

# 9th Annual S.T.E.M. Research Symposium

Wednesday, April 12, 2017  
9:00 am – 12:00 pm  
Andreas Building, Room 111  
Barry University  
Miami, FL

This research symposium is aimed at engaging the Barry community in learning about and sharing in the excitement of ongoing discoveries and research within the S.T.E.M. disciplines (Science, Technology, Engineering, and Math). Undergraduate students will present posters related to their past and current research in biology, chemistry, computer science, health science, information technology, mathematics, psychology, and physics.

## **This Event is Organized by Members of Barry University's STEM Committee**

Sumera Ackbarali, MS | Khaled Deeb, PhD | Sabrina Des Rosiers, PhD  
Maurizio Giannotti, PhD | Christoph Hengartner, PhD | Ricardo Jimenez, PhD | Peter Lin, PhD  
Michael Robinson, PhD | Zuzana Zajickova, PhD | Sanja Zivanovic, PhD | Anita Zavodska, PhD

## **We Gratefully Acknowledge**

Sponsors from Barry University:  
College of Nursing and Health Sciences  
Department of Biology  
Department of Mathematics and Computer Science  
Department of Physical Sciences  
Department of Psychology  
School of Professional And Career Education  
&  
The Dedication of Research Mentors, Support Staff,  
and Undergraduate Researchers

## **Special Thanks for Assisting with the Symposium**

Department of Brand Marketing and Communications  
Flona Redway, PhD, Director, RISE Program  
Norma Barrera, Administrative Assistant, RISE program  
Beth Culverson, Administrative Assistant, Department of Physical Sciences  
Undergraduate Student Volunteers



# Barry University College of Nursing and Health Sciences

## Clinical Biology - Histotechnology Specialization

### 1. Comparison of Decalcification Methods Routinely Used in the Histopathology Lab

*Elysse Hall, Marc Coppola, Romaldi Thelusma, Katherine Senra, Didiana Duque, Tatiana Chavarria, Daniel Packert (Barry University, Miami Shores, FL)*

Timing is of the utmost importance in the histopathology laboratory and needs to be taken into careful consideration when determining how specimen will be processed. Decalcification of hard tissues, like bone, is a routine aspect of histopathology and with many different choices of decalcifying methods. Timing is a crucial factor. Methods of decalcification include using strong acids, weaker acids, chelating agents, and electrolysis. Usually, acids will decalcify smaller specimen within days to weeks, while chelating agents can take up to months to decalcify the same size of specimen. Decalcifying hard tissue should balance the speed of decalcification but preserve cellular morphology and quality of staining. Other influences to consider are heat and agitation to speed up the decalcification process. The present study compares the rate of decalcification that occurred within seven days on the bones of chicken feet using different decalcification agents: 10% nitric acid, 10% formic acid, Perenyi's fluid, and EDTA all completed with and without mechanical agitation. The specimens were rated by ease and difficulty of obtaining sections and tissue morphology was compared with hematoxylin and eosin. In addition, the rate of decalcification was compared between and within groups by using a Von Kossa stain for calcium salt deposits remaining in the specimens. The stronger acids decalcified the hard and soft tissue components within seven days; however, the chelation agent used required more time to decalcify the specimens. Despite EDTA being used to preserve cellular components, it is apparent that using stronger acids like 10% nitric acid would drastically reduce the decalcification time and result in similar cellular detail. Physical agitation of the decalcification fluid may be recommended to retain tissue morphology and quality staining and speed up the rate of decalcification.

# Barry University School of Professional And Career Education

## 2. Rehabilitation Information System for American Veterans

*Edwin Casseus, Lionel Dufresne, Mariamne Lagrange, Rolando Pera, Daniel Rodriguez, Khaled Deeb (Barry University, Miami Shores, FL)*

The goal of this project is to develop a rehabilitation information system designed to assist American veterans who are suffering from Post-traumatic Stress Disorder (PTSD). The primary focus of the system is create a virtual community that facilitate communication between online communities and connect veterans through a secured medium. The system assists veterans diagnosed with this disorder by generating an avenue to express their thoughts into words by providing access to a virtual environment. This environment will be equipped with the accessibility to a variety of settings for comfort and relaxation to enhance creative writing ability. The intent is not to have veterans relive the horrors of their condition, but rather to expand on the desires to write about topics that peak their interest. The purpose of the web-based system is to combine the atmosphere, the equipment, and the guidance for Veterans to express their thoughts in writing with the intention of avoiding PTSD symptoms triggers. The system provides a secure web portal which gives remote access to registered participants. Writing coaches provide Veterans with assistance in the development of creative writing as well as proper grammar and sentence structure for the enhancement of their writing skill level. The system has been designed using WordPress, which is very user friendly to the online visitor and extended to those on mobile devices. This allows the convenience to access the site from any medium, including the ability to access the site blogs as well as writing materials while on the go.

## 3. Social Information System Processing

*Clarence Hallmark, Sonya Johnson, Jared Ramadhar, Khaled Deeb (Barry University, Miami Shores, FL)*

The objective of this mobile and web application is to facilitate information access to local residents about events that are going on in their communities. How many times have we sat at home on during the week nights asking ourselves “What is there to do?” This application shows what, when and where an event is going on in an area of interest. The ultimate goal of this application is to get today’s society more interactive with each other rather than living vicariously through social media. This will greatly benefit citizens of all age and socioeconomic groups by providing a service that promotes contact within communities. Users can filter the search results by distance, age group, or event name, among other options. The application uses a secure web-based access available on all devices. Such service will give citizens the opportunity to explore and interact within an atmosphere that promotes socializing face-to-face. Users will be able to download the free application in their respective application market. With this light social media application, users will feel encouraged to socialize and, in turn, this will bring a natural marketing strategy approach to businesses. In addition, this will give small or big companies the opportunity to invest in themselves to promote their business and attract more customers.

#### **4. Haiti Resilience Systems Application Interface**

*Mario Osorio, Daniel Garcia, Dwayne Quick, Katdo Robinson, Vanessa Pedrianes, Khaled Deeb (Barry University, Miami Shores, FL)*

The objective of this project is to develop an interface for the Haiti Resilience System to facilitate data collection and analysis. This data will in turn aid in strategic planning of where, when, and how to provide the most benefit for communities in need. With this information, the Haiti Resilience System can identify patterns, make forecasts, and develop strategic plans to manage the current issues on the ground. Through procedures, such as data mining and data aggregation, analyses can be performed to help identify the best course of action. During the process of analyzing the data, visual analytics can also be used in order to get a better understanding of the situation being examined. With this interface, the Haiti Resilience System will gain the capability to study data, make proactive decisions, and take preemptive actions to better manage and combat crises. This project will be particularly relevant in helping Haiti after the devastation caused by Hurricane Matthew. Hurricane Matthew destroyed much of Haiti, taking hundreds of lives, destroying almost all homes in its path, contaminating the water supply (bringing about cases of cholera), destroying substantial amounts of crop (which could lead to a famine), isolating parts of the country in need of aid, and severely damaging hospitals. This data analytics interface can help in identifying where cases of cholera have appeared and where they might be predicted to appear next. By having this information, responders will be able to take strategic actions in an effort to control the spread of the plague.

#### **5. Haiti Resilience System GIS Mapping System**

*Mario Osorio, Seneca Doss, Samuel Brunt, Cleophas Babinguy Samba, Ricardo Del Cueto, Khaled Deeb (Barry University, Miami Shores, FL)*

In efforts to address the severity level 5 humanitarian crisis following Hurricane Matthew's landfall on the southern peninsula in Haiti, which has threatened the health and lives of hundreds of thousands of Haitians during the last quarter of 2016, we have developed a data aggregation system which allows the Haiti Mayors' Resilience Initiative to provide open situational awareness on mission critical gaps in Haiti. The system would allow key stakeholders to understand the need for essential response, recovery, and resilience initiatives and how they can be best engaged. It also connects the Haiti Resilience Networks' crowd-sourcing and secondary source findings to a process of data aggregation, data cleansing, analysis, and visual analytics for easy sense-making. The system is composed of a web and mobile-based application to capture critical information exchanged between groups on Whatsapp regarding on ground's mission critical information, such as food, sanitation, outbreaks, transportation, among others. The system provides an interactive geographical map, capable of pinpointing locations in Haiti that correspond with a specific issue/event being searched. The interface interacts with an online database and tagging system, applying markers to the GIS Map, and assisting analysts and decision makers by providing a better way to conceptualize the information being sent by those on the ground. This increased visualization will allow for better decision-making when it comes to allocating resources and manpower to areas in Haiti. The system was developed using XAMPP, a MySQL, and PHP. The user interface provides a means to upload data extracted from text files of exported Whatsapp Group Chats that are later stored in multiple databases for data mining. The interface uses Google Map API to view and analyze a geographical location in Haiti using color-coded identifiers to express the severity of a mission critical function.

## **Barry University College of Arts and Sciences Department of Biology**

### **6. Nocodazole inhibits myeloid leukemia cells and cancerous hepatocytes and their stem/progenitors via multiple signal pathways**

*Jocelyn Baquier, Darrell Henry, Sebastien Brumaire, Laura Schoonover, Tang Hu (Barry University, Miami Shores, FL)*

Nocodazole is known for its inhibitory effect on microtubule polymerization. However, its specific effect on human myeloid leukemia cells and cancerous hepatocytes, especially on their stem/progenitors is largely unknown. In this study, we investigated the effect of Nocodazole on the growth of human myeloid leukemia cells (MV4-11 and TF-1a) and liver cancer cells (HEP-G2). Addition of Nocodazole at a concentration of 5 QM to the cell culture significantly inhibited the growth of MV4-11, TF-1a, and HEP-G2 cells, measured by MTT assay and Trypan blue staining. The inhibitions were dose-dependent with maximal inhibition being observed at a concentration of 10 QM of Nocodazole. Less than 1 QM of the agent had no significant inhibitory effect on the growth of the cells. The cytology study showed that the cells treated with Nocodazole displayed some apoptotic-like changes, which is consistent with the activation of caspase 8, an apoptosis-regulatory molecule, detected by Western blot. Nocodazole also induced partial differentiation in TF-1a cells, evidenced by reduced nucleus/cytoplasm ratio. We were surprised to find that the stem/progenitors of MV4-11, HEP-G2 and TF-1a cells measured by semi-solid clonal culture had a much high sensitivity to Nocodazole. At a concentration of 0.01 QM, Nocodazole inhibited 80-90% of the colony-forming cells derived from the three cell lines described above. Paralleled to the decreased cell proliferation, expression of two cell cycle regulatory proteins, cdc2 and cdk2, were markedly inhibited. In addition, our preliminary data suggests that the mechanisms responsible for Nocodazole action also involve the transcription factors, E2Fs. Our data suggests that Nocodazole inhibits cell growth via regulating multiple signal pathways and the high sensitivity of hematopoietic stem/progenitor cells to Nocodazole makes this agent a potential drug for disrupting damaged bone marrow stem cells before receiving healthy bone marrow transplantation.

*Supported by NIH-NIGMS RISE Grant, R25 GM059244-16 Barry University.*

### **7. An ex-vivo tissue explant zebrafish model for the study of biofilm formation and eradication**

*Arin Blake<sup>1</sup>, Miguel Belaunzaran<sup>1</sup>, Peter Rodriguez<sup>2</sup>, Brenda Schoffstall<sup>1</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>FAU-Max Plank Florida Institute for Neuroscience, Jupiter, FL)*

Biofilm is an accumulation of multi-species and multicellular microbial mass embedded in polysaccharide matrix with adhesive abilities. Complex biofilm has remarkable ability to impede normal immune responses and aggressive medical interventions, leading to difficulties in treating infections of wounds, heart valves, and bone tissue. We must utilize in vitro, in vivo, and ex vivo models to gain understanding of biofilm formation and eradication. We have previously established that the RP62A (WT) *S. epidermidis* strain was able to form robust biofilm, compared to 1457(WT), which formed smaller biofilm mass, and mutant 1457 aapΔ/icaΔ, which was unable to form biofilm. We previously established a wound model using *Danio rerio* (zebrafish), both in in vivo setting and ex-vivo tissue explant culture, within which formation, growth, and treatment of biofilm can be analyzed. After inflicting penetrating burn injuries to zebrafish, wounds were inoculated with RP62A (WT), 1457 (WT), or 1457 aapΔ/icaΔ strains of *S. epidermidis*. We photographically documented the process of biofilm formation in inoculated wounds within zebrafish explant cultures. We found evidence of bacterial growth in all three strains; however, only the RP62A strain formed robust, macroscopic biofilm. All Gram stains demonstrated presence of classic staphylococcal bacteria and Gram negative rods,

which are representative of endogenous or environmental bacteria. Gram stain of RP62A biofilm exhibited evidence of cluster formation held together with polysaccharide matrix. Future studies will focus on investigating chemical or pharmaceutical means to disrupt biofilm formation in zebrafish in vivo and in ex-vivo tissue explant culture.

*Supported by DARPA Award BAA 10-55 to G. Packert, Barry University and by 2016 ASCB MAC Linkage Fellowship awarded to B. Schoffstall.*

## **8. Extreme hypoxia and apoptosis programming in zebrafish cardiomyocytes**

*Samantha Britz, Fabio Frech, Gabriela Hernandez, Brenda Schoffstall (Barry University, Miami Shores, FL)*

Although human cardiomyocytes are capable of some cell division, this response is neither sufficient to repair damaged cardiac tissue, nor compensate for pathological stress. In contrast, it is known that cardiomyocytes in damaged *Danio rerio* (zebrafish) hearts are capable of complete regeneration in response to pathological injury and stress. We have developed a simple anaerobic incubation tank to induce pathological hypoxia in zebrafish hearts. After exposing fish to a severely oxygen-depleted environment for 2 hours, we found that the dissolved oxygen (DO) in fish water is reduced by an average of 81%, when compared to water exposed to normal atmospheric conditions – presumably sufficient to cause detectable cardiomyocyte damage. When cardiomyocytes are damaged by prolonged hypoxia exposure, they are typically programmed for apoptosis, and should exhibit an increase in the level of mono- and oligonucleosomes in the cytoplasm prior to actual cell death and dissolution of the cell membrane. Following re-exposure to normal oxygen levels, we dissect hearts to study specific effects on cardiac tissue. Here, we demonstrate our efforts to assess the level of cardiomyocyte damage inflicted using our hypoxia model, by testing for evidence of apoptosis programming using an ELISA assay to detect cytoplasmic histone-associated DNA fragments. With the ability to achieve detectable cardiomyocyte damage using our hypoxia model, we can conduct future investigations of cardiac regeneration and cardiomyocyte proliferation in zebrafish. Findings could promote investigation of targeted molecular therapies to treat human cardiac disease.

*Supported by NIH-NIGMS RISE Award, R25 GM059244-16, Barry University and by the 2016 ASCB MAC Linkage Fellowship, B. Schoffstall.*

## **9. Does embryonic alcohol exposure affect neurogenesis in the zebrafish hindbrain?**

*Valdwin Etienne, Shanell Smith-Cappa, Stephanie Bingham (Barry University, Miami Shores, FL)*

The far-reaching effects of fetal alcohol exposure on development, behavior and cognition have been documented for decades. Previous studies in rat models have highlighted effects on hippocampal neuron populations, seemingly providing a mechanism by which learning impairments arise in those afflicted with fetal alcohol spectrum disorders (FASDs). In this study, we are examining the possible effect of fetal alcohol exposure on neuronal density in the hindbrain region of embryonic zebrafish. Control and ethanol-treated embryos were preserved, cryosectioned and then stained using immunohistochemical approaches. Neuronal density was then quantified using Image J analysis software in order to compare neuronal density across treatment groups. We hope to determine whether there is a correlation between the cranial nerve density in the hindbrain and the craniofacial abnormalities that are hallmarks of FASDs such as fetal alcohol syndrome.

*Supported by the Department of Biology, College of Arts and Sciences.*

## 10. An RNA-Sequencing Approach to Studying the Molecular Mechanisms Underlying Fetal Alcohol Spectrum Disorders

*Annalliam Flores, Jennyvette Trinidad, Stephanie Bingham (Barry University, Miami Shores, FL)*

The investigation into the molecular mechanisms underlying Fetal Alcohol Spectrum Disorders (FASDs) is a fertile area of scientific inquiry. RNA sequencing is an emerging method for observing transcriptome changes. Here, we are examining gene expression alterations in embryonic zebrafish in response to ethanol exposure. Wild-type zebrafish were bred and the embryos treated with ethanol during an embryonic period coincident with both rapid neurogenesis and a time during which a woman may continue consuming alcohol because she is not yet aware that she is pregnant. To address the question of whether there is a quantifiable change in gene expression following embryonic ethanol exposure, RNA isolation was performed using standard protocols, and confirmed via spectrophotometry and RNA gel electrophoresis. This isolated RNA will be used for RNA sequencing (RNA-Seq) analysis to help with the identification of candidate genes whose expression profile is altered following ethanol exposure. It is predicted that some of the genes identified will provide clues to the genetic basis for disorders such as those associated with FASDs.

*Supported by the Department of Biology, College of Arts and Sciences.*

## 11. Pathological stress in zebrafish hearts using extreme hypoxia exposure

*Fabio Frech<sup>1</sup>, Gabriela Hernandez<sup>1</sup>, Johan Sanchez<sup>2</sup>, Brenda Schoffstall<sup>1</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>Methodist University, Fayetteville, NC)*

Although human cardiomyocytes are capable of some cell division, this response can neither repair damaged hearts, nor efficiently compensate for pathological stress. However; *Danio rerio* (zebrafish) cardiomyocytes are capable of proliferation to repair pathological damage. Here, we report a new zebrafish cardiac stress model using extreme hypoxia exposure as a negative stressor to induce pathological cardiomyocyte damage. We have developed a chemical-free model, using a simple anaerobic incubation tank to induce hypoxia. Our measurements demonstrate that after 2 hours' exposure in the hypoxia chamber, dissolved oxygen (DO) in individual fish tubes are reduced by an average of 81%, when compared to water exposed to normal atmospheric conditions. Following re-exposure to normal oxygen levels, we dissect hearts to study specific effects on cardiac tissue, either immediately following damage or during the reperfusion and repair process. We have used fluorescent labels to detect nitroreductase activity and reactive oxygen species (ROS) production – – both indicators of hypoxic damage – – to study effects on hearts immediately following hypoxia under the described conditions. Epicardial, pericardial, and myocardial tissues appear to exhibit detectable ROS production, while only myocardial tissue appears to demonstrate nitroreductase activity. Our novel hypoxia/reperfusion model will be used in future investigations to follow cardiac regeneration over time and identify molecular mechanisms that may act as a “switch” to turn on proliferation in zebrafish cardiomyocytes to repair the hypoxic damage. Findings could promote investigation of targeted molecular therapies to treat human cardiac disease.

*Supported by NIH-NIGMS RISE Award, R25 GM059244-16, Barry University.*

## 12. Extract of green tea and its major chemical component inhibit human myeloid leukemia and liver cancer cells

*Darrell Henry, Sebastien Brumaire, Jocelyn Baquier, Tang Hu (Barry University, Miami Shores, FL)*

Although the benefits of green tea to human health including prevention of cancer have been widely reported in recent years, the specific effect of green tea on cancer cells is still unclear and the reports on green tea are somewhat inconsistent. In this study, we presented evidence that green tea extract and Epigallocatechin-3-gallate (EGCG), inhibit both suspension and adherence cancer cells. Addition of green tea extract to the culture of myeloid leukemic TF-1a and MV4-11 and liver cancerous HEP-G2 cells significantly inhibited their proliferation in liquid culture, measured by XTT assays and cell number counting. The inhibition is dose dependent with more than 40% inhibition being observed when concentrations of 3-6% of the extracts were added to the culture. The tea extract also markedly reduced the numbers of stem/progenitors derived from the three cell lines, determined by counting colony-forming cells in semi-solid clonal culture. EGCG, a major component of polyphenol in green tea, showed more profound inhibitory effect on the three cell lines. At a concentration of 0.2 mg/ml, EGCG inhibited 30-50% of the cells tested, varied with each cell type. Trypan blue staining and cytology analysis exhibited that both green tea extract and EGCG caused death in the portion of the cells, some of which showed apoptotic-like change and some cytotoxic injury. In the HEP-G2 cells EGCG induced formation of large amount of cluster cells; the cell adhesion to the substrate (to form monolayer) was significantly repressed. By performing Western blot, we found that green tea inhibited two cell cycle regulatory molecules, cdc2 and cdk4. A specific apoptotic target by green tea is currently under investigation. Our results clearly demonstrated that green tea extracts and its polyphenol component have antiproliferative and anti-cancer activity by downregulating the expression of several cell cycle molecule, activating apoptotic pathway, and causing cytotoxic effect.

*Supported by the Department of Biology, College of Arts and Sciences.*

## 13. Roles of a Dynamin-related protein and interacting proteins in plant development

*Gabriela Hernandez<sup>1</sup>, Gayani Ekanayake<sup>2</sup>, John M. Smith<sup>2</sup>, Antje Heese<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>University of Missouri, Columbia, MO)*

Studying how plants defend themselves against pathogens is highly important because many plants can be damaged by bacterial infections, which in turn can cause a decrease in crop production and biomass. The biomass of a plant mainly depends on the amount of organic matter produced in the leaves and the nutrients that are taken up by the root system. Vesicular trafficking is the movement of cargo proteins from one organelle to another in the form of small membrane-bound vesicles. Our lab is interested in understanding the role of vesicular trafficking proteins in plant immunity and plant growth and development. We have recently shown that the vesicular trafficking protein Dynamin-Related Protein 2B (DRP2B) acts as molecular scissors during ligand-induced endocytosis of plant immune receptor Flagellin Sensing 2 (FLS2). In addition, DRP2B functions as a regulator for immune signaling and immunity against the virulent *Pseudomonas* bacteria. In a large scale co-immunoprecipitation assay, we have identified several vesicular trafficking proteins interacting with DRP2B including Vesicular Trafficking Protein 3 (VES3). We aimed to determine whether DRP2B and VES3 have roles in plant growth and development. Polymerase chain reaction (PCR) and cleaved amplified polymorphic sequences (CAPS) analysis were used to confirm that each *drp2b-2* and *ves3-1* are homozygous mutants. To check whether *drp2b-2* and *ves3-1* single mutants have potential developmental and growth defects, roots were grown and aerial tissues of the single mutants were weighed, and compared to wild-type Col-0. The *ves3* mutants were smaller in weight and had shorter roots compared to the wildtype Col-0 and *drp2b*. In the long term, understanding how these vesicular trafficking proteins contribute to plant growth and development may help to improve biomass production.

*Supported by NIH-NIGMS RISE Grant, R25 GM059244-16, Barry University and Cell Biology Summer fellowship from the University of Missouri-Columbia.*

#### **14. Loss of estrogen receptor alpha causes metabolic and endothelial dysfunction in male mice**

*Gabriela Lin*<sup>1</sup>, *Thomas Jurrissen*<sup>2</sup>, *Michelle Gastecki*<sup>2</sup>, *Rebecca Welly*<sup>2</sup>, *Nathan Winn*<sup>2</sup>, *Dennis Lubahn*<sup>2</sup>, *Victoria Vieira-Potter*<sup>2</sup>, *Jaume Padilla*<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>University of Missouri-Columbia, Columbia, MO)

It is well established that estrogen signaling through estrogen receptor alpha (ERα) plays a protective role against metabolic and cardiovascular dysfunction in females, however, less is known about the putative role of ERα in males. Consequently, we investigated whether it plays a similar role in metabolism and cardiac function in male mice. Sixteen month-old C57BL/6J wild type (WT; n=6) and mutated/non-functional ERα (knockout, KO; n=7) male mice underwent metabolic tests for glucose and insulin tolerance, body composition analysis, as well as aortic stiffness tests (in vivo and ex vivo), and ex vivo aortic vasomotor function tests. ERα KO mice exhibited impaired glucose and insulin tolerance compared to the WT. Despite no significant differences in body mass, KO mice displayed increased body fat percentage (KO: 24.832.83% vs. WT: 16.830.46%; p<0.05) and decreased lean mass (KO: 70.432.63% vs. WT: 78.130.41%; p<0.05) compared to WT. In addition, acetylcholine-induced vasorelaxation, an index of endothelial function, was blunted in ERα KO compared to WT mice (maximal relaxation KO: 27.335.9% vs. WT: 57.835.1%, p<0.05), whereas no differences between groups was noted in sodium nitroprusside-induced relaxation (p>0.05) and measures of aortic stiffness (p>0.05). Collectively, these findings demonstrate that disruption of ERα causes metabolic and cardiac dysfunction in males, thus supporting the notion that estrogen signaling through ERα is critical for maintenance of cardiometabolic health in both males and females.

*Supported by NIH K01 award to JP and a University of Missouri Summer Research Internship Program Award to GL.*

#### **15. Telomere defects in *cdc13-1* strains at permissive temperatures**

*Kamren Livingston*, *Wesam Azaizeh*, *Christoph Hengartner*, *Leticia Vega* (Barry University, Miami Shores, FL)

Telomeres are the physical ends of eukaryotic chromosomes that protect DNA ends from degradation. Telomeres are composed of repeated TG rich DNA sequences that end with 3' single stranded G-rich overhangs. The maintenance and function of telomeres are facilitated by the enzyme telomerase and by accessory proteins such as Ku and Cdc13. In the budding yeast, *Saccharomyces cerevisiae*, Cdc13p is an essential protein that binds to the single-stranded G-tails to prevent their degradation. The *cdc13-1* allele is a temperature sensitive allele of CDC13 that is defective in telomere capping. *cdc13-1* mutant strains are inviable at temperatures above 30°C but have been reported to show normal growth at 23°C. Furthermore, at permissive temperatures telomere length in *cdc13-1* strains is similar to wild-type. This study uses *S. cerevisiae* to examine the viability of strains containing *CDC13* (wt) and the mutant allele, *cdc13-1*, in both log and stationary phase at various temperatures. Our studies show that for cells in log phase, *cdc13-1* strain viability is reduced relative to wild-type strains by quantitative plating. However, viability in *cdc13-1* strains is unaffected by prolonged incubation in stationary phase or by incubation at 11°C. Our studies suggest that even at temperatures that are permissive for growth for *cdc13-1* strains, there is a low level of DNA damage present in these strains. Additionally, we find that yKu and Pif1 helicase activity are necessary to maintain the telomeres at permissive temperatures in these strains. The results from our investigations will be presented.

*Supported by NIH-NIGMS RISE Award, R25 GM059244-16, Barry University.*

## 16. Genetic interactions of *S. cerevisiae* telomere proteins

*Kamren Livingston, KeiAuyndria Edwards, Wesam Azaizeh, Christoph J. Hengartner, Leticia R. Vega (Barry University, Miami Shores, FL)*

Due to their linear nature, eukaryotic chromosomes possess physical ends called telomeres. They consist of stretches of repeated C/G-rich DNA ending with a 3' single-stranded G-rich overhang and function to protect the ends from degradation and end to end fusion. The enzyme telomerase and its accessory proteins catalyze the processes necessary for telomere maintenance. Cdc13p is an essential, G-strand binding protein that recruits telomerase to telomeres and is involved in telomere capping. *cdc13-1* is a temperature sensitive allele of *CDC13* that is defective for telomere end protection and, at elevated temperatures, shows a G2/M cell cycle arrest due to extensive C-strand specific degradation. At permissive temperatures for growth, however, telomere length and end protection have shown to be similar to wild-type. Ku is a non-essential heterodimer composed of Ku70p and Ku80p that plays multiple roles in DNA metabolism including non-homologous end joining, recombination, telomerase recruitment and telomere end protection. yKU also has a necessary capping function for telomeres in the G1 stage. The *cdc13-1, ykuΔ* double mutant strains show enhanced temperature sensitivity and impaired growth. This study examines the effect of a panel of mutations in *yKU80* on *cdc13-1* strains. Cells were monitored for growth at permissive and semi-permissive temperatures and telomere lengths were assayed by Southern blot. Our studies suggest that at permissive temperatures for growth, *cdc13-1* strains have subtle growth defects and Pif1p and yKU function may be required for normal telomere length in these strains.

*Supported by NIH-NIGMS MBRS RISE: R25 GM059244-16, Barry University; and NIH-NIGMS/NCI MBRS SCORE, 5SC 2CA 138567 to LRV.*

## 17. Degradation of essential proteins leads to DNA repair mediated bacterial cell death

*Kamren Livingston<sup>1</sup>, Charley C. Gruber<sup>2</sup>, Graham C. Walker<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>Massachusetts Institute of Technology, Cambridge, MA)*

All species of surgeonfish (Acanthuridae) have one to multiple spines on the base of their dorsal fin presumably used as weapons in intraspecific combat. These spines vary among species in their conspicuousness. In some species these spines are apparently advertised with colorful accents whereas in other species the spines almost appear absent because of masking colors. Surgeonfishes also have a diverse array of social systems, ranging from territorial individuals to schools of hundreds. We are attempting to determine the role of the spine and the social reasons some fish would advertise while other fish hide their spines. We conducted online surveys to assess how conspicuous the spines of the surgeonfishes are. Humans rated the conspicuousness of the caudal spines on a scale from 1 (least conspicuous) to ten (most). Fish ranged from 1 to 10 with an average value of 5.32430.042. Using these data in combination with phylogenetic analyses, we determined that group-living species were more likely to have conspicuous spine coloration than solitary ones. This does not obviously support the idea that the coloration of these spines is to advertise them for intraspecific coloration.

*Supported by NIH 5R01CA021615-39 to Graham C. Walker, MIT; The Bernard S. and Sophie G. Gould Fund to the MIT Biology Department; NIH-NIGMS MBRS RISE: R25 GM059244-16.*

## 18. Discovery of a cryptic species of Viperfish (*Chauliodus* sp) in the Gulf of Mexico

*Eva Paulus*<sup>1</sup>, *Ron I. Eytan*<sup>2</sup>, *Max D. Weber*<sup>2</sup>, *Tracey T. Sutton*<sup>3</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>Texas A&M University at Galveston, Galveston, TX; <sup>3</sup>NOVA, Miami, FL)

The deep sea is the largest habitat on earth but remains largely unknown to humans. The deep-oceanic Gulf of Mexico, however, is known to one of the highest diversity pelagic ecosystems in the world. Genetic sampling of deep sea animals is sparsely done, despite being a potentially powerful tool that often reveals fascinating new phylogenetic relationships between species. Using the mitochondrial barcoding gene COI, two divergent viperfish (*Chauliodus* sp.) lineages were revealed to be co-existing in the Gulf of Mexico, which were previously thought to be one species, *C. sloani*. Viperfishes are widely distributed top predators in the deep sea. We found that the two lineages of *C. sloani* live in sympatry in the Gulf of Mexico, one with a globally-distributed (i.e., wild) haplotype, the other seemingly endemic to the Gulf of Mexico (i.e., cryptic). Morphological characters such as fin rays and photophores were counted, and standard length was determined to compare the different lineages. These measurements did not show any significant differences between the cryptic and wild haplotype. It is not clear what characteristic differentiates the two yet. Even though no obvious visual differences can be observed, the estimated split time of the two lineages is 1.47 – 5.89 million years ago, according to the strict clock model which estimates phylogenetic radiation of species. These results indicate that many deep sea species, even common ones like the viperfish, are not sufficiently explored and sequenced, which increases the likelihood of countless new cryptic species to be discovered in the future.

*Supported by a grant from The Gulf of Mexico Research Initiative.*

## 19. Characterization of the viability and status of DNA damage checkpoint activation in wild-type and *cdc13-1* yeast strains

*Pedro Sanchez, Leticia Vega* (Barry University, Miami Shores, FL)

*Saccharomyces cerevisiae*, better known as baker's yeast or brewers' yeast, is a single-celled eukaryote widely used in the production of brewing, winery, and baking products. Because the genetic information of this organism has been fully sequenced, many scientists use *S. cerevisiae* to study eukaryotic cellular functions. One of the most biologically important structures studied in *S. cerevisiae* are telomeres. They are nucleoprotein complexes that can be found at the ends of eukaryotic chromosomes and they function to protect DNA ends from degradation. Components that contribute to the protection of telomeres are: the terminal 3' G-tails overhangs found at the end of telomeric DNA, a functional telomerase enzyme, and accessory proteins such as Ku and Cdc13. The Cdc13 protein, which binds to the G-tails, is essential in regulating telomere replication, and in recruitment of complexes required for telomere capping. Disrupting of these telomeric complexes leads to shortening of telomeres which is associated with ageing and cancer. Yeast cells containing the *cdc13-1* allele can grow at permissive temperatures (23°C) and have wild-type telomere lengths but they are not viable when incubated at temperatures above 30°C. At restrictive temperatures, the telomeres become uncapped and the DNA is degraded. This study focuses on examining the viability of *Cdc13* (wt) and *cdc13-1* (mutant) strains in log and stationary phase at different temperatures, while further examining DNA checkpoint activation. By quantitative plating, our studies suggest the viability of *cdc13-1* strains is similar to wild-type strains at the permissive temperature of 23°C. However, some experiments in the lab suggest that the DNA damage checkpoint may be active in *cdc13-1* strains at the permissive temperature to help to maintain viability and telomere length.

*Supported by NIH-NIGMS MBRS RISE: R25 GM059244-16, Barry University.*

## 20. Non-Structural Protein s1s Enhances Reovirus Resistance to Type 1-Interferon Responses

*Pedro Sanchez*<sup>1</sup>, *Karl Boehme*<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>University of Arkansas, Fayetteville, AR)

Mammalian orthoreovirus (reovirus) traffics from initial sites of infection, such as the intestine or lung, via the bloodstream to target organs, including the central nervous system. Reovirus non-structural protein s1s is required for the establishment of viremia and dissemination through the blood. However, the mechanism by which s1s promotes hematogenous spread is unknown. The s1s protein enhances reovirus replication in SV40-immortalized endothelial cells (SVECs) and murine embryonic fibroblasts (MEFs) by promoting viral protein synthesis. Replication of s1s-deficient reoviruses is restored by treatment of SVECs with antibodies that block interferon- $\alpha/\beta$  receptor 1 (IFNAR1) and in MEFs genetically deficient for IFNAR1 (IFNAR1<sup>-/-</sup>). We hypothesized that the s1s protein enables reovirus to overcome type 1-interferon responses by enhancing viral protein synthesis. We used RT-qPCR to measure viral RNA and found that wild type virus (rsT1L) and a s1s-deficient mutant virus (rsT1L s1s-null) produced comparable levels of viral RNA in IFNAR1<sup>+/+</sup> and IFNAR1<sup>-/-</sup> MEFs. This result indicates that s1s does not modulate viral RNA synthesis. We next assessed viral protein synthesis in IFNAR1<sup>+/+</sup> and IFNAR1<sup>-/-</sup> MEFs infected with rsT1L or rsT1L s1s-null by immunoblotting for viral proteins from infected cell lysates. We found that wild-type virus rsT1L produced markedly greater viral protein levels than a s1s-deficient virus rsT1L s1s-null in IFNAR1<sup>+/+</sup> MEFs. However, viral protein production by rsT1L and rsT1L s1s-null was comparable in IFNAR1<sup>-/-</sup> MEFs. Our findings suggest that non-structural protein s1s enhances reovirus protein synthesis in the face of a type 1-interferon response and allows the virus to overcome the antiviral effects of the interferon response.

*Supported by Public Health Awards R25 HL108825 (UAMS); P20 GM103625 (K.W.B.); R56 AI118801 (K.W.B.); NIH-NIGMS RISE Grant, R25 GM059244-16, Barry University.*

## 21. Synthesis of digoxigenin-labeled RNA probes for in situ characterization of *Polycomb 2 (cbx4)* expression pattern in zebrafish embryos

*Bertina Telusma*, *Stephanie Bingham*, *Gerhild Packert*, *Y-W. Peter Lin*, *Teresa Petrino* (Barry University, Miami Shores, FL)

*Polycomb (Pc)* group genes regulate transcriptional expression of crucial developmental regulators in a range of organisms. They exert their functions by modifying chromatin structure and by regulating the deposition and recognition of multiple post-translational histone modifications. Previously, we cloned several *Danio rerio polycomb* genes and hypothesized that they may have complementary and/or overlapping functions, and that this may be manifested as a variation in their expression patterns at different stages of embryogenesis. Analysis of *Pc1 (cbx2)* transcripts revealed expression as early as the 4-cell stage with expression confined to the nervous system in later stages of embryogenesis. The current study aims to determine *Pc2 (cbx4)* expression at the transcriptional level. In preparation for in vitro synthesis of RNA probes, several clones containing a region specific to the *Pc2* DNA sequence were cut via single restriction digest to identify the best restriction enzyme pair to facilitate linearization at each of the flanking regions of the *Pc2* insert. The sense and antisense digoxigenin-labeled RNA probes generated by T7 and SP6 polymerases will be used for wholemount in situ hybridization on the zebrafish embryo. It is hoped that determination of the precise spatial and temporal expression patterns of *Pc* genes will provide additional clues to the mechanisms by which they regulate gene expression and cell fates/embryonic regionalization. An improved understanding of the mechanistic pathway of these homeostatic patterns determining genes is critical to understand their impact on early vertebrate development.

*Supported by NIH-NIGMS MBRS RISE: R25 GM059244-16, Barry University.*

## 22. Inhibition of replicative helicase loading by an alpaca nanobody

*Bertina Telusma*<sup>1</sup>, *Megan Warner*<sup>2</sup>, *Stephen Bell*<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>Massachusetts Institute of Technology, Cambridge, MA)

In eukaryotic cells, DNA replication initiation is tightly regulated to maintain genome integrity. Intricate mechanisms ensure temporal separation of the loading of the replicative helicase (Mcm2-7) during the G1-phase from its activation in S phase. In *S. cerevisiae*, the onset of DNA replication is coordinated by the ATP-dependent binding of the origin recognition complex (ORC) to defined origins of replication. Origin-bound ORC recruits Cdc6 and this complex recruits the Mcm2-7/Cdt1 complex. In a complex series of events, this initial series of interactions leads to the assembly of an inactive head-to-head Mcm2-7 double hexamer. Here we investigate how nanobodies raised against ORC impact assembly of the Mcm2-7 double hexamer. Nanobodies are small, antigen-binding, single domain polypeptides found in camelid species. Because of their small size, nanobodies often recognize folded domains, making them a useful tool to study complex protein-protein interactions. We have identified a nanobody, nB5c, that inhibits Mcm2-7 helicase loading in a fully reconstituted helicase-loading assay. Addition of equimolar amounts of nB5c and ORC results in complete inhibition of helicase loading. When the amount of nB5c is reduced relative to ORC, nB5c inhibition of helicase loading is reduced in a stoichiometric manner. Biochemical assays show that nB5c does not inhibit ORC-DNA binding or Cdc6 recruitment to the origin during helicase loading. Single-molecule helicase-loading assays show that nB5c addition inhibits Mcm2-7/Cdt1 origin association. Importantly, overexpression of nB5c in the budding yeast *S. cerevisiae* results in cell death. Overall, these data suggest that nB5c binding to ORC interferes with the initial recruitment of Mcm2-7/Cdt1 to origin DNA.

*Funded by EXROP HHMI awarded to Bertina Telusma. Funded by the College of Arts and Sciences and NIH-NIGMS RISE Grant, R25 GM059244-16, Barry University.*

## 23. Generation of a cdc13-1 myc13 epitope tagged allele

*Kathryn Turner, Austin Cruz, Leticia Vega (Barry University, Miami Shores, FL)*

Epitope tags are short amino acids sequences that can be added to a target protein using genetic engineering. Addition of an epitope tag to a target protein enables researchers to use commercially available antibodies to characterize and biochemically purify the tagged protein from cells. The purpose of this study was to introduce a myc13 epitope tag (N-EQKLISEEDL-C) at the C-terminus of the *cdc13-1* gene through polymerase chain reaction (PCR) in order to study the activity of the mutant *cdc13-1* protein. Cdc13 protein is an essential protein that is required for telomere capping in the budding yeast, *Saccharomyces cerevisiae*. *cdc13-1* is a mutant version of *CDC13* that is unable to protect telomere ends at high temperatures (30 °C) but that can support normal end-protection at (23 °C). Deprotection of telomeres results in cell death. Currently, our lab only has an epitope tagged version of wild-type Cdc13 protein. Thus, we lack the ability to directly compare *cdc13-1* to wild-type Cdc13 proteins. By making a tagged version of the mutant allele of *cdc13-1* we will be able to introduce this allele into yeasts by homologous and will hopefully allow us to be able to track its behavior.

*Funded by the Department of Biology.*

## 24. Sinister flies among us: *Drosophila melanogaster* express a lateral preference

*Anastasia Zharova, Alexis Williams, Donald Streater, Amber Snelling, Maira Sanon Canel, Jeremiah Paul, Martina Muoz, Genesis Muoz, Lilyveth Mesa, Kyle McHugh, Rainin Johnson, Alexia Hunter, Sabrina Holifield, Toriean Gordon, Naomi Garcia, Angela Duff, Demarkis Dormer, Seth DeRuggiero, Tyler Bonner, Beatriz Alvar, Michael Robinson (Barry University, Miami Shores, FL).*

Laterality is the preference of an organism for one side of their body one type of which is handedness (i.e., the preferences for the use of a certain hand). Laterality has been identified across a number of animal taxa and it probably has a strong relationship with brain function leading to efforts to understand the causes and consequences of laterality. We investigated laterality in wingless fruit flies (*Drosophila melanogaster*) using Y-mazes and allowing individual flies to turn left or right. Individual flies were observed up to six times. Across the population, there was a small but significant preference for left-turns during the first trial (109 left vs. 99 right; binomial test:  $p = 0.043$ ). Each fly with more than one trial was scored with an index of the proportion of left-turns (i.e., always turned right = 0, always turned left = 1). The mean index across flies indicated a significant tendency to turn left ( $x = 0.55030.305$ ; one-sample t-test:  $n = 171$ ;  $p = 0.032$ ). The clearest result was that individual flies have a preferred laterality. Fewer than 39% switched their turn decision from the first trial to the second which was significantly lower than the 50% as predicted by random turning (Fisher's exact test:  $p = 0.004$ ). The preference to turn left is similar to the laterality of another species of fly that prefers to display its left side during agonistic encounters.

*Funding provided by the NIH-NIGMS MBRS RISE: R25 GM059244-16 awarded to Barry University.*

## **Barry University College of Arts and Sciences**

### **Department of Mathematics and Computer Science**

#### **25. Multimedia Campus Locator**

*Jose Gomez, Alfonso Logrono, Oliver Bautista, and James Haralambides (Barry University, Miami Shores, FL)*

The problem of allocated resources effectively at a complex organization such as a university is very challenging. Identifying specialized personnel and obtaining reliable information is particularly important for prospective students and their families for purposes of navigation, selection, admission, and registration. We are designing an application that allows students and visitors to locate offices, departments, buildings, and personnel on a university campus through a keyword-based search. Each keyword is associated with a list of appropriate synonyms and relevant expressions for increased flexibility. Keywords such as “financial aid” or “health services” are classified alphabetically as well as with respect to the group entity they characterize (building, office, department, etc.). User selection is followed by the activation of a window that displays pertinent information such as offices, individuals, and services provided at that location. A multimedia window will display the location of the building as a highlighted segment on an interactive campus map. As the user hovers over the selection, a tooltip presents a summarized version of the services provided in the building. The user has the option to display an individual location on the map or a set of locations that satisfy search properties. If the highlighted region is selected, a pop-up window will provide a list of images for the building as well as a 360-degree animation of the surrounding areas. This increases the degree of familiarity of the campus for users of the system and reduces overhead as services are located faster and more accurately.

#### **26. Alternative ways of proving several differentiation rules from calculus**

*Ricardo Gomez, Lubomir Markov (Barry University, Miami Shores, FL)*

In a recent note from the American Mathematical Monthly, it is demonstrated how one may prove the Product Rule for differentiation without the standard technique of adding and subtracting certain quantities, which is often counterintuitive to the student. We develop this idea further. First, two rules are proved from the definition of a derivative and from the rules for differentiation of sums and differences. Then we show that these rules suffice to prove the Product Rule and the Quotient Rule, and indeed the fact that they are equivalent. Furthermore we show that if one begins with the derivative of the tangent function (proved from the definition), then one easily obtains the derivatives of the remaining five trigonometric functions, unlike the usual approach via sines and cosines. The main advantage of developing the theory this way is the fact that one does not use the general Chain Rule, the proper justification of which is the most difficult of all proofs of the rules for differentiation.

## **27. A Mobile Degree Audit System**

*Roland Schiller, Julian Dasilva, and James Haralambides (Barry University, Miami Shores, FL)*

We are creating an automated degree audit system for mobile devices. Currently, degree audit forms must be filled out manually by advisors whose tasks include evaluating university catalogs, general education requirements, co-requisite requirements, and requirements set in the major and minor disciplines. The system is rule-based; it has online access to a student's transcript as well as all applicable master lists of courses that fulfill degree requirements in each of the appropriate categories. The application prototype is developed for the Computer Science Major (CS) with a dedicated Mathematics Minor. Courses are classified in the following categories: General Education, CS core courses, CS electives, Math courses in the minor, co-requisites, and general electives. Degree requirements for all of the above categories are incorporated in the system and are organized chronologically according to the catalog year in which they apply. The application allows students that use their mobile devices to logon with their university credentials and obtain an electronic as well as printed copy of their unofficial degree audit document. A list of courses that fulfill all remaining requirements is optionally provided to assist students and advisors during the next registration period. In cases of courses taken that do not fall in any of the predefined categories, a list of recommendations for substitution and subsequent advisor approval is offered by the system. The system can be utilized equally by students, advisors, and administrators by setting appropriate access privileges. The application will be updated at regular intervals to accommodate changes in degree requirements.

## **28. Unmanned Aerial Vehicle-based Automobile License Plate Recognition System for Institutional Parking Lots**

*Roland Schiller, Julian DaSilva, Ricardo Jimenez, Sanja Zivanovic (Barry University, Miami Shores, FL)*

Technology continues to grow at an exponential pace. Vehicle automation (both land and aerial) is now a reality, as unpiloted aircraft technology has shrunk down to a civilian level, and artificial intelligence is making leaps and bounds in multiple disciplines. Drones have many purposes, and they are a current trend across many industries. They can be used for delivery, sports, surveillance, professional photography, cinematography, military combat, natural disaster assistance, security, and the list grows exponentially every day. Programming opens an avenue to automate many processes of daily life and with the drone as aerial programmable eyes, security can become more efficient and cost effective. At Barry University, parking is becoming an issue as the number of people visiting the school greatly outnumbers the available parking locations. This has caused a multitude of hazards in parking lots due to people illegally parking, as well as unregistered vehicles parking in reserved areas. Drone surveillance is utilized to detect unauthorized parking at Barry University. The surveillance process is completed in three steps: collecting visual data, processing data automatically, and sending automated responses and queries to the operator of the system. Essentially, an app is being created, so that with a click of a button, the drone will be able to survey a chosen parking lot and to return license plates of cars that are illegally parked.

## Barry University College of Arts and Sciences Department of Physical Sciences

### 29. Preparation of organo-silica monolithic columns for applications in capillary liquid chromatography using thiolene click reaction

*Aurora Burkus-Matasevac<sup>1</sup>, Zuzana Zajickova<sup>1</sup>, Frantisek Svec<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>The Molecular Foundry, Berkeley, CA)*

This study is aimed at preparation of organo-silica monolithic columns based on the radical-mediated thiolene click reaction of 3-methacryloxypropyltrimethoxysilane (MPTMS) with multi-thiol crosslinkers: trimethylolpropane tris(3-mercaptopropionate) (TPTM), pentaerythritol tetrakis(3-mercaptopropionate) (PTM), or 2,2'-(ethylenedioxy)diethanethiol (EDDT) in the presence of a catalyst (aqueous hydrochloric acid), a porogen (toluene), and an initiator (2,2'-azobis(2-methylpropionitrile) (AIBN) or dimethylphenylphosphine (DMPP)). So far the results in vial indicate that AIBN is a better initiator at 60 °C than DMPP as no monolith was procured with DMPP. PTM proved to be the most promising among the thiol crosslinkers resulting in the formation of a sturdy white monolith. However, preparation conditions must be further optimized in order to achieve chromatographic performance comparable or better than what we have achieved with ethylene dimethacrylate (EDMA) as a crosslinker.

*Funded by the National Science Foundation CBET-1066113 award.*

### 30. Mechanochemical synthesis of porphine and bis-pocket porphyrin

*Diana Cordero Dumit, Tamara Hamilton (Barry University, Miami Shores, FL)*

Porphyrins and derivatives are compounds of high interest due to their various uses such as light-harvesting, catalysis, and as biological models. However, the use of porphyrins has been held back because their synthesis usually results in low yields and requires a high-dilution reaction medium. This contributes to a very high-cost and environmentally taxing synthesis. We have previously shown that tetra-meso-substituted porphyrins are attainable using mechanochemistry. In this way solvent is eliminated, making the synthesis process greener and more cost-friendly. The compounds we aim to synthesize here are relevant biological model compounds. Porphine is the parent structure of all porphyrins and bis-pocket porphyrin is used as a model of heme in hemoglobin. Both porphyrins are currently synthesized in low yields (porphine less than 10%; bis-pocket porphyrin 1%) and using large amounts of solvent. We will present mechanochemical protocols for the synthesis of both compounds with characterizations using ultraviolet spectroscopy and proton nuclear magnetic resonance.

*Funded by Research Initiative for Scientific Enhancement (RISE): NIH-NIGMS RISE Grant, R25 GMO59244-16, Barry University.*

### 31. Calibrating tris(hydroxymethyl)aminomethane (TRIS) buffers for pH measurements in natural seawater

*Diana Cordero Dumit<sup>1</sup>, Frank J. Millero<sup>2</sup>, Ryan J. Woosley<sup>2</sup> (<sup>1</sup>Barry University, Miami Shores, FL; <sup>2</sup>University of Miami, Key Biscayne, FL)*

Accurate and precise measurements of seawater pH are important to understand the changes experienced in seawater as a result of the uptake of anthropogenic carbon; this translates into an increase in dissolved carbon dioxide. Seawater pH can be determined using either potentiometric or spectrophotometric techniques. TRIS buffers are used to

calibrate the pH measurements; however, TRIS buffers have only been calibrated in artificial seawater. Here we present pH measurements using the Total Hydrogen Scale (pHT) and the Seawater Scale (pH<sub>sws</sub>) in natural seawater. Using a spectrophotometer to measure pH of TRIS buffers in real seawater, we aim to derive an equation that can accurately calibrate pH values of natural seawater over temperature and salinity ranges of 15° to 40° Celsius and 5° to 35°, respectively. Past literature has successfully calibrated the instruments using TRIS in artificial waters; this research presents the first formula for calibrating pH measurements using natural seawaters. By using natural seawater, a more accurate measurement of pH can be calculated for water ranging from estuaries to open ocean seawater.

*Funded by Leadership Alliance Summer Research – Early Identification Program (SR- EIP) and Research Initiative for Scientific Enhancement (RISE): NIH-NIGMS RISE Grant.*

### **32. Mechanochemical oxidation leading to porphyrins**

*Shatora Everett-Hannah, Tamara Hamilton (Barry University, Miami Shores, FL)*

Porphyrins are a group of heterocyclic macrocycle compounds, composed of 4 pyrrole subunits that are interconnected at their alpha carbon via methine bridges. Traditional synthesis of porphyrins requires large amounts of corrosive or toxic organic solvents. Opportunities for new and cleaner synthesis will allow minimal solvent use and possibly greater percent yields. We have reported that it is possible to eliminate solvent from porphyrin synthesis through mechanochemistry. Addition of pyrrole, an aldehyde and an acid catalyst in a ball mill leads to a mixture of reduced porphyrins that can be oxidized to produce porphyrins in yields similar to those obtained in solution. In our previous studies, the mechanochemical oxidation was not as efficient as oxidation in solution. In this study, an oxygen atmosphere is introduced to the grinding jars before a second mechanochemical step with an oxidizing agent. In this research, two variables consisting of different amounts of time that the compound is present in oxygen as well as in the ball mill were studied to yield a product of tetraphenylporphin (TPP). TPP is measured by comparing absorbance of the Soret band of the resulting reaction mixture to that of the same concentration of TPP.

*Funded by the Department of Physical Sciences.*

### **33. Synthesis, NMR characterization and kinetic studies of creatine pyroglutamate**

*Miguel Gao, Anton Wallner (Barry University, Miami Shores, FL)*

Creatine is a naturally occurring amino acid synthesized within the human body that is widely used as a dietary supplement to enhance athletic performance mostly related to its effect for increasing muscle growth. It is known through various studies that creatine has neuroprotective benefits, and provides alleviation for diseases such as amyotrophic lateral sclerosis. Pyroglutamic acid is a derivative of the amino acids glutamine and glutamic acid, and it is found in small amounts in the body as a by-product of the glutathione cycle. Various studies have shown that pyroglutamic acid has a role in improving cognitive functionality, which serves as a memory enhancer. Furthermore, pyroglutamic acid has an important role in maintaining the levels of acetylcholine, an organic chemical messenger that protects the brain from any harmful chemicals that may degrade an individual's memory capabilities. We propose a novel salt composed of both creatine and pyroglutamic acid that combines the neuroprotective benefits of the individual compounds. The purpose of this research was to develop a method to synthesize creatine pyroglutamate by varying stoichiometry, acid/base character, and identity of solvent, and reaction time and temperature to maximize yield. The product obtained from the synthesis was characterized by NMR spectroscopy and elemental analysis. Kinetic studies were performed on the synthetic product in order to determine its stability over time at different conditions of temperature.

### **34. Determination of natural narcotics using separation techniques**

*Debbie Hernandez (Barry University, Miami Shores, FL)*

In this review, the use of various separation techniques will be described towards determination of natural narcotics in biological samples. The development of new separation methods are used to determine the herbal materials in biological substances which is of utmost importance in the control of narcotic substances by law enforcement and public health authorities. Gas chromatography (GC) and high performance liquid chromatography (HPLC) in combination with mass spectrometry (MS) are traditionally used to identify narcotics in urine, blood samples, hair, stomach, liver, and plasma. Biological samples are initially subjected to selective extraction, even though the HPLC--MS/MS method has attracted attention due to direct analysis of biological fluids. Current methods for determination of narcotic substances are quite satisfactory in sensitivity and selectivity; but development of analytical equipment and new selective adsorbents stimulate the development of novel and rapid methods that give more accurate and reliable determination.

### **35. Tetra-substituted Porphyrin with Exo-dentate Binding Groups: Toward Catalytic Metalloporphyrin Assemblies**

*Nirva Maxi, Tamara Hamilton (Barry University, Miami Shores, FL)*

Although tetra(4-pyridyl) porphyrin has been widely studied as a structural building unit (SBU) for metal-organic frameworks (MOFs), leading to porous structures that have catalytic and other useful properties, metal-organic assemblies of tetra(aryl) substituted porphyrins with coordinating atoms in the 2 or 3 position of the atomic ring are less widely studied. As these ligands can have a coordination angle less than 90°, it is hoped that they would assemble with metals to create a finite, rather than extended structure. In addition, metal salts that include the chelating anion hexafluoroacetylacetonate leave open an acute coordination angle on the metal, further favoring finite structures. With this in mind, 3-pyridyl porphyrin and 2,3-hydroxyl porphyrin were synthesized using the Adler method and combined with manganese(II) hexafluoroacetylacetonate and bis(hexafluoroacetylacetonato)copper(II) hydrate in a 6:1 and 8:1 metal salt to porphyrin ratio in 1:1 chloroform/methanol. Samples were divided for slow evaporation and crystallization layerings at room temperature, in the fridge, and in the freezer. Crystallization layerings were set up with toluene, diethyl ether, and tetrahydrofuran as the precipitating solvent. It is hoped that the resulting assemblies could have enhanced catalytic properties compared to metalloporphyrin MOFs, since they would have the added capability of trapping reagents, much like an enzyme. X-ray crystallography will be used to characterize the product and structures will be presented.

*Funded by the Department of Physical Sciences.*

### **36. Synthesis of functionally selective M1/M4 antagonist for Parkinson's disease application**

*Jelena Momirov, John Boulos (Barry University, Miami Shores, FL)*

Muscarinic receptors are known to play important biological roles and are drug targets for several humans' diseases. Novel muscarinic antagonists were synthesized and used as chemical probes in structure-activity relationship (SAR) studies to obtain additional information of the muscarinic pharmacophore. The design of these ligands made use of current orthosteric and allosteric models of drug-receptor interactions together with chemical motifs known to achieve muscarinic receptor selectivity. This approach has led to the discovery of several bitopic muscarinic ligands that strongly bind at a secondary receptor site. Several compounds were found to be non-competitive M1/M4 functionally selective antagonists that completely abolished carbachol activation in functional assays.

### **37. Muscarinic Receptor Antagonists; Finding Drugs that Work in Asthma and COPD**

*Ajani Morgan (Barry University, Miami Shores, FL)*

The parasympathetic nerves in the lungs provide the control of airway smooth muscle with the release of acetylcholine onto M3 muscarinic receptors. Around 2000 years ago, treatment with anticholinergic drugs that block muscarinic receptors help with the treatment of airway diseases such as asthma and chronic obstructive pulmonary disease (COPD). Pharmacologic data indicate that anti-muscarinic drugs are highly effective when it comes to asthma patients, but mixed results were obtained from clinical trials. With the discovery of  $\beta$ -adrenergic receptor agonists the use of muscarinic antagonists declined. The reason why muscarinic antagonists have a lack of effectiveness is due to a variety of unwanted side effects, from dry mouth to coma. Another decline in the use of muscarinic receptors is due to the lack of knowledge of understanding the differences between routes of administration and no effective way of testing if the antagonists block receptors stimulated physiologically by acetylcholine. New muscarinic receptor antagonists are being developed that address the problems of side effects and receptor selectivity that appear to be quite promising in the treatment of asthma and chronic obstructive pulmonary disease. In this presentation, we are going to go through the cause of asthma and COPD, how the receptors work, and what the medicine that can be used to treat them.

### **38. Community outreach with hands-on physics for 5th graders.**

*Eva Paulus, Maurizio Giannotti, Tamara Hamilton, Sanja Zivanovic (Barry University, Miami Shores, FL)*

Studies show that scientific literacy in North America is declining. A root of this problem is the lack of hands-on experiences in elementary school science, partially because teachers may lack a solid background and confidence to prepare these experiments and, more importantly, because very often schools don't have the necessary resources to provide such experiences. The importance of an education in basic physics in the elementary school is attested by the FCAT (Florida Comprehensive Assessment Test) physical sciences learning goals, many of which pertain to temperature, electricity and magnetism, mass, energy and several other elementary physics topics. We are reaching out in the community with a set of physics experiments which are meant to offer elementary school students more chances to see and work with physics instrumentation, to learn about temperature, electric circuits, energy and motion and, ultimately, to increase the interest for science and STEM disciplines at an early age. In particular, we have designed experiments that are not just informative on a certain topic, but also engaging and easy to follow. Here we discuss some physics experiments that we have presented at the 5-th graders in the Olinda elementary school.

### **39. Tetra-meso-substituted porphyrins via mechanochemistry: reaction homology and applications of a porous catalyst**

*Qiwen Su, Tamara Hamilton (Barry University, Miami Shores, FL)*

Synthetic porphyrins are important biological system model compounds useful for optical, catalytic, and magnetic applications. Even so, the synthesis and purification procedures involve large amounts of toxic solvents for relatively low yields. This causes the synthesis on a large scale to be problematic. With the environmentally-friendly alternative of a mechanochemical technique, the cyclization step of the porphyrin synthesis can be solventless. Ball-mill grinding equimolar amounts of pyrrole and an aldehyde in the presence of an acid catalyst gives porphyrin precursors that can be oxidized to yield

porphyrins (Hamilton, T.D. et al. Faraday Discussion. 2014, 170, 56-69). Characterizations with UV-Vis and <sup>1</sup>H-Nuclear Magnetic Resonance spectroscopies have confirmed the successful synthesis and purity of these porphyrins. A series of tetra-meso-substituted porphyrins have been synthesized mechanochemically from both aliphatic and aromatic aldehydes, including those aldehydes that are sterically hindered and porphyrins that are difficult to obtain in solution. Some of these have given yields comparable to or higher than those obtained from solution-based syntheses. This protocol has been further explored using Montmorillonite K10 clay (Freeman et. al. Synthetic Commun. 1999 29, 1843-1855) as the acid catalyst. The amount of this acid-loaded clay has been optimized, and results will be presented.

**Barry University College of Arts and Sciences**  
**Department of Psychology**

**40. Accent perceived discrimination and intention to quit among college students: the moderating role of hardiness**

*Cynthia Socarras (Barry University, Miami Shores, FL)*

In 2008, the Viacom Media Network and associated press conducted a survey and found that 80% of college students say they frequently or sometimes experience daily stress (Schuder, 2014). Stressors are physical, psychological, or social forces that put demands on all internal and external aspects of an individual (Hopper, 2014). Individuals stigmatized by accent are likely to be exposed to risk factors such as perceived discrimination and stressful social environments, which can increase their vulnerability to the effects of stress (Allison, 1998; Meyer, 2003; Williams et al., 1994). Over the past few years, hardiness has emerged as a buffer in the relationship between stressors and different outcomes particularly in the academic environment (Maddi, 2006). Hardiness is a personality trait commonly defined as a collection of personality characteristics that help individuals cope with stressful life events (Kobasa, 1982). The purpose of the present study was to evaluate the moderating role of hardiness between discrimination based on accent and intention to quit in college students. Participants were 65 (77% women and 23% men) emerging adults enrolled in universities across the country with ages ranging from 18 - 29 ( $M = 21.42$ ,  $SD = 2.57$ ). Results indicated that hardiness did not moderate the relationship between accent perceived discrimination and intention to quit. However, there was a significant relationship between accent perceived discrimination and intention to quit ( $r = .42$ ,  $p < .001$ ). These findings have important implications for improving student's retention.

**41. The impact of accent as a stressor on college students' psychological well-being**

*Luna Ugrenovic (Barry University, Miami Shores, FL)*

Accent-based discrimination is becoming a rising concern in the academic environment as the number of ethnically and culturally diverse students is increasing (McMurtrie, 2001). An accent usually brings a stereotypical social identity that often diminishes the perception of an individual's abilities (Gluszek & Dovidio, 2010). Being the target of social stigma that results from negative stereotypes constitute stressful life events (Dovidio, Major, & Crocker, 2000) that may threaten well-being (Lazarus & Folkman, 1984). Stigma may trigger the perception of stress by making people subject to prejudice and/or discrimination, which in turn may translate into poor psychological well-being (Mackie, Devos, & Smith, 2000). According to the transactional model of stress, background factors, such as social support, can also shape the perceptions of the nature and strength of environmental stressors (Lazarus & Cohen, 1977). Hence, coping mechanisms can play a significant role by protecting individuals from negative consequences of stressful situations (Ben-Zur & Zeidner, 2012). The aim of the present study was to investigate whether social support moderates the relationship between accent-based perceived discrimination and psychological well-being in college students. The participants were 65 multi-ethnic college students (50 women, 15 men), and their age ranged from 18 to 29 years old ( $M = 21.42$ ,  $SD = 2.57$ ). Results indicated that accent-based perceived discrimination was negatively associated with psychological well-being ( $r = -.29$ ,  $p = .020$ ), and social support was positively related to psychological well-being ( $r = .44$ ,  $p < .001$ ). Yet, social support failed to moderate the relationship between accent-based perceived discrimination and students' psychological well-being. These findings can help to increase awareness about the impact that accent-perceived discrimination may have on students' psychological well-being.

## Author Index

| <b>First Name</b> | <b>Last Name</b> | <b>Abstract Number</b> |
|-------------------|------------------|------------------------|
| Beatriz           | Alvar            | 24                     |
| Wesam             | Azaizeh          | 15, 16                 |
| Cleophas          | Babinguy Samba   | 5                      |
| Jocelyn           | Baquier          | 6, 12                  |
| Oliver            | Bautista         | 25                     |
| Miguel            | Belaunzaran      | 7                      |
| Stephen           | Bell             | 22                     |
| Stephanie         | Bingham          | 9, 10, 21              |
| Arin              | Blake            | 7                      |
| Tyler             | Bonner           | 24                     |
| John              | Boulos           | 36                     |
| Samantha          | Britz            | 8                      |
| Sebastien         | Brumaire         | 6, 12                  |
| Samuel            | Brunt            | 5                      |
| Aurora            | Burkus-Matsevac  | 29                     |
| Edwin             | Casseus          | 2                      |
| Tatiana           | Chavarria        | 1                      |
| Marc              | Coppola          | 1                      |
| Diana             | Cordero Dumit    | 30, 31                 |
| Austin            | Cruz             | 23                     |
| Julian            | Dasilva          | 27                     |
| Julian            | DaSilva          | 28                     |
| Khaled            | Deeb             | 2, 3, 4, 5             |
| Ricardo           | Del Cueto        | 5                      |
| Seth              | DeRuggiero       | 24                     |
| Demarkis          | Dormer           | 24                     |
| Seneca            | Doss             | 5                      |
| Angela            | Duff             | 24                     |
| Lionel            | Dufresne         | 2                      |
| Didiana           | Duque            | 1                      |
| KeiAuyndria       | Edwards          | 16                     |
| Valdwin           | Etienne          | 9                      |
| Shatora           | Everett-Hannah   | 32                     |
| Ron I.            | Eytan            | 18                     |
| Annalliam         | Flores           | 10                     |
| Fabio             | Frech            | 8, 11                  |
| Miguel            | Gao              | 33                     |
| Daniel            | Garcia           | 4                      |
| Naomi             | Garcia           | 24                     |
| Michelle          | Gastecki         | 14                     |

|              |              |                    |
|--------------|--------------|--------------------|
| Maurizio     | Giannotti    | 38                 |
| Jose         | Gomez        | 25                 |
| Ricardo      | Gomez        | 26                 |
| Toriean      | Gordon       | 24                 |
| Charley C.   | Gruber       | 17                 |
| Elysse       | Hall         | 1                  |
| Clarence     | Hallmark     | 3                  |
| Tamara       | Hamilton     | 30, 32, 35, 38, 39 |
| James        | Haralambides | 25,27              |
| Christoph    | Hengartner   | 15                 |
| Christoph J. | Hengartner   | 16                 |
| Darrell      | Henry        | 6, 12              |
| Debbie       | Hernandez    | 34                 |
| Gabriela     | Hernandez    | 8, 11, 13          |
| Sabrina      | Holifield    | 24                 |
| Alexia       | Hunter       | 24                 |
| Tang         | Hu           | 6, 12              |
| Ricardo      | Jimenez      | 28                 |
| Rainin       | Johnson      | 24                 |
| Sonya        | Johnson      | 3                  |
| Thomas       | Jurrissen    | 14                 |
| Mariamne     | Lagrange     | 2                  |
| Gabriela     | Lin          | 14                 |
| Y-W. Peter   | Lin          | 21                 |
| Kamren       | Livingston   | 15, 16, 17         |
| Alfonso      | Logrono      | 25                 |
| Dennis       | Lubahn       | 14                 |
| Lubomir      | Markov       | 26                 |
| Nirva        | Maxi         | 35                 |
| Kyle         | McHugh       | 24                 |
| Lilyveth     | Mesa         | 24                 |
| Frank J.     | Millero      | 31                 |
| Jelena       | Momirov      | 36                 |
| Ajani        | Morgan       | 37                 |
| Genesis      | Muoz         | 24                 |
| Martina      | Muoz         | 24                 |
| Mario        | Osorio       | 4, 5               |
| Daniel       | Packert      | 1                  |
| Gerhild      | Packert      | 21                 |
| Jaume        | Padilla      | 14                 |
| Jeremiah     | Paul         | 24                 |
| Eva          | Paulus       | 18, 38             |
| Vanessa      | Pedrianes    | 4                  |
| Rolando      | Pera         | 2                  |

|            |               |            |
|------------|---------------|------------|
| Teresa     | Petrino       | 21         |
| Dwayne     | Quick         | 4          |
| Jared      | Ramadhar      | 3          |
| Katdo      | Robinson      | 4          |
| Michael    | Robinson      | 24         |
| Daniel     | Rodriguez     | 2          |
| Peter      | Rodriguez     | 7          |
| Johan      | Sanchez       | 11         |
| Pedro      | Sanchez       | 19, 20     |
| Maira      | Sanon Canel   | 24         |
| Roland     | Schiller      | 27, 28     |
| Brenda     | Schoffstall   | 7, 8, 11   |
| Laura      | Schoonover    | 6          |
| Katherine  | Senra         | 1          |
| Shanell    | Smith-Cappa   | 9          |
| Amber      | Snelling      | 24         |
| Cynthia    | Socarras      | 40         |
| Donald     | Streater      | 24         |
| Qiwen      | Su            | 39         |
| Tracey T.  | Sutton        | 18         |
| Frantisek  | Svec          | 29         |
| Bertina    | Telusma       | 21, 22     |
| Romaldi    | Thelusma      | 1          |
| Jennyvette | Trinidad      | 10         |
| Kathryn    | Turner        | 23         |
| Luna       | Ugrenovic     | 41         |
| Leticia    | Vega          | 15, 19, 23 |
| Leticia R. | Vega          | 16         |
| Victoria   | Vieira-Potter | 14         |
| Graham C.  | Walker        | 17         |
| Anton      | Wallner       | 33         |
| Megan      | Warner        | 22         |
| Max D.     | Weber         | 18         |
| Rebecca    | Welly         | 14         |
| Alexis     | Williams      | 24         |

|           |           |        |
|-----------|-----------|--------|
| Nathan    | Winn      | 14     |
| Ryan J.   | Woosley   | 31     |
| Zuzana    | Zajickova | 29     |
| Anastasia | Zharova   | 24     |
| Sanja     | Zivanovic | 28, 38 |

