. Phys. Chem.* **1995**, *99*, 17680.
- 5). Sullivan, B. P.; Meyer, T. J. *J. Chem. Soc., Chem. Commun.* **1985**, *20*, 1414.
- 6). Sullivan, B. P.; Meyer, T. J. *J. Chem. Soc., Chem. Commun.* **1984**, *18*, 1244.
- 7). Allston, Richard, Ph.D. Dissertation, Seton Hall University, **2005**.
- 8). Murphy, W. R. Jr. Unreported results.

## **Equilibrium and Kinetics of the Nitro-Nitroyl-Nitroxide Interconversion of $[\text{Ru}(\text{tpy})(\text{dppz})(\text{NO}_2)]^+$ in Model Physiological Media**

Nicole-Irene O Lahanas, W. Rorer Murphy, Jr.

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Ruthenium complexes have yielded many useful drugs, particularly for anticancer treatments. Ruthenium complexes containing the planar ligand, dppz (dipyrido[3,2-a:2',3'-c]phenazine), bind strongly to DNA. This reaction can be exploited to chaperone functional groups free radical species to DNA, potentially leading to strand cleavage. One such functional group is  $\text{NO}_2^-$ , which is in acid-base equilibrium with  $\text{NO}^+$ . Under physiological conditions, the  $\text{NO}^+$  will be reduced, providing the free radical NO. The first research goal is to prepare the ruthenium  $[\text{Ru}(\text{tpy})(\text{dppz})(\text{NO}_2)]^+$ . The second goal is to characterize the equilibrium and kinetics interconverting the nitro and nitrosyl ligand. The third goal is study the complex-DNA binding process. The results of steady-state and time-resolved absorption spectroscopy measurements and their analysis will be reported.

## Acid-Base Studies of $[\text{Ru}(\text{bpy})_2(\text{NO}_2)(\text{OH}_2)]^+$

Victoria S. Lonney, Dr. Wyatt R. Murphy, and Nicole Lahanas

Ruthenium polypyridyl complexes containing the nitro/nitrosyl and aquo/hydroxy/oxo ligands have been of interest to inorganic chemists for some time. The former have been useful models for nitrite reductase and free radical electrochemistry. The latter have been used as oxidation electrocatalysts. We are extending the initial investigations on  $[\text{Ru}(\text{bpy})_2(\text{NO}_2)(\text{OH}_2)]^+$  (bpy = 2,2'-bipyridine) by Meyer and Murphy in 1980 to isolate the equilibrium constants for the nitro/nitrosyl and aquo/hydroxy ligands via steady-state and fast kinetic (stopped-flow) measurements. The complex will be prepared by displacement of the nitrosyl group in  $[\text{Ru}(\text{bpy})_2(\text{NO}_2)(\text{NO})]^{2+}$  with azide.

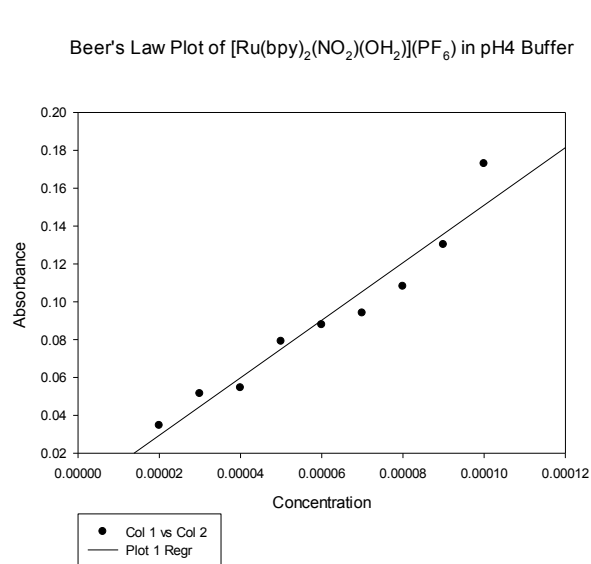


Figure 1 – Beer's Law plot of compound in pH4 Buffer

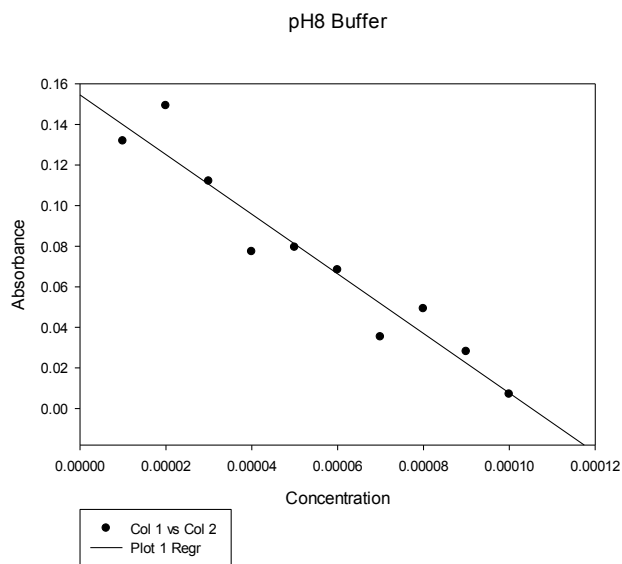


Figure 2 – Beer's Law plot of compound in pH8 Buffer

References: Wyatt R. Murphy, Nicole Lahanas, Thomas Meyer

## Polycyclic Aromatic Hydrocarbon Detection in Menhaden Fish Oil Using Fluorescence Spectroscopy

Lauren Ridley, John Sowa and Wyatt R. Murphy

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On April 20, 2010 the Deep Water Horizon of the Mississippi Canyon exploded. The resulting oil spill had a huge impact on the Gulf of Mexico's wildlife and human livelihood. The animals that live in this region are used for consumption and when the spill occurred, this consumption was halted and it was unclear the extent that the spill would have on wildlife. Seton Hall has been consistently studying the chemical and biological effects on Menhaden, a popularly used fish in both the Gulf and the Eastern Seaboard as bait since the initial spill.

The current study will utilize fluorescence spectroscopy to determine identity and quantities of polycyclic aromatic hydrocarbons (PAHs) and their metabolites in several organs of the fish. One of the greatest issues faced with this study is the matrix of the analyte. Fish oils are comprised of lipid soluble vitamins that interfere with the analyses. The fluorimeter recently purchased will allow for a more detailed analysis of the fish oil through the use of matrix scanning and time-resolved detection. Furthermore, the new system includes a 96-well plate reader, which will allow the analysis of samples subjected to several chemical treatments to eliminate or suppress interferences. Three types of Menhaden will be used, Atlantic (*Brevoortia Tyrannus*), Gulf (*Brevoortia Patronus*) and Florida Coast (*Brevoortia Smithi*). The Atlantic Menhaden although possibly contaminated as well but by a different mode, will serve as a positive control and Florida Coast as a negative control. Gulf Menhaden will have had the greatest impact from the spill and will be the main focus for identification of PAHs and their metabolites. Additional variables will include the time of harvest and age of the fish. Studies will include development of model samples of expected fluorescent compounds, extraction procedures to optimize sensitivity and speciation of contaminants, and the determination of compounds found within several fish organs.

### References:

1. Carmona, N.; Cohen, B.; Organero, J.; Douhal, A. (2012). Excited state intermolecular proton and energy transfer of 1-hydroxypyrene interacting with the human serum albumin protein. *Journal of Photochemistry and Photobiology, A: Chemistry*, Volume 234, Pages 3-11. DOI:10.1016/j.jphotochem.2011.10.024
2. NOAA gulf spill restoration Retrieved 4/1/2013, 2013, from <http://www.gulfspillrestoration.noaa.gov/>

## Cancer-targeting Peptides as Anti-Cancer Drugs

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The non-specificity of anti-cancer drugs often leads to high levels of cellular toxicity which weakens the immune response in fighting the disease. By synthesizing peptides that specifically target receptors found on tumor cells, a more selective form of therapy is proposed to lower the cellular toxicity of the therapeutic drugs. In our study, we focus on specific receptors expressed on the surface of cells, and function as valuable bio-markers in our tumor targeting approach, namely the Glucose Regulated Protein (GRP78)<sup>1</sup>, the insulin receptor tyrosine kinase (IRTK) and the Cluster of Differentiation 69 (CD69). The receptor-targeting peptides consists of a cyclic 13-mer oligopeptide, CTVALPGGYVRVC, known to target the GRP78 oncoprotein, the pentapeptide LELTE, as ligand to the CD69 receptor found on leukocytes<sup>2</sup>, and the aza peptide analogs of DIYET, as inhibitors of the IRTK, were all synthesized by Solid Phase Peptide Synthesis (SPPS). Once synthesized, peptides were conjugated to various biomolecules to affect tumor cell killing<sup>3</sup>. This presentation highlights the use of cancer targeting peptides in various anti-cancer applications, related to gene therapy, immunotherapy and in photodynamic therapy.<sup>4</sup>

### References

1. Kim, Y.; Lillo, A.M.; Steinger, S.C.; Liu, Y.; Ballatore, C.; Anichini, A.; Mortarini, R.; Kaufmann, G.F.; Zhou, B.; Felding-Habermann, B.; Janda, K.D. *Biochemistry* **2006**, 45 (31), 9434-9444.
2. Bezouška, K.; Kubínková, Z.; Stříbný, J.; Volfová, B.; Pompach, P.; Kuzma, M.; Šírová, M.; Říhová, B. *Bioconjug. Chem.* **2012**, 23, 2032-2041.
3. a. Suzuki, T.; Lu, J.; Zahed, M.; Kita, K.; Suzuki, N. *Arch. Biochem. and Biophys.* **2007**, 468, 1  
b. Tsutsumi, S.; Namba, T.; Tanaka, K.; Arai, Y.; Ishihara, T.; Aburaya, M.; Mima, S.; Hoshino, T.; Mizushima, T. *Oncogene* 25 **2006**, 1018–1029.
4. Kato, M.; Abe, M.; Kuroda, Y.; Hirose, M.; Nakano, M.; Handa, T. *J. Pept. Sci.* **2009**, 15, 327-336.



## **The assembly of stable, higher-order oligonucleotide structures and their applications in regulating gene expression**

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Oligonucleotides that may target a detrimental gene and silence its expression in gene therapy applications often do so with the assembly of a higher-order hybrid structure. Our work aims to characterize the structure and stability of the pre-requisite hybrid complex for gene regulatory activity. In this presentation, a novel 3-component system (3CS) strategy is presented to target a specific gene by the canonical Watson-Crick hydrogen base-pairing interactions. This approach highlights the use of a template (i.e. antisense strand) to guide the assembly of RNA segments and facilitate the formation of a stable 3CS. In order to achieve a stable 3CS, the chemical composition of the sequences, length of the template strand and buffer conditions were explored. The structural and bio-physical properties of the 3CS were studied by PAGE, UV-thermal denaturation and CD-spectroscopy in order to assess their relevance in RNA binding and regulation.

## Applications of Aminoacyl Nucleolipid Bio-conjugates in Medicinal Chemistry

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Aminoacyl nucleolipids are a new class of bio-conjugates with the ability to form higher-order structures.<sup>1</sup> Considering these bio-conjugates may mimic the structure and function of cationic lipids at physiological conditions, we've begun exploring their potential in gene therapy applications. In this presentation, the synthesis, characterization and DNA binding applications of aminoacyl nucleolipids is described. Aminoacyl nucleolipids were designed to contain key structural motifs that may function in highly specific and efficient oligonucleotide binding interactions. Their synthesis is highlighted by a chemically robust and versatile coupling procedure for the preparation of bio-conjugates in 53-78% yields. Following characterization, the bio-conjugate-DNA interactions were assessed by native gel shift mobility assays, thermal denaturation experiments and CD spectroscopy paving the way for gene therapy applications in cell-based studies.

### References:

1. Simeone, L.; Irace, C.; Di Pascale, A.; D'Errico, G.; Montesarchio, D. *Eur. J. Med. Chem.* **2012**, 1-12.

## **Solid Phase Microextraction-GC-MS-MS of steroids in water**

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Recently, there has been heightened interest in the analysis of steroids and other endocrine disrupting drugs in water, as they were detected in small (part per trillion) quantities and were suspected of having adverse effects on aquatic life. In this work, Solid Phase Microextraction coupled to Gas Chromatography –Mass Spectrometer –Mass Spectrometer (SPME-GC-MS-MS) was used to separate a mixture of steroids that were not well separated by SPME-GC-MS alone. Selected reaction monitoring (SRM) was used, where both first and second analysers were focused on selected masses allowing the use of daughter ions to generate high selectivity. SPME-GC-MS-MS is effective for detecting and quantifying analytes that are not fully separated by GC or GC-MS alone. The co-eluted steroids were effectively separated using selected reaction monitoring and showed linear calibration behavior between 100-900 ppt. All steroids reported RSD < 10%. The calculated limits of detection were in ppq level.

### **References**

1. Mc Nair, H.M; Miller, J.M. Basic Gas chromatography, second ed, Wiley: New York, 1998
2. Liua, D.; Hopb, C. Journal of Pharmaceutical and Biomedical Analysis. 2005, 37, 1
3. Pawliszyn, J. Solid Phase Microextraction: Theory and Practice, first edition, Wiley: 1997

### **Acknowledgements**

1. Thermo Scientific
2. Supelco
3. Sanafi-Aventis Foundation

# **Ionic Liquid Submerged Single Drop Microextraction Of Aromatic Hydrocarbons From Water and Determination Of Partition Coefficient**

Ramkumar Dhandapani and Nicholas H. Snow

Department of Chemistry and Biochemistry, Center for Academic Industry Partnership, Seton Hall University

## **Abstract**

Room-temperature ionic liquids (RTILs) also known as molten salts, are salts or mixtures of salts that are liquids at ambient temperature and consist entirely of ionic species. They have emerged as possible “green” solvents. The high viscosity, low volatility and high selectivity of ionic liquid were utilized to selectively extract aromatic hydrocarbons from water. In the present research, ionic liquid–submerged single drop micro extraction (IL-SSDME) was performed to extract aromatic hydrocarbons from water. In IL-SSDME, a single drop of ionic liquid is dispensed from a syringe needle and dispersed into the matrix containing the analyte. Once the equilibrium is attained, the drop is withdrawn into the syringe for injection into gas chromatograph. Partition coefficient and analytical figures of merit including precision, accuracy, limit of detection, limit of quantification were determined using GC-MS for the instrumental analysis. IL-SSDME not only proved to be an attractive ‘green’ alternative to traditional solvents but also served as a selective, efficient and time saving extraction technique.

## **References**

- (1) Yazdi,A.S; Mofazzeli,F. *Chromatographia* .2010, 72, 867–873
- (2) Jain,A;Verma.K.K, *Analytica Chimica Acta* .2011,706 , 37– 65
- (3) Armstrong, D. W; Anderson,J.L. *Anal. Chem.* 2003, 75, 4851-4858

## **Acknowledgement**

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## Extraction of Caffeine from Tea using QuEChERS and Gas Chromatography Mass Spectrometry

Michelle Schmidt and Nicholas H. Snow

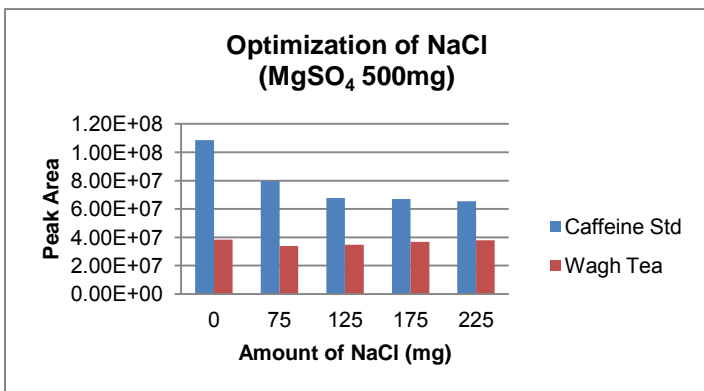
Center for Academic Industry Partnership

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The extraction of caffeine from tea has been a long standing experiment used in undergraduate science laboratories. This study aims to improve upon the extraction by the use of a sample preparation method known as QuEChERS (Quick, Easy, Cheap, Effective, Rugged, and Safe). QuEChERS has been used for the analysis of pesticides in foods and is applicable to caffeine in tea. Providing clean samples free of matrix interferences is one of the main advantages of QuEChERS. The use of a micro-liquid liquid extraction step combined with dispersive-solid phase extraction, provides clean samples with limited solvent use and sample preparation time. Another important parameter of this study is optimizing the partition coefficient during the liquid-liquid extraction. In order to provide a method which has maximized the percent recovery of caffeine, the solubility of caffeine in the solvent must be maximized. Determining the optimal solvent for the extraction will aid in optimizing the partition coefficient for the system.

Thus far, it has been shown that the addition of salts (125mg NaCl and 500mg MgSO<sub>4</sub>) to the system increases the amount of caffeine extracted. Peak areas for caffeine in Lipton tea increased from  $9.40 \times 10^7$  to  $1.62 \times 10^8$  when salt was added to the QuEChERS method. In addition, the peak area of caffeine when simply soaking the tea bag in a solvent was higher than when QuEChERS was applied with the absence of salts. Without salts, the peak area for caffeine was  $8.66 \times 10^7$  with QuEChERS and  $9.40 \times 10^7$  without QuEChERS, as compared to the increase observed for QuEChERS *with salts* giving a peak area of  $1.62 \times 10^8$  with QuEChERS and  $1.12 \times 10^8$  without QuEChERS. The same trend was also observed with Wagh Bakri masala chai tea bags. It was also observed that, for the Wagh Bakri tea, increasing the amount of NaCl compared to MgSO<sub>4</sub> during the extraction resulted in a slight increase in the peak area of caffeine for the tea bags, but a decrease for the caffeine standard (see Figure 1).

Not only was the affect of salts during the extraction investigated, but multiple solvent systems including ethyl acetate, acetonitrile, acetone, and methanol are currently being studied to determine which solvent provides optimal solubility, and thus the optimal partition coefficient, of caffeine in the organic phase using gas chromatography mass spectrometry (GC-MS).



**Figure 1.** Bar graph illustrating the effects of varying NaCl on peak area for a caffeine standard and Wagh Bakri tea.

### References

1. The Chemistry of QuEChERS: Quick, Easy, Cheap, Effective, Rugged and Safe Method for Determining Pesticide Residues. UCT. [http://analytische.kvcv.be/downloads/organische\\_analyse\\_3/TOA3\\_achrom.pdf](http://analytische.kvcv.be/downloads/organische_analyse_3/TOA3_achrom.pdf) (Accessed Sept 26, 2012).
2. Anastassiades, M. The QuEChERS Method: Background Information and Recent Developments. CRL-SRM. Stuttgart June 12, 2006. [http://www.eurl-pesticides.eu/library/docs/srm/1stws2006\\_lecture\\_anastassiades\\_quechers.pdf](http://www.eurl-pesticides.eu/library/docs/srm/1stws2006_lecture_anastassiades_quechers.pdf) (Accessed Sept 26, 2012).
3. Braganca, I.; Placido, A.; Paiga, P.; Domingues, V. F.; Delerue-Matos, C. QuEChERS: A New Sample Preparation Approach for the Determination of Ibuprofen and its Metabolites in Soils. *Sci. Total Environ.* **2012**, *433*, 281-289.

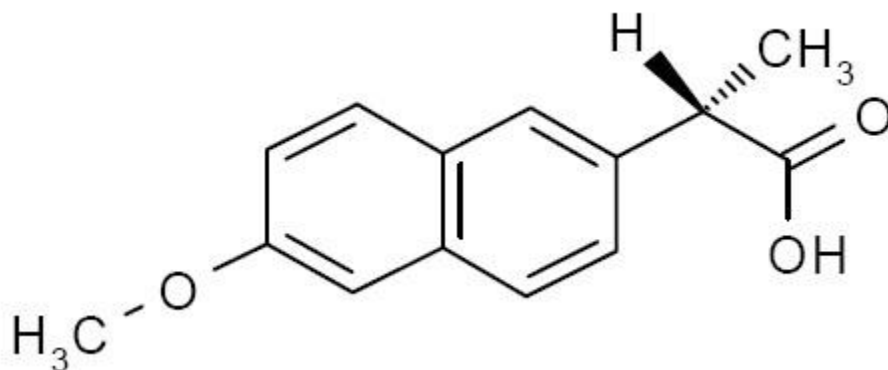
## Understanding the reaction rate of Naproxen using FTIR

Julianne Berger, Dr. John Sowa

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In this study, the reaction rate of Naproxen will be observed by FTIR under standard USP conditions. However, the idea is to vary certain conditions and monitor how the concentration of Naproxen and the rate of dissolution changes. Such conditions include two tablets versus one tablet, the pH of the phosphate buffer and the reaction time. Absorbances will be measured by an FTIR probe that will collect samples from the dissolution vessel every two minutes. After the absorbances are collected, kinetic studies will be completed to determine the maximum release of Naproxen overtime. In the early stages of this project, a standard curve of absorbance vs. concentration was produced for phosphate buffer pH 7.4. The curve was generated by measuring the absorbance of five known concentrations of Naproxen. The first kinetic study will monitor the release of two naproxen tablets over an eight hour period in phosphate buffer pH 7.4.

Naproxen is a nonsteroidal anti-inflammatory drug that helps reduce pain, fever, inflammation and any stiffness that one may be feeling. It can be identified as Aleve, Midol, and Naprelan to name a few.



**Figure 1.** Molecular structure of Naproxen.

### References

USP29-NF24 Page 1485. *US Pharmacopeia: Naproxen Sodium Tablets.*

Overview of Pharmacokinetics: The Merck Manual.

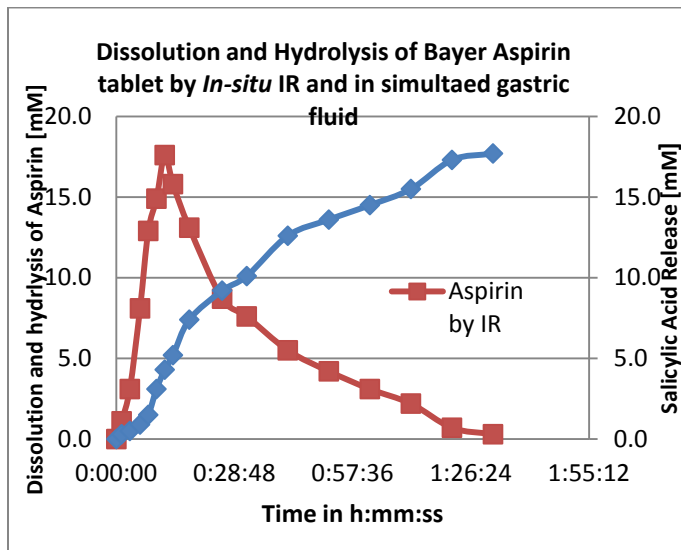
## Understanding the dynamic process of dissolution using IR spectroscopy

Vrushali Bhawtankar

Mentor: Dr. John Sowa

Seton Hall University, South Orange, New Jersey

Dissolution studies are critical tests for measuring the performance of a drug product. In the past few years, the importance of the dissolution test has increased. Using in-situ ATR/FTIR spectroscopy we developed a methodology of analyzing and monitoring dissolutions of pharmaceutical APIs. The accuracy of this technique was found to be  $\pm 3\%$  relative to HPLC and UV using acetaminophen tablet. Additionally, research was conducted on multi-component drugs such as Excedrin and Extended Release Acetaminophen tablets. We are still working on multicomponent tablet. In fact, we also performed the Hydrolysis of Aspirin and will study the chemistry behind the dissolution by React IR. In the calibration study of acetaminophen we observed that at higher concentration its behavior is non-linear, and our hypothesis is due to dimerization of acetaminophen. With the study of hydrolysis of aspirin we are trying to study the non linear behavior of acetaminophen. With improved sensitivity, this is a promising method for monitoring dissolution of pharmaceutical tablets with an excellent automated capability for distinguishing individual components.



### References

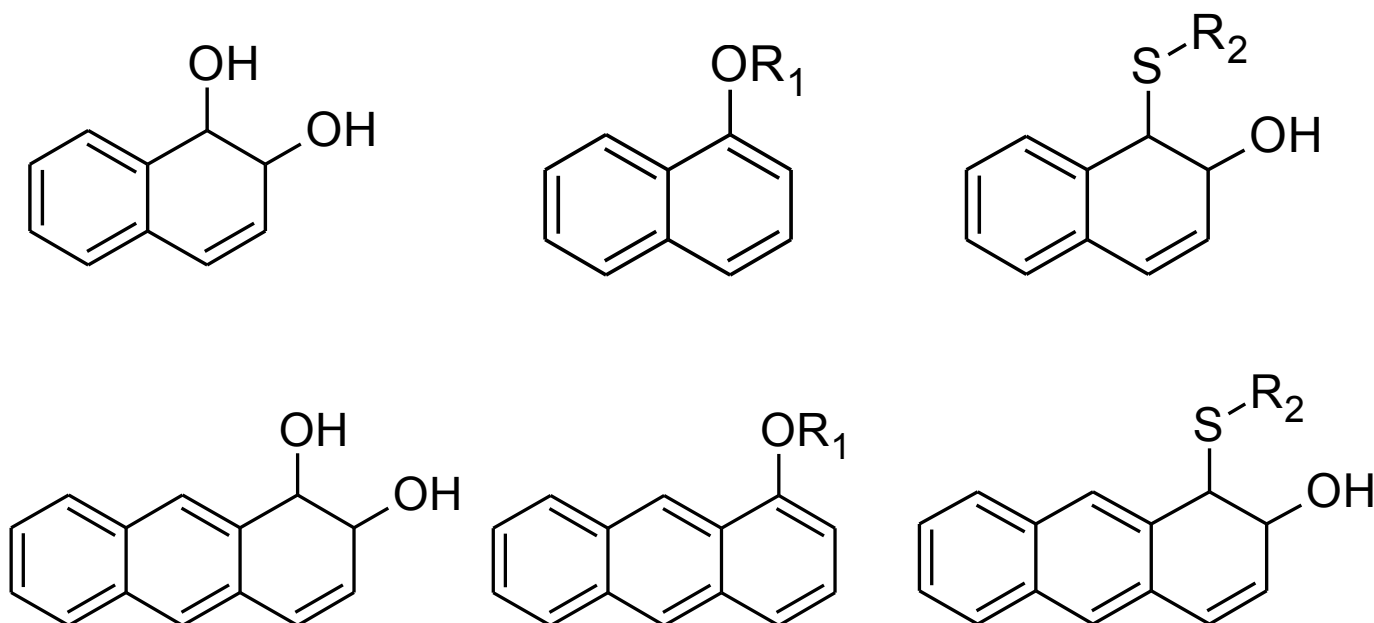
- (a) J.J. Dressman, J.K. Kramer (Eds.), Pharmaceutical Dissolution Testing, Taylor and Francis, Boca Raton, FL, 2005.
- (b) R. Hanson, V. Gray, Handbook of Dissolution Testing, 3rd ed., Dissolution Technologies, Hockessin, DE, 2004.

# Analysis of Polycyclic Aromatic Hydrocarbons (PAH's) Metabolites in *Menhaden* Using Tandem Mass Spectrometry (MS/MS)

Thomas DelMastro

In fish, the metabolism of PAH's is achieved through the use of a two-phased enzyme system that utilizes oxidation, reduction, hydrolysis and conjugation reactions. Phase I metabolism employs the use of enzyme Cytochrome 450 (CYP) to oxidatively biotransform PAH's into their hydroxylated metabolites. Phase II metabolism utilizes conjugation enzymes that transfer glutathione, sulfate or glucuronic acid residues to the hydroxylated metabolites. This two-phase enzyme catalyzed metabolic system allows for the breakdown of lipophilic PAH's to their hydrophilic toxic metabolites. These toxic metabolites can then bind to cellular macromolecules and illicit cell damage, mutagenesis, teratogenesis, and carcinogenesis. In this study, the detection of naphthalene and anthracene metabolites using MS/MS in *Menhaden* will be explored.

## Naphthalene & Anthracene Metabolites of Interest



R1 Glucuronic acid / sulfate residue  
R2 N-Acetyl-L-Cysteine residue

## References

- Tuvikene, A. Responses of fish to polycyclic aromatic hydrocarbons (PAHs). *Ann. Zool. Fennici*. **1995**, 32, 295-309.
- Stegeman, J.J.; Lech, J.J. Cytochrome P-450 Monooxygenase Systems in Aquatic Species: Carcinogen Metabolism and Biomarkers for Carcinogen and Pollutant Exposure. *Environmental Health Perspectives*. **1991**, 90, 101-109.
- Preuss, R.; Angerer, J.; Drexler, H. Naphthalene-an environmental and occupational toxicant. *Int. Arch. Occup. Environ. Health*. **2003**, 76, 556-576.

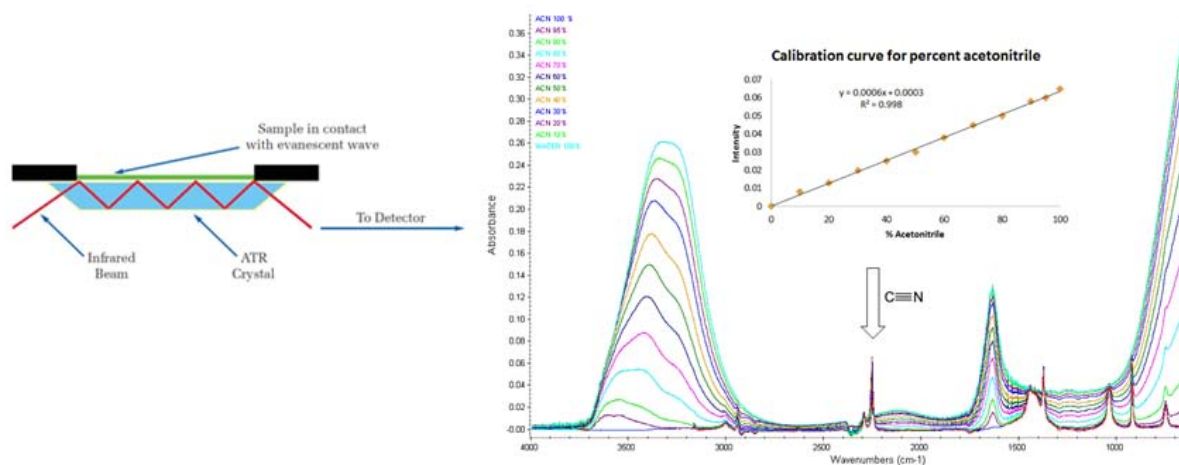


# Separation Of Acetonitrile-Water Mixture Using Mass Separating Agents

Mithilesh Deshpande

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Worldwide shortage of acetonitrile (ACN), a commonly used HPLC solvent has forced us to implement a strategy for conserving the existing stocks. The most economical at laboratory level still remains the toll-recovery and resupply of ACN extracted from HPLC solvent wastes, and is already being considered by many as an exciting prospect. It is technically very challenging as ACN forms an azeotropic mixture with the water (H<sub>2</sub>O) as well as other organic solvents like methanol that is often also present in HPLC solvent wastes, making straightforward distillation unlikely to achieve the purity levels required (99.95%). Therefore a cost effective, nondestructive separation technique needs to be proposed. In present study we investigated different Mass separating agents (MSAs) like salts and sugars as means of separating ACN-H<sub>2</sub>O mixture and study phase separation by employing ATR-FTIR spectroscopy.



**Figure.** Schematic of ATR-FTIR spectroscopy along with IR spectra generated for quantitation of acetonitrile

## References:

- Yesong G., Po-Hung S., **Salt-induced phase separation can effectively remove the acetonitrile from the protein sample after the preparative RP-HPLC**, *Enzyme and Microbial Technology*, 35 (2004) 592–597.
- Wang B., Ezejias T., Feng H., Blaschek H., **Sugaring-out: A novel phase separation and extraction system** *Chemical Engineering Science*, 63 (2008) 2595-2600.
- Dhamole P. B., Mahajan P., Feng H., **Sugaring out: A new method for removal of acetonitrile from preparative RP-HPLC eluent for protein purification** *Process Biochemistry*, 45 (2010)1672-1676.
- Acetonitrile shortage, <http://www.chromatographyonline.com/lcgc/article/articleDetail.jsp?id=60565> (Accessed date Oct 2011).
- Principles of green chemistry, [www.epa.gov/sciencematters/june2011/principles.htm](http://www.epa.gov/sciencematters/june2011/principles.htm) (Accessed date Feb 2012).
- Acetonitrile-water azeotrope, <http://en.wikipedia.org/wiki/Azeotrope> (Accessed date Nov 2011).
- Attenuated total reflectance, [http://shop.perkinelmer.com/content/technicalinfo/tch\\_ftiratr.pdf](http://shop.perkinelmer.com/content/technicalinfo/tch_ftiratr.pdf) (Accessed date Dec 2011).

# Ru-Catalyzed Isomerization/Asymmetric Transfer Hydrogenation of Secondary Allylic Alcohols

Christopher O. Shoola and John R. Sowa Jr.

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The increasing value of chiral alcohols as synthetic intermediates or precursors in the synthesis of many biologically active compounds and therapeutic drugs, continue to attract research attention of synthetic chemists. Among the methodologies that have been developed for the synthesis of chiral alcohols, one of the common methods is the asymmetric reduction of prochiral ketones through Asymmetric Transfer Hydrogenation (ATH) reactions.

Asymmetric transfer hydrogenation has thus, emerged as a method of choice for the reduction of ketones and other unsaturated compounds such as imines, olefins and heterocyclic aromatics. Moreover, another class of unsaturated system is the allylic alcohols particularly secondary allylic alcohol, which we envisioned can be converted to chiral secondary alcohols via a one-pot isomerization/asymmetric transfer hydrogenation mechanisms, knowing that transition-metal hydride such as ruthenium-hydride can be generated *in situ* to catalyze redox-isomerization of allylic alcohol to afford prochiral ketone which can be subsequently transformed to chiral alcohol.

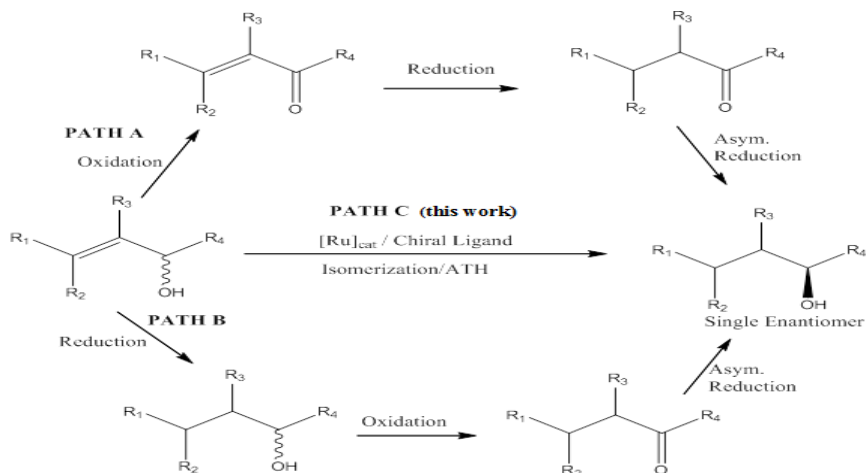
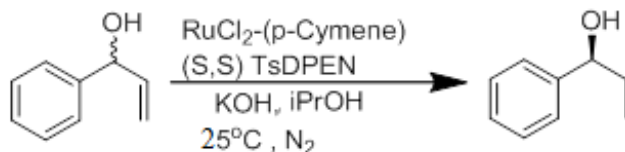


Figure 1: Representative one-pot transformation of allylic alcohol

We have recorded impressive product yield and very encouraging product enantiomeric excess in this reaction, and currently studying substituents' electronic and steric effects on the reaction.



(S) Enantiomer, 95% yield, 90% ee

Scheme 1: Model reaction

## References:

1. Z.-H. Yang, R. Zeng, G. Yang, Y. Wang, L.-Z. Li, Z.-S. Lv, M. Yao and B. Lai, *Journal of Industrial Microbiology and Biotechnology*, **2002**, 35, 1047-1051.
2. R. Noyori, S. Hashiguchi, *Acc. Chem. Res.* **1997**, 30, 97-102
3. Ruoqiu Wu, Marie G. Beauchamps, Joseph M. Laquidara, and John R. Sowa, Jr. *Angew. Chem. Int. Ed.* **2012**, 51, 1-6
4. M. T. Reetz, X. Li, *J. Am. Chem. Soc.* **2006**, 128, 1044-1045
5. R. Kadyrov, T. H. Riermeier, U. Dingerdissen, V. Tararov, A. Borner, *J. Org. Chem.* **2003**, 68, 4067-4070.

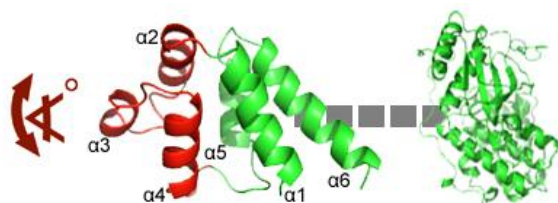
## Analyzing PEA-15 Death Effector Domain Conformational Change upon ERK2-binding through Residual Dipolar Coupling

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Protein-protein interactions are dictated by protein conformational changes which facilitate the interactions and often dictate a wide array of functions for a given protein. Understanding the basis for these changes in protein structure is important for assessing the foundations of the interactions at the structural level. Here we present a method, using Residual Dipolar Coupling (RDC) Nuclear Magnetic Resonance (NMR) spectroscopy experiments, to assess protein conformational change upon protein-protein interaction without knowledge of the protein complex structure, and demonstrate the utility of this method through assessing PED/PEA-15 (phosphoprotein enriched in diabetes/astrocytes, 15 kD) conformational change upon ERK2-binding (Extracellular Regulated Kinase 2) along the PEA-15 death effector domain (DED).

PEA-15 has long been implicated in an array of protein-protein interactions along various pathways, including FADD and caspase-8 (apoptosis), ERK1/2 (cell cycle entry), and PLD1/2 (diabetes). Recently, we solved the high definition structure of the PEA-15 DED<sup>1</sup> and assessed PEA-15 dynamics upon ERK2 binding<sup>2</sup>. Here, we describe an interesting conformational change of the PEA-15 DED upon binding ERK2.



### References

1. Twomey, E. C. & Wei, Y. High-definition NMR structure of PED/PEA-15 death effector domain reveals details of key polar side chain interactions. *Biochemical and Biophysical Research Communications* **424**, 141-146 (2012).
2. Twomey, E. C., Cordasco, D. F. & Wei, Y. Profound conformational changes of PED/PEA-15 in ERK2 complex revealed by NMR backbone dynamics. *Biochimica et Biophysica Acta* **1824**, 1382-1393 (2012).

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## HIGH-DEFINITION NMR STRUCTURE OF PED/PEA-15 DEATH EFFECTOR DOMAIN ALLOWS ASSESSMENT OF KEY SIDE CHAIN INTERACTIONS ON THE PROTEIN SURFACE

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PED/PEA-15 (phosphoprotein enriched in diabetes/astrocytes, 15 kD) is a small, non-catalytic, death-effector domain (DED) containing protein, that is widely expressed in different tissues and highly conserved among mammals. PED/PEA-15 has been found to interact with several protein targets in various pathways, and these targets include FADD and caspase-8 (apoptosis), ERK1/2 (cell cycle entry), and PLD1/2 (diabetes). We have recently refined the PED/PEA-15 DED structure with additional residual dipolar coupling (RDC) restraints measured from two independent alignment media using explicit solvent refinement protocol. The improved structural quality of the protein allows us to assess the charge triad interactions, together with several other functionally important surface interactions, which provide profound structural insights in the regulatory roles of PED/PEA-15 in various cellular processes.

### Reference:

- Twomey, E.C. and Wei, Y, High-Definition NMR Structure of PED/PEA-15 Death Effector Domain Reveals Details of Key Polar Side Chain Interactions, *Biochem. Biophys. Res. Commun.* **2012**; 424: 141-146, doi: 10.1016/j.bbrc.2012.06.091
- PDB ID: 2LS7 – High Definition Solution Structure of PED/PEA-15 Death Effector Domain

## **Molecular Modeling of Transient Receptor Potential Vanilloid Type 1 Ion Channel (TRPV1) and Transient Receptor Potential Melastatin Type 8 (TRPM8)**

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The Transient Receptor Potential (TRP) family of ion channels encompasses more than 30 members, which are expressed in many different tissues and cell types.<sup>1</sup> Molecular modeling will be used in order obtain structural and functional data on Transient Receptor Potential Vanilloid Type 1 (TRPV1) and Transient Receptor Potential Melastatin Type 8 (TRPM8) ion channels in their membrane bound environment. In particular, the S1-S4 region and C-terminal domain of each protein will be used for this study. TRPV1 is part of the TRP family gated by vanilloids, heat and protons, while TRPM8 is activated by cold, methanol and icilin.<sup>2</sup> S1-S4 region of both channels are the putative ligand binding segment, while the C-terminal domain is suggested to respond to temperature and regulated by phosphatidylinositides. Currently, the only portion of either model that has been crystallized is the six ankyrin repeats that make up a small segment of the N terminal region. Therefore, a molecular model of the transmembrane S1-S4 domain segment of TRPV1 and TRPM8 was created using their respective homology models and inserted into their membranes. In addition, a molecular model using an alpha helix bound, mimicking helix S6 in TRPV1 or TRPM8, to the C-terminal domain of either protein was also created. Performing molecular dynamics simulations on the both regions could provide pivotal information about ligand binding, voltage sensing, interaction with heat/cold and proton binding for both TRPM8 and TRPV1. A greater understanding of the structure of TRPV1 and TRPM8 could provide important details on how to alleviate certain diseases such as pain, asthma and diabetes.

### References:

1. Jara-Oseguera, A., A. Nieto-Posadas, et al. (2010) "Molecular Mechanisms of TRPV1 Channel Activation." The Open Pain Journal. **3**: 68-81.
2. Clapham, D. E. (2003). "TRP channels as cellular sensors." Nature **426**(6966): 517-524.