10th Annual S.T.E.M. Research Symposium

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.

DAY

Friday, April 6, 2018

TIME

9:00 AM – 12:00 PM

PLACE

Andreas 111

Barry University, Miami Shores, FL

Organized by Members of Barry University's STEM Committee:

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

We gratefully acknowledge:

Sponsors from Barry University: Department of Biology, Department of Math and Computer Sciences, Department of Physical Sciences, Department of Psychology, and School of Nursing and Health Sciences

The dedication of research mentors, support staff, and undergraduate researchers.

Special thanks for assisting with the Symposium to:

Institutional Advancement; Department of Marketing and Communications; Dr. Flona Redway, Director of RISE program; Ms. Diana Cordero, Administrative Assistant of RISE program; Ms. Beth Culverson, Administrative Assistant at Department of Physical Sciences; and undergraduate student volunteers.

Barry University, College of Nursing and Health Sciences, Clinical Biology

1. **Higher Education is Correlated with Better Time Management & Quality of Life**

Willie Barron (*Barry University, Miami Shores, FL*)
Introduction: The high levels of health outcomes and low risks of mortality, morbidity, smoking, drug abuse, and accidents exhibited by the more educated illustrate the remarkable connection between education and health. Preliminary research from our group shows that balance between daytime time management and nighttime sleep behaviors is more important for academic performance than each behavior independently. We hypothesize that behaviors affecting academic performance could affect the connection between education and health. The purpose of the present study is to determine the relationship between time management and sleep behaviors and quality of life as a function of educational level. Methods: Students, faculty, and staff at Barry University were invited to answer a research questionnaire via SurveyMonkey. Participants needed to give their informed consent before proceeding to the survey, which was comprised of time management, sleep, and quality of life, and demographic questions. Only 361 individuals were included in the analysis. Participants were separated into educational groups. Results: One ANOVA yielded statistically significant results for Time Management ($F_{4,359}=5.8$, $p<.000$) for the educational groups. Kruskal-Wallis identified important differences between educational groups for sleep quality ($H(2)=10.2$, $p=.038$), restorative sleep ($H(2)=10.2$, $p=.036$), and feeling tired ($H(2)=15.1$, $p=.005$). Spearman correlation coefficient showed that higher educational level correlated with higher time management. Higher education level correlated with lower ratings of anxiety, depression, and fatigue as well as with better sleep quality and restorative sleep. Conclusion: These data show that individuals with higher educational levels possess better time management and sleep behaviors and enjoyed superior quality of life. It is possible that time management and sleep behaviors organization increases to meet the demands of each educational level. Subsequently in life, balance of daytime and nighttime activities could facilitate implementation and maintenance of better health and quality of life patterns.

2. **Embryonic Ethanol Exposure Negatively Impacts Cardiac Contractility and Output**

Angel Tapia, *Alexandria Wallace*, *Gabriela Alvarez*, *Jeremy Martinez*, *Sabrina Rodriquez*, *Stephanie Bingham* (*Barry University, Miami Shores, FL*)

Cardiac deficiencies are one of the hallmarks of fetal alcohol syndrome. The hearts of embryos exposed to ethanol tend to be smaller, beat more slowly, contract more weakly than untreated controls, and in some cases, fail to perform the proper looping process. Using zebrafish as a model for understanding the mechanisms, we have performed quantitative measurements of the heart in various phases of the cardiac cycle in order to determine the relative reduction in contractility following exposure to ethanol. Coupled with analysis of the effects on key cardiac development genes and organization of actin and myosin proteins in ethanol-exposed heart tissue, we hope to arrive at a model for why cardiac muscle contractility is so greatly compromised following ethanol exposure.

Barry University, College of Arts and Sciences, Department of Biology

3. **A Possible Role for Cereblon as a Desmoplakin-Associated Regulator at the Intercalated Disc**

Jocelyn Baquier[1], *William Bradford*[2], *Farah Sheikh*[2] ([1]*Barry University, Miami Shores*; [2]*University of California-San Diego, La Jolla*)

Arrhythmogenic right ventricular cardiomyopathy (ARVC) is a leading cause of sudden cardiac death in young athletes due to high frequency of ventricular arrhythmias. Human genetic studies have identified that 40% of ARVC patients carry mutations in components of the desmosomal complex, including desmoplakin. Despite links between desmosomal mutations/loss and ARVC, the biological mechanisms driving ARVC are not fully understood. Through a yeast-two-hybrid screen we identified cereblon (CRBN) as a novel desmoplakin-associated protein in adult human heart cDNA library. CRBN has been shown to interact with the calcium activated potassium channel (BKca), which may play a role in the electrical repolarization phase as well as AMP-activated protein kinase (AMPK), which has recently been implicated in regulating the BKca channel during hypoxic/stress conditions. We hypothesize that CRBN localizes to the cardiac desmosome to regulate ion channel activity in the heart, during stress and may be important in early phases of ARVC pathogenesis. To determine the role of CRBN in the adult heart, we generated cardiac-specific CRBN knockout mice (CRBN-cKO). We show that CRBN and BKCa channels localize to cell-cell junctions in adult wildtype hearts and localization is lost in CRBN-cKO hearts. Protein blot analysis validated these findings as BKCa channels were significantly downregulated in CRBN-cKO hearts, when compared to controls. Furthermore, protein blot analysis revealed that phospho-AMPK levels were also significantly reduced in CRBN-cKO hearts, implicating a link between AMPK and BKca regulation. Telemetry ECG analysis further demonstrated that CRBN-cKO mice exhibited significant ST depression (repolarization phase) following isoproterenol (stress) challenge, when compared to controls, further linking CRBN pathways to electrical function. We provide evidence that a novel desmoplakin interacting protein may play a role in regulating ventricular electrical activity in the adult mouse heart during ventricular stress (eg. exercise), which may provide mechanistic insight into the concealed phase of ARVC.

Funded by: NIH-NIGMS, R25 GM059244-17

4. **The effects of acetic acid on biofilm formation and wound healing using a zebrafish model**

Miguel Belaunzaran, *Arin Blake*, *Brenda Schoffstall* (*Barry University, Miami Shores, 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. To gain understanding of biofilm formation and eradication, *in vitro*, *in vivo*, and *ex vivo* models are utilized. We have previously established a wound model using *Danio rerio* (zebrafish), both *in vivo*, and as a novel *ex-vivo* tissue explant

culture, to analyze the formation, growth, and treatment of biofilm. We have compared formation of biofilm within zebrafish penetrating burn wounds using three specific strains of *Staphylococcus epidermidis*. *S. epidermidis* RP62A (WT) is a robust biofilm-former, 1457 (WT) is a moderate biofilm-former, and 1457 aapΔ/icaΔ does not form detectable biofilm. Using zebrafish tissue explant cultures, we previously found evidence of bacterial growth in all three strains; however, only the RP62A strain formed robust, macroscopic biofilm and demonstrated microscopic Gram stain evidence of cell clusters held together with polysaccharide matrix. Here, we demonstrate our efforts to begin assessment of the effectiveness of acetic acid treatments on disrupting biofilm formation, both *in vitro* and using our zebrafish *in vivo* and *ex vivo* explant culture models. We hope to gain understanding of the role that acetic acid treatment could play in the treatment of bacterial biofilm infections of chronic wounds.

Supported by ASCB MAC Linkage Fellowship (2016-2017 to Brenda Schoffstall)

5. **Transforming growth factor-beta (TGF-ß) inhibits cancerous hepatocytes and their stem cells via pRb-E2F signals**

Angela Duff, Tang Hu (*Barry University, Miami Shores, FL*)

The TGF-ß regulates multiple cellular processes; however, its effect on liver and breast cancer cells is not well established. Further characterization of TGF-ß on these cells is needed. Hep-G2 is isolated from hepatocyte carcinoma and MCF-7 is breast cancer cell line, both cancers derived from epithelial cell mutations. We used these cell lines as a research model to determine if TGF-ß inhibits or stimulates these two type carcinoma cells in culture and expose its possible action mechanism(s). Morphological examination of Hep-G2 cells show that addition of TGF-ß to Hep-G2 cells promoted cell adhesions at first two days followed by some sort of cell detachment from substrate and disruption of monolayer formation, which was not observed in MCF-7 cells. BrdU Proliferation Assay indicates that TGF-ß inhibited Hep-G2 cell division at a range of 20-45% depending on the dose of TGF-ß applied, with a maximal inhibition being observed at a concentration of 30 ng/ml of TGF-ß. Lower concentration (5 ng/ml) had no significant effect on the cell proliferation. XTT assay on day 4 could not detect the difference in cell viability between the cells treated with and without TGF-ß. In compliance with the outcome from BrdU assay, the growth of Hep-G2 stem/progenitor cells was also markedly downregulated determined by counting the numbers of colony-forming cells in soft-agar culture. Wester blotting shows that TGF-ß upregulated pRb and downregulated the phosphorylation of E2F3 and E2F4, two transcriptional factors. Although MCF-7 is also epithelial-origin cancer cell line, TGF-ß had no significant inhibitory effect on the growth and morphology of MCF-7 cells. In summary, TGF-ß inhibited Hep-G2 but not MCF-7 cells, suggesting that the inhibitory effect of TGF-ß varies with cell and tissue type, or with development stages of cells. The TGF-ß -induced growth inhibition in Hep-G2 cells is linked to transcriptional regulation via pRb-E2F signals.

Funded by 2017-2018 Barry Faculty Stimulus Grant; Biology Faculty Research Funds.

6. **The Effect of Embryonic Ethanol Exposure on the Expression of TyrP1 and CENPF**

Alayna Gallagher, Vania Arboleda, Annalliam Flores, Jennyvette Trinidad, Stephanie Bingham (*Barry University, Miami Shores, FL*)

Ethanol is a known teratogen, though the precise mechanisms by which it exerts this effect are not well understood. In the current study, we aimed to get a handle on the genetic pathways that are disrupted as a result of embryonic ethanol exposure. Using an RNA sequencing approach, we scanned the genome of embryonic zebrafish and performed a comparison of gene expression levels in treated and untreated embryos. This analysis revealed two putative genes of interest: TyrP1 and CENPF. TyrP1 is an integral membrane protein with diverse roles including melanocyte differentiation, an interesting fact since ethanol exposed embryos display delayed pigmentation. CENPF, on the other hand, is a nuclear matrix protein and regulator of the cell cycle. Further analysis of this protein and its function may reveal an answer to the age-old question of whether the reduced brain size indicative of fetal alcohol syndrome is a result of reduced cell division, increased cell death, or a combination of the two.

Department of Biology; Faculty Senate research mini-grant

7. **Rb may play a key role in green tea-induced growth inhibition of human myeloid leukemia cells**

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

There are many inconsistent reports regarding the effect of green tea on human myeloid leukemia cells. In this study, we presented evidence that green tea extract and its major chemical component, Epigallocatechin-3-gallate (EGCG), inhibit human myeloid leukemia cells via the regulation of pRb-CDK complexes. Addition of green tea extract or EGCG to the culture of the myeloid leukemia TF-1a and MV4-11 cells significantly inhibited the cell proliferation, measured by XTT and BrdU proliferation assays. The extract and EGCG have a stronger inhibitory effect on stem/progenitor cells derived from TF-1a and MV4-11 cells with more 90% inhibition being observed when 4% (v/v) extract or 0.00001% of EGCG (g/ml) was applied to the clone culture. Next, we investigated what mechanism(s) is responsible for the green tea-induced growth inhibition of the cells. Surprised us, the expression of Rb protein in both TF-1a and MV4-11 cells was significantly enhanced analyzed by Western blotting. The upregulation of Rb was significantly blocked by pre-treatment for 1 h with cycloheximade, a protein synthesis inhibitor. In contrast, the green tea extract and EGCG downregulated dramatically phosphorylation form of pRb. Addition of cycloheximade had no effect on the phosphorylation of Rb in the absence or presence of green tea extract or EGCG analyzed by Western blotting. We also found that green tea extract and EGCG had no marked effect on the expression of CDK4, CDK6, and CDK inhibitors, p21 and p27, but the formation of CDK4-pRb and CDK6-pRb complexes were significantly downregulated detected by immunoprecipitation. Taken together, our data suggest that green tea (the extract and EGCG) regulates Rb protein at both translation and post-translation levels. The upregulation of Rb synthesis, downregulation of Rb phosphorylation and CDK-Rb complexes all promote the binding of Rb to E2F transcription factors and inhibit the E2F-dependent transcription, leading to cell growth inhibition.

Supported by 2017-2018 Barry Faculty Stimulus Grant

8. **Effects of acute hypoxia on zebrafish cardiac tissue**

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

Human cardiomyocytes are only capable of an inadequate proliferative and

regenerative response to damage. In contrast, cardiac tissue in damaged *Danio rerio* (zebrafish) hearts is capable of complete regeneration in response to pathological injury and stress. We have repurposed 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. Following re-exposure to normal oxygen levels, we dissect hearts to study effects on cardiac tissue. We have used fluorescent labels to detect nitroreductase activity and reactive oxygen species (ROS) production—both indicators of hypoxic damage. Repeatedly, epicardial, pericardial, and myocardial tissues appear to exhibit detectable ROS production, while only myocardial tissue appears to demonstrate nitroreductase activity. 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. Here, we present our efforts to test for evidence of apoptosis programming using an ELISA assay and an in-situ labeling technique to detect cytoplasmic histone-associated DNA fragments. Future investigations will focus on how understanding cardiac regeneration in zebrafish following hypoxia damage could translate into discovery of molecular targets for therapies to stimulate human cardiomyocyte regeneration and repair.

Supported by RISE NIH-NIGMS, R25 GM059244-17

9. **An PI3K-Akt inhibitor-induced growth inhibition of human myeloid leukemia and liver carcinoma cells is linked to Ras-ERK pathway and adhesion molecule**

Llona Kavege, *Jocelyn Baquier*, *Tang Hu* (*Barry University, Miami Shores, FL*)

Phosphatidylinositol-4,5-bisphosphate 3-kinases (PI3Ks) regulate several important cellular and subcellular processes including cell proliferation and differentiation. Activated PI3Ks phosphorylate PIP2 to PIP3. Then, PIP3 activates protein kinase B (Akt) by phosphorylation. However, its effect on cellular adhesion molecules (CAMs) and CAMs-linked growth inhibition and apoptosis are largely unknown. Thus, study the regulatory effect of PI3K-Akt signals on CAMs and its link to apoptosis have profound impact on understanding complexity of the cellular signal network. LY294002 is PI3K-Akt inhibitor. In this study, we used LY 294002 to investigate if the inhibition of PI3K-Akt is linked to CAMs and other signal pathways in human myeloid leukemia and liver carcinoma cells. In hepatocytic carcinoma Hep-G2 cells, LY-294002 caused significant detachment of the cells from culture substrate and formed aggregates suspended in the culture medium, leading to the failure in the monolayer formation of the cells. Similar aggregates were also found in suspension TF-1a and MV4-11 cells. Addition of LY 294002 to TF-1a and MV4-11 cells significantly inhibited their proliferation/viability measured by MTT and XTT assays. The inhibition is does-dependent with a maximal inhibition being observed when 50 μM of LY294002 was applied. LY294002 also dramatically inhibited the colony-forming cells derived from TF-1a, MV4-11, and Hep-G2 cells in soft-agar culture. Western blotting shows that LY294002 significantly downregulated the phosphorylation of PI3Kp85 and Akt after cells treated with LY294002 for 48 hours. In addition, expression of ERK, a component of Ras-ERK pathway and adhesion molecule, integrin-linked kinase (ILK) also significantly downregulated in response to LY294002. These data suggest that the LY294002-induced growth

inhibition in TF-1a, MV4-11 and Hep-G2 cells is a result of the downregulation of both PI3K-Akt and Ras-ERK pathways. The inhibition of ILK and disruption of the monolayer formation in Hep-G2 cells suggest that CAMs may play a key role in LY294002-induced growth inhibition

Supported by 2017-2018 Faculty Stimulus Grant, NIH-NIGMS, R25 GM059244-17 Barry University, and Department of Biology Faculty Research Funds

10. **Genetics and the potential for evolution of laterality in the fruit fly**

Shayna Ramirez, Caomie Archelus, Deja Roach, Ashley Vargas, Sparkel James, Gabriela Garcia, Lillian Jiron, Kyra Carter, Rachel Angulo, Amanda Escalera, Shantesia Nichols, Fabian Ramos, Jovelyne Charles, Danielle Siddons, Samantha Deleon, Kailyn Belle Isle, Michael Robinson (*Barry University, Miami Shores, FL*)

Handedness is one expression of laterality, that is the preference of an organism to use one side of its body. Laterality exists in many animal taxa and is probably strongly related to neurology which makes laterality an interesting model to study. We investigated laterality in wingless fruit fly (Drosophila melanogaster) using Y-mazes and allowing individual fly to turn left or right multiple times. As seen previously, there was a small preference for left-turns during the final trial (91 left vs. 74 right; binomial test: p = 0.026). We then scored flies with more than one trial with an index of the proportion of left-turns (i.e., always turned right = 0, always turned left = 1). The mean index across fly indicated a significant tendency to turn left (mean±SD = 0.538±0.223; one-sample t-test: n = 140; p = 0.046). We allowed flies with known turning indices to mate and determined the turning indices of their offspring. We found that laterality had a narrow sense heritability of 0.216. This is similar to the lowest heritabilities observed for some physical traits in D. melanogaster. We conclude that individual fly have a preferred laterality, although it varies across the population. A significant portion of this is controlled by genetics, but environment or random developmental processes influence laterality, as well.

Supported by the NIH-NIGMS MBRS RISE: R25 GM059244-17 awarded to Barry University.

11. **Assaying the relative effectiveness of biofilm disruption by natural oils**

Sabrina Rodriguez, Genesis Munoz, Christoph Hengartner, Leticia Vega (*Barry University, Miami Shores, FL*)

Biofilm formation is a survival mechanism some bacteria have evolved to adapt to host defense systems and harsh environmental conditions. Biofilms exhibit characteristics that are distinct from those expected for planktonic microorganisms including: increased antibiotic resistance, increased resistance to environmental stresses, and the expression of virulence factors. As such, biofilms contribute to bacterial pathogenicity. A crucial component of biofilms is the polysaccharide matrix, which allows adherence of bacteria to surfaces. We developed qualitative and quantitative methods to analyze biofilm formed in static cultures of *Staphylococcus aureus* and *Staphylococcus epidermidis*, two clinically important pathogens, and aim to use these methods to examine the biofilm-inhibiting properties of various chemicals. Under our laboratory

conditions, Staphylococci produce a polysaccharide rich biofilm matrix that can be disrupted by diastase. In these new studies we examine the qualitative and quantitative effects of natural, easy to find oils including: olive oil, coconut oil grapeseed oil and peanut oil to disrupt biofilm. The ability to disrupt existing biofilm using oils may inform novel topical therapies. Our preliminary studies suggest that in coconut oil inhibits *S. epidermidis* biofilm formation under out assay conditions. However, more work is needed to determine the mechanism for the reduced biofilm formation in the presence of coconut oil.

12. **Diversity of UV-reflectance in damselfishes and the Aggression-Identification Hypothesis**

Elizabeth Schabot, Michael Robinson (*Barry University, Miami Shores, FL*)

Although ultraviolet (UV) radiation is not visible to the human eye some animals, including many coral reef fi might use it as a source of communication. Multiple species of damselfish (Pomacentridae) possess complex ultraviolet facial patterns. In at least one species these ultraviolet facial color patterns are apparently used for territorial aggression; we call this the Aggression-Identification Hypothesis. Damselfishes are diverse and have evolved a range of social systems and color patterns in visible light. We predict that UV-reflectance would also to vary with social system. We used a UV-photography system to record the UV-reflectance of multiple species and genera of damselfish. The fish were placed into a small UV-transparent Lexan aquarium for photography. There were significant qualitative differences in UV-reflectance among species and age-classes. Some species (e.g., yellowtail damselfish (Microspathodon chrysurus) had complex patterns on their faces (i.e., typically around the eye and preopercular regions) and/or bodies whereas others had no UV-reflectance whatsoever (e.g., blue chromis, Chromis cyanea). In general, UV-reflectance was most often associated with territorial and aggressive species which supports the Aggression-Identification Hypothesis. There were exceptions, however. The beaugregory, Stegastes leucostictus, had UV-reflection but the patterns were much more extensive and complex in juveniles which are non-aggressive than in adults which are highly territorial.

13. **An RNA-Sequencing Approach to Understanding the Genetic Influence on Fetal Alcohol Syndrome**

Daniel Villada, Julia de Almeida Rego, Alayna Gallagher, Vania Arboleda, Annalliam Flores, Jennyvette Trinidad, Stephanie Bingham (*Barry University, Miami Shores, FL*)

In the current study, we used an RNA sequencing approach to perform whole genome analysis of ethanol-treated and untreated zebrafish embryos. The whole-genome analysis revealed 86 genes that were significantly up- or down-regulated following embryonic exposure. Further analysis allowed us to narrow this number down to 40. Using genome search engines, the genes were classified according to function and 18 distinct gene categories were revealed. The majority of the genes (21%) coded for metal-binding proteins, followed by actin-binding (14%) and oxidoreducatase and kinase functions (both 7%). We will now follow-up with analysis of specific genes of interest revealed by this analysis.

Department of Biology; Faculty Senate research mini-grant.

Barry University, College of Arts and Sciences, Department of Mathematics & Computer Science

14. **A mobile university locator and guide**

Jose Gomez, *James Haralambides* (*Barry University, Miami Shores, FL*)

As a visitor to a vast and complex organization, one often finds oneself in search of a portable map to make route of common walkways to one's next destination. We are designing a mobile application that will provide full accessibility of a university campus and will serve as a guide to various locations and services of the university. The user will select or type a searchable keyword such as registration or admission. The system will find all relevant locations from a large spectrum of buildings, including but not limited to: libraries, food courts, and parking lots. It will also provide a point on the map where the building is located in relevance to the use's current location. The user will then have the option to learn more about the building, allowing the user to see a variety of pictures, a 360 degree animated video of the frontal view, contact information to staff within, and commonly associated words to brief the user in on the building's utility and ongoing activities. The user may also provide a location from which they wish to move, as opposed to giving their own; allowing the user to provide directions to others, or on campus routes for when the user wishes to go offline. In addition, non-campus based users accessing the application from an external location will be routed to a campus parking lot or entrance first, prior to on-campus walkways. A shortest path algorithm will be developed to produce optimal routes from source to destination. An associated graphical interface on a mobile platform will provide directions and pathways for the user to follow.

15. **Continuous functions as approximation to uncertainty**

Ricardo Gomez, *Sanja Zivanovic* (*Barry University, Miami Shores, FL*)

Real-life systems are often described by mathematical models via differential equations. In many cases such systems depend on parameters that change from time to time due to external forces or natural events. There are different ways one can model uncertainty of the parameters. One possible way is via differential inclusions. Differential inclusions are generalization of differential equations having multivalued right-hand sides. Moreover, they arise from differential equations with discontinuous right-hand side and time-varying inputs; from model-order reduction and control systems that are noisy in the input. Numerical methods are needed to reliably analyze the behavior of the system, such as its safety, under uncertainty. The ultimate goal of the research is to construct algorithms for computation of solution sets of non-linear differential inclusions. In particular, over-approximations of reachable sets are desired with high-order error of approximation at each time step. The approach is based on the approximations of inputs by continuous functions at each time step and calculation of the single step error on the difference of the solutions. The algorithm constructed will be tested and implemented in the open-source software, Ariadne, which is a verification tool developed for "formal verification of cyber-physical systems, using reachability analysis for nonlinear hybrid automata".

16. **An Automated Advisor Assistant**

Kyle Lothian, *Ricardo Gomez*, *James Haralambides* (*Barry University, Miami Shores, FL*)

The goal of this version of the project is to build upon an Android app that creates an unofficial degree audit for an undergraduate student. The app is intended to automatically download a student's current transcript once they login to web advisor with their student credentials and display all relevant results to the user on the front-end of the application. The back-end side of the application will be able to read the student's unaltered transcript, extrapolate all relevant results such as prefixes of classes taken, semester in which the class was taken in, the final grade they received, etc., and insert them into a database. The user's information is cross-referenced to an official degree curriculum in order for the user to be able to see what courses that s/he has not taken yet, needs to retake, or can take in place of another class and give an estimate as to when the student will be able to graduate. Ultimately, we want to be able to algorithmically provide suggestions to the student for future courses they can register for or recommend courses that can be substituted for by others. Our hope for this application is to streamline the class registration process for both the student and academic advisor in order to ensure that all academic requirements, as outlined by the program(s) requirements of the student's discipline(s), are met in a timely manner for students to acquire their degree according to plan. At its current build, the project solely functions in accordance to the Computer Science Major program as well as a required Minor in Mathematics. However, the ultimate goal for this project is to provide unofficial degree audit reports and recommendations to students, as well as their advisors, regardless of their field of study.

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

17. **Synthesis and biological evaluation of novel long acting muscarinic antagonists**

Jocelyn Baquier (*Barry University, Miami Shores, FL*)

Muscarinic receptors are known to play important biological roles and are drug targets for several human diseases. Novel long acting muscarinic antagonists were synthesized and tested for biological activity in CHO cells expressing individual subtypes of muscarinic receptors. 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. The 4-hexyloxy-1-[2-(4-oxidobenzoyloxy)eth derivatives were found to non-competitively antagonized functional response to carbachol with potencies ranging from 20 nM (pKB 7.68, α 0.0011) at M1 to 3 μM at M3 receptors. Under washing condition, half-life of antagonistic action ranged from 1.7 at M2 to 5 hours at M5 receptors. Overall, these derivatives were found to be potent long-acting M1-preferred antagonists. M1-preferred muscarinic antagonists are therapeutic targets for a number of neurological and psychiatric disease states.

18. **Appropriate linear fit equations for manipulated data**

Aurora Burkus-Matesevac, *Maurizio Giannotti*, *Sanja Zivanovic*, *John Goehl* (*Barry University, Miami Shores, FL*)

We show that the standard equations used to fi linearly distributed data lose validity when the data is manipulated. We propose a new set of equations which should be used in this case. The new set of equations ensure that the estimates for physical parameters do not depend on the data manipulation procedure.

19. **Applying thiol-ene click reaction to preparation of organo-silica monolithic columns aimed for applications in capillary liquid chromatography**

Aurora Burkus-Matesevac, *Zuzana Zajickova* (*Barry University, Miami Shores, FL*)

Liquid chromatography is the most widely utilized separation technique. Recent trends in achieving faster separations rely on a use of highly permeable monolithic columns. In this study, we intend to explore the feasibility of a radical-mediated thiol-ene click reaction towards preparation of organo-silica monolithic capillary columns (100 μm ID). Initially, optimization of preparation conditions was performed. Polymerization mixtures with varying composition were prepared using a starting monomer (3-methacryloxypropyltrimethoxysilane, MPTMS), a catalyst (aqueous hydrochloric acid), a porogen (toluene), an initiator (2,2'-azobis(2-methylpropionitrile), AIBN) or dimethylphenylphosphine (DMPP), and one of the multi-thiol crosslinkers such as trimethylolpropane tris(3-mercaptopropionate) (TPTM), pentaerythritol tetrakis(3-mercaptopropio (PTM), or 2,2'-(ethylenedioxy)diethanothiol (EDDT). Optimized conditions were achieved via thermal polymerization at 80 °C with AIBN and PTM selected as an initiator and a crosslinker. The prepared capillary column showed suitability for separation of a homologous mixture of alkylbenzenes and a

mixture of polar analytes in a reversed-phase mode at 50% of aqueous acetonitrile. This validates the presence of organic (methacrylate) and silica (silanol) functionalities at the pore surface of this hybrid monolith. To further improve separations in reversed-phase mode, the most suitable mode for separation of small analytes, a nonpolar organic modifier octadecyl methacrylate (ODM) or 1-octadecanethiol (ODT) were added directly to the reaction mixture. In conclusion, this study confirmed the feasibility of a radical-mediated thiol-ene click reaction towards preparation of organo-silica hybrid capillary column and subsequent suitability towards separation of small organic compounds which are encountered in our daily life in food, pharmaceutical and environmental samples.

Funded by the National Science Foundation CBET-1066113 award

20. **Using analytical instrumentations in humanitarian efforts to define the role of chemists in underprivileged communities outreach**

Alberto Liriano (*Barry University, Miami Shores, FL*)

Whether on a third-world country, or a developed nation, there are constant reports of health hazards that manage to inflict damage due to the neglect of safe and adequate living conditions of affected communities. Often time the source of these problems can be targeted through humanitarian efforts that fall on the shoulders of many disciplines; particularly chemists. The discourse thus shifts toward qualified chemists employing their expertise through means of working closely with afflicted areas; identifying the problem and the community needs, solidifying chemists' role in engaging in social justice. Additionally, these health issues are addressed through optimization of analytical instrumentation to detect and prevent further hurdles. As an approach that is most needed in impoverished communities, using analytical chemistry to provide low-resource alternatives is a personal responsibility in applying science and technology to solve world problems. Some of these affordable resolves range from the use of microflow paper-based devices to help in diagnosis, to the development of metal test kits. Numerable instances of these approaches will be analyzed; particularly the way this model is exemplified by groups such as Chemists Without Borders. There are drawbacks to some of these approaches, and their success or failure would define future projects. If chemists that seek to provide humanitarian help manage to adhere to this philosophy, not only would they be improving the lives of the affected communities, but these methods would become a standard application of chemistry knowledge.

21. **Differential expression of glycine receptors in the globus pallidus, thalamus, and striatum**

Jeremiah Paul[1], *Manuel Miranda*[2] ([1]*Barry University, Miami Shores*; [2]*University of Texas, El Paso*)

The brain is a complex system of cells, proteins, and neurons acting together to carry out many of the functions of the body. A specific type of receptor in the brain, known as the glycine receptor (GlyR), is responsible for interpreting the signals of the neurotransmitter glycine which initiates a change in the conformation of the receptor allowing chloride to enter a neuron, reducing its probability to elicit an action potential. The glycine receptor is comprised of differing combinations of five subunits, known as alpha-1, alpha-2, alpha-3, alpha-4, and beta. In our study, the different alpha isoforms of the glycine receptor subunits were identified in different parts of the brain, specifically in the cortex, striatum, thalamus, globus

pallidus, and brainstem. We hypothesize that GlyR alpha subunits are differentially expressed in different brain regions. The results from our study suggest that high concentrations of alpha-1, 2, and 3 are found in the striatum and the thalamus, compared to the cortex. In the case of the alpha-4 subunit, the highest concentration was in the thalamus and brainstem, and low levels were observed in the striatum. Based in our results, we concluded that alpha-1 subunit was the least specific and appeared at high levels in all samples except the globus pallidus, whereas the alpha-4 subunit appeared to be more specific with lower levels in all samples except the brainstem.

22. **Mechanochemical synthesis of diphenylporphyrins**

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Porphyrins are aromatic macrocyclic rings, consisting of four pyrrole groups that are linked together by four methine bridging groups. Their main role is their support of aerobic life, but they are also used in toxicology as biomarkers and evaluated as candidates for photodynamic therapy. Diarylporphyrins have aryl substituents on two of the four *meso* positions. This makes them unique because of the unsymmetrical structure, ability to form isomers, and the possibility of "scrambling." The two aryl substituents may end up across from each other, in a "trans-like" arrangement, or next to each other in a "cis-like" arrangement. In previous research, we have shown that the four-fold acid-catalyzed condensation of aldehyde and pyrrole to yield a tetra-substituted porphyrin is possible through mechanochemical techniques, without any solvent. In this study, we grind equimolar amounts of dipyrromethane and benzaldehyde in a ball mill in presence of an acid catalyst. Following this, the reaction mixture is oxidized using 2,3-dichloro-5,6-dicyano-1,4-benzoquinone to yield porphyrinic products, which are confirmed by UV-spectrophotometry and proton NMR spectroscopy. The products can be separated using column chromatography. The studies are ongoing to characterize the isolated yield, isomer distribution and extent of scrambling in the mechanochemical approach to this synthesis. Preliminary results indicate the possibility of post-synthesis migration of the aryl substituents to a neighboring methine bridge. Understanding this process would give us important insight into the mechanism of mechanochemical versus solvent-based reaction. These results hold promise for the development of mechanochemical synthetic protocols for porphyrins and related classes of compounds.

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23. **Design and synthesis of selective muscarinic antagonists for the treatment of Parkinson's disease**

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Muscarinic receptor subtypes provide effective therapeutic targets for a number of neurological and psychiatric diseases such as Alzheimer's, schizophrenia, and Parkinson. Functionally selective M1/M4 muscarinic antagonists may provide a viable approach for the treatment of certain central nervous system disorders including Parkinson (PD). The aim of this experiment is to synthesize M1/M4 selective muscarinic antagonists. We are currently working on the synthesis of

antagonists having two chemical groups, a phenyl and piperidinyl, linked by an ester moiety that meet the structural requirements for receptor-ligand interaction. Intermediates and final compounds are characterized using Proton Nuclear Magnetic Resonance (H-NMR), Infrared (IR) spectroscopy, melting points and elemental analysis. Binding affinity, functional selectivity towards receptor subtypes and the inherent cellular activity are determined. These selective ligands may improve current drug applications with the potential of reaching a maximum physiological response at low doses and lower side effects.

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24. The sixth personality trait: honesty-humility and college success

Janene Bottinelli, Guillermo Wated, Sabrina E. Des Rosiers, Salman Ahmad (Barry University, Miami Shores, FL)

Personality determines the way individuals think and behave (Pinter-Wollman, 2012). Many personality models have been proposed to gain insight into the structure of personality. Among the most popular is the Five-Factor model, which includes the following traits: openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism (Costa & McCrae, 1992). Nevertheless, more recent empirical evidence suggests the existence of a sixth personality factor, honesty-humility, which may be relevant in the prediction of counterproductive behaviors (Lee & Ashton, 2004). Honesty-humility can be defined as a measure of the tendency to be fair and genuine in dealing with others (Oh, et al., 2014). The goal of the present study was to evaluate the predictive ability of honesty-humility in academic environments by examining its relationship with indicators of college success. It was hypothesized that honesty-humility will be positively related to student's performance, satisfaction with school and student involvement will be negatively related to intention to quit school. Humility (α =.66) was assessed using the HEXACO Personality Inventory-Revised (Lee & Ashton, 2004). Students also completed an adapted version of Cammann's et al (1979) measure of job satisfaction to gauge student satisfaction (α = .83), Studsrod and Bru's (2009) measure of intention to quit (α = .77) and reported their GPAs. Two questions addressed student involvement. Participants were 120 multi-ethnic college students (85 women, 19 men). Results indicated that honesty-humility was negatively related to intention to quit (r = - .22, p = .032) but was not related to GPA, student satisfaction, and student involvement. Such data can help students identify and become aware of how humility can help them be more successful in college

25. Differences in perceived discrimination as a function of foreign accent provenance

Ingrid Lian, Guillermo Wated, Sabrina Des Rosiers (Barry University, Miami Shores, FL)

In general, non-native accented speakers are viewed more negatively than standard American-accented speakers (Deprez-Sims & Morris, 2010; Hosoda & Stone-Romero, 2010; Munro & Derwing, 1995). For instance, native English speakers view Korean

accented speakers as less intelligent than native speakers of English (Lindemann, 2003). Therefore, possessing a non-native accent can lead to negative perceptions of oneself, as well as from other people (Cargile & Giles, 1998). The level of perceived discrimination may vary based on where the accent is from (Dewaele & McCloskey, 2014). For example, it has been shown that people with Asian and Latino accents experience higher levels of discrimination compared to European-accented speakers (Gluszek & Dovidio, 2010). However, there is limited empirical evidence documenting the differences in perceived discrimination based on the accent's origin. Archival data from a study exploring the role of cultural stress as a predictor of behavioral outcomes in emerging adults will be used to examine potential differences in perceived discrimination based on the origin of the accent. The goal of the present study is to provide data that may help create interventions that could be used to decrease experiences of discrimination in immigrant young adults.

26. An insight into the role of helicopter parenting in college student's success

Julia Suglia, *Guillermo Wated*, *Sabrina Des Rosiers* (*Barry University, Miami Shores, FL*)

According to the U.S. government National Center for Educational Statistics (2017), about three million students enroll in college in the United States each year. Nevertheless, half of American college students withdraw from college before receiving their degree, and this number continues to increase each year due to many factors (Waldron, 2012). Research has shown that high levels of self-esteem and family support deter students from forming intentions to quit school and encourage students to excel in their academic life, leading to achievement (e.g., Anthony et al., 2007; Mac Iver, Epstein, Sheldon, & Fonseca, 2015). Despite the positive outcomes of family support, it has also been predicted that too much family involvement, such as helicopter parenting, can induce intentions to quit (Lynthcott-Haims, 2015). Nevertheless, there is a gap in the literature regarding how helicopter parenting impacts intentions to quit in college students. This review attempts to summarize the existing research that addresses the relationship between students' family support, particularly helicopter parenting, and self-esteem on college students' academic achievement and intentions to quit.

27. Intentional Self-Regulation among College Students: Preliminary Findings.

Karenthia Wilmore, *Sabrina Des Rosiers*, *Guillermo Wated* (*Barry University, Miami Shores, FL*)

Intentional self-regulation refers to how people set goals, make choices, plan actions to reach their goals, and carryout out those actions (Lerner et al. 2011). Studies have shown that processes of intentional self-regulation contribute to healthy development (e.g., Gestsdottir et al., 2015). Baltes' (1990) model of Selection, Optimization, and Compensation (SOC) have been used to conceptualize intentional self-regulation. In the SOC model, *Selection* is the action of goal-setting in a specific domain. *Optimization* refers to the ability to increase resources to complete goals. *Compensation* is the ability to overcome loss of strategies and resources that help with goals' attainment. The capacity to set goals, optimize actions, and counterweigh obstacles make SOC processes important to healthy human functioning. Many studies have evaluated SOC among older adults. Less is known about emerging adults (individuals 18-29 years) who are in college and the demographic factors associated with SOC. The purpose of this preliminary analysis was to explore demographic differences

in SOC in college students. Findings showed that women reported higher mean levels of compensation (M = 7.76, SD = 1.86) compare to men (M = 6.95, SD = 1.88). This difference was statistically significantly $t(189) = -2.49$, $p < .01$. Bivariate correlations between SOC components, chronological age, employment, and involvement in college-specific activities revealed that optimization was positively associated with age $r(191) = .12$, $p < .05$ selection was directly related to hours employed per week $r(180) = .14$, $p < .05$ and the number of college campus events attended $r(175) = .18$, $p < .05$. However, number of hours involved in student organization was inversely related to compensation $r(179) = -.13$, $p < .05$. Findings describe demographic factors associated with the way college students set goals, resources they use toward attaining those goals and measures they take to overcome obstacles.

28. Factors Associated with Subjective Well-Being among College Students: A Preliminary Analysis

Tristan Zonnevylle, *Sabrina Des Rosiers*, *Guillermo Wated* (*Barry University, Miami Shores, FL*)

The construct of life satisfaction has been defined as one's overall subjective evaluation in life domains including academic, relational, emotional and physical (Diener, 1984). Additionally, life satisfaction has been found to be a reliable and distinct single measure of subjective well-being (Pavot & Diener, 2008). The purpose of this preliminary analysis was to identify demographic characteristics associated with life satisfaction in college students. To this end, this study explored bivariate relationships between life satisfaction and a number of demographic domains as well as differences in mean levels of life satisfaction based on relevant demographic characteristics in a diverse sample of college students. Preliminary results showed that participants who reported being currently employed in their current field of study (M= 18.54, SD = 4.00) rated their life satisfaction higher than those who were not currently working in their field of study (M = 16.55, SD = 4.02). An independent sample t test revealed a statistically significant mean difference $t(181) = 2.62$, $p < .01$, indicating when employed in their field of study, college students reported higher mean levels of life satisfaction. Next, a correlation analysis was conducted to explore whether amount of hours worked was related to life satisfaction. Bivariate results revealed a statistically significant modest direct correlation, $r(181) = .16$, $p < .05$, suggesting that more hours of work per week was related to higher ratings of life satisfaction. While additional analyses are warranted to further understand the association between demographic characteristics and life satisfaction, the current preliminary findings describe the value of meaningful employment (i.e., work in field of study) for college students' subjective well-being.

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