8th Annual S.T.E.M. Research Symposium

Wednesday, March 23, 2016
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
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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

1. The rate of A(H1N1)pdm09 detection between 2009 and 2015 in China

Ruwayd Alguhani, Dashka Augustin, Hassan Bedeiry, Eliciane Noel, Sumera Ackbarali (Barry University, Miami Shores, FL)

The influenza virus causes acute disease of the respiratory tract and is transmitted via direct contact with an infected person's secretions. During the spring of 2009 in Hong Kong, the virus caused a pandemic which claimed many lives. The strain of the virus that emerged during that pandemic is referred to as A(H1N1)pdm09 and is still prevalent in Western Asia, North America, Eastern and Northern Europe. It has been included as a component of the seasonal vaccine in subsequent years, including the current trivalent vaccine for the northern hemisphere (A/California/7/2009 (H1N1)pdm09-like virus, A/Switzerland/9715293/2013 (H3N2)-like virus and B/Phuket/3073/2013-like virus) and the southern hemisphere (A/California/7/ 2009 (H1N1)pdm09-like virus, A/Hong Kong/4801/2014 (H3N2)-like virus, and B/Brisbane/60/2008- like virus). The purpose of this study is to investigate the number of positive influenza A(H1N1) pdm09 cases detected since the 2009 epidemic in China. The number of confirmed A(H1N1)pdm09 influenza virus cases detected in China from weeks 1 through 53 of each year between 2009 and 2015 was collected from the World Health Organization's (WHO) Flu Net interactive database of influenza laboratory surveillance: http://apps.who.int/globalatlas/dataQuery/default.asp. The data were recorded and analyzed using Microsoft Excel and SPSS. Results and discussion of the analysis will be presented.

2. The relationship between child mortality rates and vaccination with the measles-containing vaccine (MCV1 and MCV2) in the Americas

Saud AlSharyan, Greta Garcia, Sumera Ackbarali (Barry University, Miami Shores, FL)

The measles virus causes an estimated 400 deaths worldwide each day, making it a leading cause of death among young children. Measles is an airborne disease which is usually transmitted through infected aerosolized respiratory droplets (through coughing and sneezing) from the affected individual. The purpose of this study was to assess the relationship between child mortality rates and vaccination with the measles-containing vaccine. Immunization summary reports from 2013 were obtained from "Immunization Summary: A statistical reference containing data through 2013", published by the World Health Organization. Measles-containing Vaccine 1 (MCV1) coverage rate, proportion of districts with 95% MCV1 coverage, and Measles-containing Vaccine 2 (MCV2) coverage rate were obtained and compared for 47 countries within the Americas. The data were recorded and analyzed using Microsoft Excel and SPSS. The analysis will be discussed during the presentation.

3. **The relationship between government-financed Expanded Program on Immunization (EPI) vaccines and infant survival rate in Africa**

Jonathan Bernabe-Rivera, Roumaissa Chekima, Jessica Vilca, Sumera Ackbarali (Barry University, Miami Shores, FL)

Infants are particularly vulnerable to infectious diseases because of undeveloped immune systems. Therefore, it is critical to protect them through immunization. Immunization is among the most cost effective public health interventions to decrease global child disability and death. In recent years, vaccination programs in Africa have made a large contribution to the effort to improve the children's health through immunization coverage. The purpose of this study is to investigate how government funds given to the expanded immunization programs are affecting the survival rate of infants in Africa. Data were collected from the World Health Organization's (WHO) publication "Immunization Summary: A statistical reference containing data through 2013" for 52 African nations for the following indicators: number of births, number of surviving infants, percentage of routine Expanded Programme on Immunization (EPI) vaccines financed by government, and gross national income per capita (PPP, US$). The data were collected and analyzed using Microsoft Excel and SPSS. Results and discussion of this analysis will be presented.

4. **Child mortality, wealth, and vaccination with the birth dose of Hepatitis B vaccine (HepBB) in Southeast Asia and the Western Pacific**

Nikia Martinez, Payton Ewing, Sumera Ackbarali (Barry University, Miami Shores, FL)

Hepatitis B (HBV) is a highly contagious virus that is passed from person to person through blood, open wounds, or body fluids. The birth dose of the HBV vaccine, HepBB, is given to prevent an individual from becoming infected with HBV. It is a recombinant vaccine that uses yeast cells to produce hepatitis B surface antigen (HBsAg) which is harvested and purified. High infant mortality rates resulting from HBV are often seen in areas with low gross national income, inadequate access to the vaccine, and low adherence to vaccination programs. This study was conducted to investigate the relationship between income, HepBB coverage, and infant mortality in the regions of Western Pacific and Southeast Asia (as defined by the World Health Organization). The following data were collected from the WHO for 47 countries in the Western Pacific and South-East Asian regions: infant mortality rate (per live 1,000 births), under-five mortality rate (per 1,000 live births), estimated national HepBB coverage, and gross national income per capita (PPP, US$). This data represents totals from January 1st, 2013 to December 31st, 2013. Microsoft Excel and SPSS were used to perform the analysis which will be discussed during the presentation.

5. **Comparison of free-hand clearing methods and traditional tissue processing techniques for demonstration of plant tissue morphology.**

Erica Nanoo, Melania Vallejo, Nikia Martinez, Juliana Lora, Lawrence Reynolds, Ana Meneses, Daniel Packert (Barry University, Miami Shores, FL)

This experiment demonstrated the differences between free-hand clearing and traditional processing methods for plant processing. These methods provide useful studies and applications in the medical and research fields. In the free-hand method the plant tissue is cut with a razor blade, cleared with sodium hydroxide and stained with histological dyes. In the traditional method the tissue is dehydrated using alcohols and histological clearing agents and paraffin embedding before staining. Toluidine Blue and the Safranin O staining techniques were used after tissue preservation was completed. Both staining methods have been used in the past to show plant morphology. This comparison determined the effect of tissue preservation on plant morphology. We will discuss the effects on tissue quality, differentiation, and morphology used between the two different methods.

6. SODIS water purification process: cost efficient catalysts

Jason Urrutia, Alexander Linares, Jessica Shuler, Daniel Packert
(Barry University, Miami Shores, FL)

Solar disinfection (SODIS) is a low cost water purification system used to help clean surface water for drinkability in undeveloped countries. The SODIS process uses solar radiation in combination with heat to improve the microbiological quality of drinking water. SODIS involves using clean polyethylene terephthalate (PET) plastic bottles or bags which are filled with water from a ground source, then exposed to direct sunlight for a time period of six hours to two days, depending on the weather conditions. In this experiment the PET bottles were manipulated to try to decrease the time of exposure from 6 hours to 4.5 hours. Three different methods of water bottle manipulations were used; in the first experiment aluminum was painted with UV reflective paint and attached to half of the bottle; in the second experiment bottles had thin strips aluminum foil attached; in the third experiment bottles had light and dark tape applied to half of the bottle. The bottles were placed in direct sunlight and UV radiation, temperature of water inside the bottles, and ambient temperature were recorded. Effectiveness of reduction of total coliform bacteria and Escherichia coli was determined after 4.5 hours by serial dilutions, plating on MI agar plates and colony counts. It should be noted that the SODIS method has no effect on chemicals present in the water but viruses and protozoa are effectively inactivated at the recommended minimum exposure time of six hours. This experiment only used coliform bacteria and Escherichia coli as the determining factor for efficacy.

Barry University School of Professional And Career Education

7. Get certified

Fernando Marrero, Duane Pereira, Luis Navas, Gyasi Clarke, Brian Weil, Khaled Deeb (Barry University, Miami Shores, FL)

This project is intended to assist students and professionals who are looking for certification in various areas of Information Technology. Currently, people interested in earning a certification in an IT technology must search various websites belonging to technology providers (Microsoft, Cisco, etc.) or third-party testing centers (New Horizons, etc.) in order to find opportunities to learn and test. Links to centers providing testing for certifications from organizations such as Microsoft (e.g., MCP, MCSE), Cisco (e.g., CCNA, CCIE), and COMPTIA (e.g., A+, Network+), as well as others can be found on our central site. Information regarding testing locations and times are collated from various partners, allowing a user to simply use our website to find them. This saves time and effort of having to do the legwork required to find a center hosting for a particular exam at a particular date/time. The added value is by including features such as study guides for the exams and similar resources, forums for discussion and brain dumps by members, "help wanted" message boards, documents and video providing assistance with writing resumes, recordings of coaching candidates for interviews, as well as anything else our members would like to see.

8. Neighbor's Eye

Tabb Pitt, Bessy Bonnell, Jose Tabb Pitt, Jonathan Frantz, Khaled Deeb (Barry University, Miami Shores, FL)

The main purpose of the Neighbor's Eye mobile application is to provide awareness of any suspicious activities and events as they take place in the neighborhood or community. The members of a neighborhood could use the application to alert other neighbors of suspicious strangers, vehicles, or other questionable activities. This neighborhood network would be a private group not accessible by anyone outside of the group. Neighborhood boundaries will be defined based on the distance from other registered users within the network. The application will be accessible using a web application interface or downloading an application to a mobile phone system. This prototype application will start with iOS, allowing users to register through the Neighbor's Eye web site and download the application to their mobile phone. Once the users register and download the mobile application, they will be able to submit different types of activities selecting the option according to the categories: suspicious person, unknown vehicle, or other possible criminal activities. An advisory alert will be triggered when the user submits the activity. When the advisory is received, residents can take actions as necessary. Once the user submits the activity, an advisory will be issued to other registered users so they will be able to reply through the mobile application or the web site. This application is focused on design simplicity as well as ease of use. With the use of current database and hosting services, we intend to create a method of alerting neighbors of any potential dangerous or suspicious activity. Although similar in concept, Neighbor's Eye doesn't require the time of individuals to patrol the streets. Unlike the Nextdoor application, Neighbor's Eye separates itself from social media encumbrances and focuses on the simple goal of alerting you and your neighbors of truly valuable information.

9. Meals of Miami (MOM): Creating a meal scheduling and delivery request system for the elderly population of Miami-Dade County

Kendrika Ratcliffe, *Joshua Stevens*, *Josephine Casillas*, *Aland Fertil*, *Khaled Deeb*
(*Barry University, Miami Shores, FL*)

The purpose of this project is to improve upon the meal delivery program for senior citizens and the elderly population. Currently Miami-Dade County Community Action and Human Services has a program where they provide home delivered meals each week to low-income, ill and/or homebound persons with disabilities. The goal is to overhaul this program and create a web interface that specifically caters to the elderly population. Research has shown that there was a need for a tool that allows seniors to have more of an input and say so into their meals and times of delivery. The software application will be user friendly for the tech savvy seniors and will have a telephone operator for those who are not computer literate. With our MOM program, seniors will be able to request their specific meals and times they would like them to be delivered. Seniors will have the option to request meals particular to their individual taste and nutritional and allergy needs. The software database tracks each customer's meal request and delivery preference and generates delivery reports for the volunteers. There will be low cost associated with this program as we will use a cloud based program to host the site which will bring operating fees to a minimum. MOM program will greatly benefit the Miami-Dade Community Action and Human Services, and it will also help the elderly population maintain their independence and relieve some of the stress associated with grocery shopping, cooking and obtaining the right nutrients needed for sustenance.

10. MyPillMinder

John Slocum, Christopher Cartrett, Kristian Seiglie, Orlando de Jesus, Khaled Deeb
(Barry University, Miami Shores, FL)

As we grow older, we begin having more and more health issues. It also seems that more and more individuals are developing serious illnesses. All of these health issues have led to the necessity of managing multiple prescriptions. People need to keep track of what prescriptions they are on, the quantity they obtain per bottle, and more importantly when it is time to refill their prescriptions. Our MyPillMinder software will have a primary business model that will be based on employing various controls to remind patients to take their medicine or supplements at the prescribed time and correct dosage. We will focus much of our attention on senior citizens since this segment of the population has highest rate of non-compliance. Our stated objective is to increase the rate of patient compliance which has the potential to improve the patient's quality of life. In addition, it will reduce the amount of money wasted on pharmaceuticals that go unused or are never filled. MyPillMinder has built a website that will provide the control patients and caregivers need to keep track of their prescriptions. Users will gain access the MyPillMinder.com website, sign up, and decide what level of involvement is needed for them to achieve the goal of patient compliance. Our program will offer several options based on the information and dosage of the medications or supplements. The only information required will be their name, email, and prescriptions. The prescription information will require the type of prescription, dosage, amount taken per day, and total quantity. The website will then calculate when the prescriptions will finish and when the customer will need to refill them. The website will also send the customer an email a week before the prescriptions need to be refilled.

11. Naturally-occurring DMSP analogs as potential precursors of dimethyl sulfide (DMS) and methanethiol (MeSH) in coastal seawater

Diana Cordero[1], Ronald P. Kiene[2] ([1]Barry University, Miami Shores, FL; [2]University of South Alabama, Mobile)

Dimethylsulfoniopropionate (DMSP) is an osmolyte produced by various macroalgae and phytoplankton in the marine environment. DMSP is the main precursor for dimethyl sulfide (DMS), the major natural sulfur gas emitted from the oceans to the atmosphere. DMS from the oceans contributes to formation and growth of sulfur-containing aerosols in our atmosphere. These aerosols influence Earth's solar radiation balance and potentially affect the formation of clouds, which could function as a counter-effect to global warming. Bacterioplankton are capable of converting DMSP into DMS via the enzyme DMSP lyase. But not all DMSP in the ocean is converted into DMS. A significant fraction of DMSP available in the ocean is converted to methanethiol (MeSH) via bacterial demethylation/ demethiolation pathway, with a portion of MeSH being assimilated as a sulfur source. Overall, DMSP is considered an important substrate for marine bacterioplankton, serving as both carbon and sulfur source. We test whether several other naturally-occurring dimethyl sulfonium compounds could be precursors of DMS and MeSH. To test this, we collected water samples from the dock of the Dauphin Island Sea Lab located on the shore of Mobile Bay in the Northern Gulf of Mexico. After collection, un- filtered seawater and seawater filtrate samples, the later containing bacteria only, were treated with 50 nM additions of either 2-dimethylsulfononioacetate (DMSA) or S-Methylmethioine (SMM). After addition of the dimethylsulfonium compounds, samples were analyzed for sulfur gases with Gas Chromatography-Flame Photometric Detection, using cryogenic-trapping techniques. Addition of DMSA resulted in an immediate increase in MeSH production in both seawater and seawater filtrate, producing even more MeSH than DMSP. This suggests that DMSA is potentially a significant precursor for MeSH. Addition of SMM resulted in a minor production of both DMS and MeSH in both seawater samples. Indicating that SMM may be a minor precursor for both gases compared to DMSP.

Funding for this research was provided by the National Science Foundation, Dimensions of Biodiversity program Grant OCE-1342699 and the NIH-NIGMS RISE Grant, R25 GM059244-15, Barry University

12. Investigation of a new hypoxia model to induce cardiomyocyte proliferation in zebrafish

Fabio Frech, Johan Sanchez, Kevin Williams, 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 efficient to compensate for pathological stress. In response to forced swimming exercise to induce excessive cardiac overload stress, Danio rerio (zebrafish) hearts respond with high proliferative capability. Zebrafish cardiac stress models are used to identify molecules that could be targeted to initiate cardiomyocyte proliferation in humans. We are developing a new zebrafish cardiac stress model using extreme hypoxia exposure as the stress event. Other hypoxia models expose zebrafish to harsh chemicals to either reduce O2 in water or to induce anemia in fish; we propose a chemical-free model, using an anaerobic chamber. We first determined the length of exposure time in an extremely low oxygen environment that is sufficient to induce excessive cardiac stress, but not death. Preliminary results indicate that dissolved oxygen (DO) levels in individual fish tanks within the hypoxia chamber can be reduced by an average of 84%, as compared to water exposed to air, after 2 hours. After 10 hours, effects

of hypoxia are too severe, inducing a 50% death rate. We are currently collecting data at other time points to determine optimal exposure time required to induce a significant cardiac stress that would result in cardiomyocyte proliferation similar to that seen with excessive exercise stress. This hypoxia model can be used to study molecular mechanisms that may act as a "switch" to turn on proliferation in zebrafish cardiomyocytes.

Support: NIH-NIGMS MBRS RISE: R25 GM059244-15

13. Tissue changes during wound healing in wild type Danio rerio

Gabriela Hernandez, Victoria Hoelscher, Brenda Schoffstall
(*Barry University, Miami Shores, FL*)

Danio rerio (zebrafish) share many physiological and genetic characteristics with humans, making them an attractive model system for scientific research. Zebrafish have been shown to completely regenerate significant portions of heart, fin, and tail tissues without loss of function or formation of permanent scar tissue. We have recently established zebrafish as a model to study regeneration in skeletal muscle and surrounding tissues following deep tissue burn puncture wounds. Our preliminary data suggest that it takes approximately 30 days for zebrafish to apparently recover from the wound; our current project focuses on attempts to characterize the changes in tissue over the healing time period, as evidenced by histological techniques. To examine the healing process at the tissue and cellular level, tissue samples were cryopreserved on specific days post-wounding, cut using a cryostat, and stained with Hematoxylin and Eosin (H&E) and Trichrome stains. The samples were collected over a 42 day period. Although with this data set, our H&E staining technique was more efficient than our attempts at trichome stain, we were able to discern specific changes in cell types over the course of healing. At six days post-wounding, loose connective tissue formation was already clearly visible. By Day 12, fat cells were beginning to infiltrate the area of the wound, and by Day 16 were predominately visible. Muscle tissue appeared to be re-establishing within the wound site by Day 16, and by Day 18 appeared to be reorganizing in distinctive bundles. Others have demonstrated that in would healing processes, fat cells may de-differentiate and re-differentiate into specific other cell types like muscle. This project is ongoing; we will further explore the hypothesis that this is occurring with the zebra fish as they heal and fully regenerate different tissue types that are damaged in the burn puncture wound.

Support: NIH-NIGMS MBRS RISE: R25 GM059244-15

14. A comprehensive analysis of the myosin heavy chain distribution in the canine model of Duchenne muscular dystrophy

Joshua Kelly[1], *Greg Jenkins*[2], *Chady H. Hakim*[2], *Dongsheng Duan*[2] (*[1]Barry University, Miami Shores, FL; [2]University of Missouri, Columbia*)

Duchenne muscular dystrophy (DMD) is a devastating muscular disease that affects boys at a young age and causes premature death. Significant progress has been made over the past few years in the development of adeno-associated virus (AAV) mediated gene therapy for DMD. The DMD canine model is an excellent large animal model for preclinical testing of AAV gene therapy. A prominent histological change in DMD is the alteration of the myosin heavy chain (MHC) expression profile, in particular, a shift towards slow MHC in dystrophic muscle. It has been shown that AAV-mediated micro-dystrophin gene therapy can ameliorate muscle pathology and improve muscle function of the extensor carpi ulnaris (ECU) muscle in adult DMD dogs. We aimed to study the histological and mechanical properties of skeletal muscles in the canine model. Here, MHC profile in normal and affected ECU muscle was studied. The ECU muscle was sectioned; immunohistochemically (IHC) stained and captured with a fluorescent microscope. ImageJ software was used to quantify MyHC isoform type per cell. In contrast to the literature, a shift towards fast MHC was found in dystrophic ECU muscle. Compared with normal ECU muscle, the number of slow type

MHC myofiber types was significantly reduced whereas the number of fast type MHC myofibers was significantly increased in the dystrophic ECU muscle. In support of this, the kinetics of the mechanical properties of the ECU muscle was also altered in affected dogs; specifically, the time to peak tension was significantly reduced, while the half relaxation time was significantly increased, compared to that of normal dogs. Future studies of MHC distribution and mechanical properties of skeletal muscle throughout the body will serve to better understand the histology of DMD in the canine model.

Support: MDA-NIH (AR-49419), NIH training grant T90DK70105, University of Missouri: NIH-NIGMS RISE Grant, R25 GM059244-15, Barry University

15. Dependence of seagrass blowout fish abundance on wind condition in Bill Baggs Cape Florida State Park

Alexander Linares, Diana Cordero, Shanika Kingston, Samantha Malkus, Natalie Perez del Rio, Silvia Macia (Barry University, Miami Shores, FL)

Seagrasses are flowering plants that form meadows, or beds, in shallow marine environments. These beds provide shelter for an abundance of species, including fishes, macro- and microalgae, mollusks, etc. Additionally, many different species, such as turtles and manatees, use the seagrasses as a food source. High winds and strong waves pose a potential threat to seagrass beds by causing blowouts. Blowouts are barren patches with little vegetation. As the sediment is eroded from the blowout, a vertical wall called a scarp develops along the edge of the blowout. The seagrass rhizomes are exposed at the scarp and can hang over the edge of the scarp, creating protective habitat for small fishes. We hypothesized that fishes will use the blowout habitat more frequently on windy days when they are seeking shelter from stronger wave action. We surveyed the fish populations in blowouts in a turtlegrass (Thalassia testudinum) bed off of Key Biscayne, Florida. During each survey all fishes found within 1 m of the scarp were identified to the lowest possible taxon and counted. We used sea state as a measure of wave activity and compared fish abundance on days with a low sea state (1) versus days with a high sea state (2). As this is study is in the preliminary stage, we currently have a small number of replicate surveys. Nevertheless, our data indicate a non-significant trend towards higher fish abundance on windier days than calm days. Additional surveys are planned for a more rigorous testing of our hypothesis.

16. First description of the anatomy of the caudal spine mechanism of the blue tang, Acanthurus coeruleus.

Shaynell Monreal, Michael Robinson (Barry University, Miami Shores, FL)

Surgeonfishes (Acanthuridae) all share a trait unique to this family, one to several sharp spines (also called scalpels) found on the caudal peduncle directly anterior to the caudal fin. The function of these spines is unknown although it is believed to be used during intraspecific aggression. These spines differ among the acanthurids. In some genera the spine is fixed and in others it is mobile and retracts into a depression. To understand better the evolution of these spines, we examined the anatomy of the retractable spine in the blue tang, Acanthurus coeruleus. Via dissection, clearing and staining, and microscopical analyses, we identified a previously unknown ligament. This ligament originated far to the anterior, passed through much of the myotomal musculature and inserted on the base of the spine. This suggests that contraction of this ligament is most likely how the scalpel is extended. This ligament is probably critical to the flexible use of the spine based on different behavioral contexts.

17. Comparative analysis of the colors of the caudal spines of surgeonfishes (Acanthuridae)

Eva Paulus, Michael Robinson (Barry University, Miami Shores, FL)

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.

18. qPCR microbial array screen for identification of bacteria in a zebrafish biofilm model

Peter Rodriguez, Jessica Ricketts, Brenda Schoffstall (Barry University, Miami Shores, FL)

Recent advances in microbiology focus on “biofilms” as a leading cause of persistent infection. Biofilms are an accumulation of a multicellular mass embedded in polysaccharide matrix with incredible adhesive abilities. Once initially formed, biofilm becomes quite complex, recruiting multiple species of bacteria and fungi to become part of the multicellular mass. Due to its complexity, biofilm has a remarkable ability to impede normal host immune responses and medical intervention. Previous research groups have focused on in-vivo biofilm models using rodent, Drosophila, or rabbit models. Here, we establish Danio rerio (zebrafish) as an in-vivo biofilm model within which the formation, growth, and ultimately treatment of different biofilms can be analyzed. We have established wounding methods to deliver a penetrating burn injury to zebrafish through the muscular tissue just below the dorsal fin. Here, we present our findings using the Qiagen Microbial DNA qPCR Array for Sepsis to screen for microbes growing in penetrating burn wounds of zebrafish at 24 and 48 hours post-wounding, with no antibiotic treatment. We have identified which endogenous or environmental bacteria might cause infections in these types of wounds. Our screen has identified at least 2 different species of aquatic bacteria, 2 specific species of bacteria commonly associated with fish, and 1 species known to participate in human wound infections. Interestingly, two species have been identified as having potential as initial biofilm formers. Our eventual goal is induction of biofilm by inoculating wounds with known initial biofilm-forming bacteria which may recruit other bacteria into the complex structure. Future studies will focus on novel methods to disrupt the biofilm formation using our in vivo model. Findings may one day be applied to treating complex human infections.

Support: DARPA grant BAA 10-55 (G. Packert/Barry University)

19. Cre recombinase has minimal effect on dendritic complexity of cultured hippocampal neurons

Mariana Ruiz-Velez[1], Laurel Kelnhofer[2], Yu Gao[2], Xinyu Zhao[2]
([1]Barry University, Miami Shores, FL; [2]University of Wisconsin-Madison, Madison)

Neurogenesis is the formation of new neurons and it is most active during prenatal development. In adults, neurogenesis mostly occurs in the hippocampus and sub-ventricular zone. We believe that methyl-CpG binding proteins (MBDs) regulate adult neurogenesis, specifically methyl-CpG binding domain protein 1 (MBD1). MBD1 is known to mediate gene repression by binding to methylated DNA. To investigate the role of MBD1

played in neuronal maturation, we try to delete MBD1 through in-vitro cultured primary hippocampal neurons using Cre-LoxP system, which involves Cre protein expression in neurons. However, overexpression of Cre through in-vitro cultured hippocampal neurons can be toxic to neurons. To test the effect of Cre-Loxp deletion of MBD1 in in-vitro cultured neurons, we first, decided (1) to determine if Cre shows toxicity in wild-type neurons, then (2) determined if Cre has an effect on MBD1 deletion affecting maturation in MBD1 conditional knockout (cKO) neurons. First, Cre toxicity was tested by transfecting Cre and dCre into wild-type neurons and we found that it has minimal effect on dendritic complexity. Second, an assay was developed to transfect MBD1 cKO neurons with Cre and dCre. We found that there was no statistical significance shown for dendritic complexity up to 3 days after a transfection is performed, leading us to believe that a 3-day timeframe may be too short.

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20. Effects of ethanol and thiamine on embryonic Rattus rattus brain cells

Pedro Sanchez, Laura M. Mudd (Barry University, Miami Shores, FL)

HSP90 is a protective protein that functions as a chaperone, along with other proteins, to assist in proper protein folding (Wandinger, et al, 2008). Embryonic day 18 neurons of Rattus rattus were cultured and maintained in vitro at 37◦C in a 95% air/ 5% CO2 incubator. The cells were treated with ethanol, thiamine, or ethanol and thiamine on DIV 1 and DIV 2. The treated cells were fixed using Histochoice fixative on DIV 8. Immunocytochemistry with a mouse monoclonal HSP90 antibody was done to determine the effects of ethanol and thiamine on HSP90.Thiamine is an essential B vitamin that is not naturally produced by mammals (Aldinger, 2016). It is suggested that long-term ethanol use decreases the B vitamin in neurons which, in turn, causes cell death (Thomas and Marshall, 2005). The purpose of this study is to determine whether the HSP90 protein will be decreased after treatment of ethanol, thus leading to cell death, and whether thiamine could reverse the effect on cell survival or HSP90 expression. Reversal of ethanol-induced thiamine deficiency could be beneficial in conditions such as Fetal Alcohol Syndrome and Wernicke - Korsakoff syndrome (Thomas and Marshall, 2005). We purpose to modify the methods to study further the interactions between ethanol and thiamine in cortical neurons.

Supported by Department of Biology, Barry University

21. Does fluctuating asymmetry communicate molecular quality in male house crickets, Acheta domesticus?

Mernyka Webster, Angel Tapia, Jean Sylvain, Kirill Stremousov, Anton Stremousov, Lavannia Raguthu, Foumi Oni, Lusanda Nogxina, Autumn Leone, Leanne Jalique, Darrell Henry, Taila Garrett, Roudy Charles, Ariana Connor, Alicia Carabarin, Jocelyn Baquier, Chelsea Bain, Jesse Aronson, Michael Robinson (Barry University, Miami Shores, FL)

Mate choice by females provides benefits that increase their fecundity and/or their offspring's genetic quality. A male's genetic quality is manifested through developmental stability. Individuals with better genes are less susceptible to environmental stressors and develop more symmetrically. Previous work on male house crickets (Acheta domesticus) demonstrated that symmetry is correlated with important traits including immune function and mate signaling. Here we test if symmetry predicts quality at the molecular level by measuring testicular protein concentration (i.e., mating quality) and telomerase activity (i.e., molecular quality). Telomerase prevents the shortening of chromosomes that occurs during replication, and telomerase activity is often inversely correlated with the rate of aging. Trade-offs are common in nature, however, and males that maintain symmetry might pay a

cost via reduced telomerase activity representing a cost to the offspring (and the mates) of these males. Symmetry in the tibia and wings of adult male crickets were positively correlated indicating asymmetry is an overall phenomenon and not more or less likely to appear in structures important to mate choice (i.e., the chirp-producing wings). Testes were removed, weighed, and frozen (-80◦C) in PBS before measuring protein content and telomerase activity with the TRAPEZE Telomerase Detection Kit. Males with greater symmetry had higher protein content, there was no significant correlation between symmetry and telomerase activity. If a developmental trade-off exists at the molecular level it is apparently too weak to affect high quality cricket males.

Funding was provided by the NIH-NIGMS MBRS RISE: R25 GM059244-15 awarded to Barry University.

22. Determining the effects of different substrates on actin structural features using Cryo-electron microscopy

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Structural biology is increasingly focusing on unraveling structural variations aiming at interpreting dynamic biological processes and pathways. Actin is an essential filamentous protein found abundantly in eukaryotic cells; it plays a role in wound healing, inflammation, cell motility, and cell development. Actin and the other proteins associated with it can be implicated in several different forms of cancer and genetic diseases. Actin binding proteins can manipulate the structure and, thereby, the function of the actin itself. In this project, we investigated how the structure, and thus, apparent function of actin can be affected when it is placed on different substrates for imaging. Previous lab research has shown that thinner substrates tend to restrict actin molecules. It was hypothesized that actin polymers change their macromolecular structure as a consequence of the environment in which they are embedded. Actin was investigated under three different substrates (Formvar, Triafol and Commercial Quantifoil) of differing thicknesses using high resolution cryo-electron microscopy (EM) imaging conditions to determine if various landscape conditions affected its structure. Images of the actin on different substrates were used to determine which grid preparation had the least effect on actin structural quality. Our preliminary results show that even though the substrates Formvar and Comercial Quatifoil are most effective on the structure of actin, Triafol is the thinnest. Therefore Triafol is the most suitable substrate for cryo-EM imaging.

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

23. Automated music composition using random segments in the Arabic maqam system

Julian Dasilva, James Haralambides (Barry University, Miami Shores, FL)

We are designing a system to auto-generate realistic music compositions in the Arabic maqam modal system. This system is selected as it is suitable for musical compositions that encourage improvisation. The design is implemented in the Microsoft Visual Studio Integrated Development Environment. Musical notes are recorded for instruments that can realize compositions in the Arabic maqam modal systems such as an oud or a violin. In such systems, notes may fall in frequencies beyond the full tone and semitone equivalents. Such tones can be generated natively or produced through synthesis of representable neighboring nodes. Synthesis is carried through the use of signal processing methods as part of a software application called Octave. Maqams selected for experiments include: ajam, husseyni, and kurd. Compositions are limited to two consecutive octaves and are synthesized according to the frequency ranges produced by that instrument. Music note sequencing is realized with the use of a random number generator. A large collection of music compositions, called segments, is available in the form of a library. These segments are realistic representations of maqam tetrachords and allow for the expansion of compositions to multiple maqams. Segments are selected randomly and "stitched" together to form longer compositions. To avoid repetitive structures, random fine-tuning of notes within a segment is allowed. Segment notes vary in frequency as well as duration. Specifics durations used are subdivisions of a full note. These represent durations of one half, one quarter and one eight of a note. Additional recordings introducing desirable instrument playing effects and synthesis effects such as delay, reverb, and so on. The graphical user interface of the program includes options for the selection of musical instruments, the range of octaves, the stitching method, and the duration of the composition. Compositions are evaluated with respect to realism, appeal, and degree of randomness.

24. Using the ant colony optimization algorithm to enhance blood vessels in retinal images

Luis Khawly, Julian Dasilva, James Haralambides (Barry University, Miami Shores, FL)

We present a probabilistic algorithm that enhances the blood vessels of retinal images and their underlying graph structure to support medical diagnosis and clinical study. Extraction of blood vessel features such as diameter, curvature, and color is important for the diagnosis of diseases and the application of appropriate treatments. Algorithmic processes are applied in two stages. During the first stage, pixel values of blood vessels are intensified through edge detection using Gaussian filters. During the second stage, enhanced images are explored to identify strong features such as the underlying graph structure of blood vessels using the ant colony optimization algorithm. Strong features allow for the detection of natural or abnormal medical conditions in the retina. Feature augmentation is achieved with the use of two-dimensional Gaussian filters. The filter is rotationally transformed to achieve directional independence with respect to feature extraction. Resulting images exhibit intensified pixel values for blood vessels and are used as inputs to the optimization stage. During the execution of the ant colony optimization algorithm, pixels that correspond to blood vessels are visited by "ants" using a weighted cost function whose parameters include color intensity and frequency. Color intensity reflects the enhanced value produce by the first stage. Frequency is a dynamic parameter that favors blood vessel pixels visited by a larger number of ants. Initial frequency values are assigned uniformly. Probabilistic selection of ant routes that combine color intensity and frequency helps identify pixels that represent strong features of the underlying graph structure. Frequency values can be filtered to allow for varying levels of detail. Experimentation is carried for a number of different configurations in which parameters such as the number of ants, the number of ant travel stages, and the number of frequency updates are fine-tuned to achieve results of higher quality and smaller execution times.

25. A population model of the Burmese Python in the Florida Everglades.

Kristina Pazienza, Kelly Merrill, Cassandra Dening, Wesam Azaizeh, Sanja Zivanovic (Barry University, Miami Shores, FL)

The Burmese python is an invasive species in the Florida Everglades (FE). Invasive species do not only compete with endogenous species, prey on them, and pose a threat to biodiversity, but they can also cause harm to ecological resources. The FE is a home to a large variety of species, such as an array of mammals, reptiles, avians, and more. In the past years, the Burmese python population in the FE has been growing at an alarming rate, which in turn had a drastic effect on the population of avian and mammal species. This decrease has been even more dramatic in endangered and almost extinct species. Therefore, understanding and estimating the advancement of these non-native species is essential to FE native species and its ecosystems. We use a well-known Predator-Prey model to model population size of Burmese python in the FE. We use estimates of mortality rates, birth rates, and diet of both predator and prey in order to model the dynamics of Burmese python.

26. Evaluation and Troubleshooting of the Globe and Calitoo Sun Photometer

Pablo Sanchez[1], Blake Phillips[2], Rachel Slank[3], Zachary Fair[4], Abbey Rodjom[5], Margaret Pippin[3] ([1]Barry University, Miami Shores, FL; [2]W.T. Woodson High School, Fairfax, VA)

Numerous aerosol measurements were made with two instruments called GLOBE and CALITOO. Aerosols are small particulate, either liquid or solid, that can be found in the Earth's atmosphere. This sort of particulate can come from many sources and can therefore be classified as either biogenic, produced in nature, or anthropogenic, produced by humans. I tested the instruments to see if they were valid and compared them to a liable source called AERONET, which is an autonomous instrument that measures valid AOD (Aerosol Optical Depth). Once validated they were sent out to schools around the country to see how the AOD changes in different areas in the United States.

This work was supported by the TEMPO Student Collaboration project with funding provided through the NASA Science Mission Directorate Earth System Sci

27. Plotting for simple indefinite integrals and composite functions

Roland Schiller, Jose Gomez, Alfonso Logrono, James Haralambides (Barry University, Miami Shores, FL)

We construct 2-Dimensional and 3-Dimensional plotting for indefinite integrals on a representative set of univariable functions. The results provide a valuable insight on the effect of constituent functional components to the overall structure of the integral. The project is an extension on work for function derivatives and is built on top of its methodologies. We use the Visual Studio Integrated Development Environment for the algorithmic component of the project and the Open GL platform for plotting in 2D and 3D. The graphical user interface allows the user to select among a list of integrable functions including: polynomials, trigonometric functions (for example, sine, cosine, and tangent), logarithmic functions, and exponential functions of a constant base (for example, $a^{\wedge}x$, $e^{\wedge}x$). As this is only a foundation of a bigger project, we limit the list of functions to eliminate the possibility of non-integrable functional expressions. Interactions between functional components explore basic arithmetic operations addition, subtraction, multiplication, and division, as well as functional composition. Multiplication and division are handled by a method called integration by parts. In such cases, the algorithm will identify an optimized selection sequence to produce the correct order for the integration of components. A random selection may result in substantial overhead and a non-closed functional expression for the integral. A certain degree of flexibility is introduced through the use of constants or

constant expressions. User selections are made from a list of predefined functions as listed above. The user also selects the set of operations to be applied on the constituent functions. Functional expressions and their corresponding integrals yield expression trees that are evaluated within the range of x and y values of a 2-Dimensional (or 3-Dimensional) system for purposes of plotting. Plotting graphs will be open to geometric transformations such as translation, rotation, and scaling for better visualization results.

Barry University College of Arts and Sciences
Department of Physical Sciences

28. "Single-pot" approach to preparation of hydrophobic sol-gel monolithic capillary columns for reversed-phase liquid chromatography

Montaha Abdallah[1], *Thales Silva Campos*[1], *Rebecca Hernandez*[1], *Frantisek Svec*[2], *Zuzana Zajickova*[1] *(* [1]*Barry University, Miami Shores, FL;* [2]*The Molecular Foundry, Berkeley, CA)*

Over the past decades, monoliths have gained popularity in separation science due to their efficiency in separating the components of chemical mixtures. Our research is aimed at developing a monolith material that can be commercialized and used for faster analysis for the mixture it separates. A hydrophobic organo-silica monolith containing octadecyl functionality was prepared via thermal polymerization of 3-(trimethoxysilyl) propyl methacrylate (MPTMS) with octadecyl methacrylate (ODM) in the presence of a crosslinker, ethylene dimethacrylate (EDMA). In contrast, thiol-ene click polymerization of MPTMS in the presence of 1-octadecanethiol (ODT) and 2,2'-(ethylenedioxy)diethanolthiol (EDDT) resulted in the formation of soft gel and transparent liquid. Further substitution of EDDT with 1,6-hexanedithiol (HDT) did not support formation of a monolith either. After adjusting the ratio of MPTMS to EDMA and MPTMS to ODM, monoliths useful for separation were produced. Monolithic capillary columns were tested for separation of selected analytes in reversed-phase liquid chromatography mode using aqueous acetonitrile as the mobile phase. These columns exhibited enhanced retention of benzene compared to capillary columns prepared from MPTMS alone confirming the availability of octadecyl functionalities at the pore surface. Our "single-pot" approach eliminates the need for surface modification and therefore represents a faster alternative to preparation of hydrophobic organo-silica monolithic columns from 3-(trimethoxysilyl)propyl methacrylate.

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29. Metal organic frameworks for carbon dioxide gas capture

Suzely Alexis (Barry University, Miami Shores, FL)

Metal-organic frameworks (MOFs) are two or three dimensional structures consisting of coordinated metal ions linked by organic ligands. Many possible structures for MOFs have been evaluated leading to synthesis and characterization of small pore MOFs for their separation properties. This study focuses on the carbon dioxide (CO_2) gas selective MOF's capability to preferentially capture CO_2 gas over nitrogen (N_2) and methane (CH_4) gas within the pores of its structure. Highly selective MOFs for CO_2 gas were synthesized via microwave irradiation to allow for a broad temperature range that ultimately controlled the particle size distribution and face morphology. Synthesized MOFs were characterized through Single Crystal X-ray Diffraction and Powder X-ray Diffraction. In addition, the potential for CO_2 gas selectivity of the MOFs was confirmed by the adsorbent performance indicator (API), and manometric gas adsorption coupled with a Tian-Calvet-type microcalorimeter. The results obtained from the API method were quantitatively analyzed to determine functionalization as crucial in adsorption mechanisms of MOFs. Another study focuses on multicarboxylate-linked MOFs (synthesized MOFs) and their effective separation of CO_2 gas in mixtures containing N_2 or CH_4 gas. Moreover, both studies support the idea for membrane-type separations where selectivity and size exclusion are vital. Understanding the highly selective CO_2 gas MOFs, can have implications for improvement of CO_2 gas emission in the environment from industries. This improvement can eventually minimize the rate of global warming by decreasing the amount of CO_2 gas released into the atmosphere and muting the effects of the greenhouse gas.

30. A proper probability distribution analysis of manipulated variables of nonlinear models.

Wesam Azaizeh[1], *Kamren Livingston*[1], *Daria Vasilyeva*[2], *John Goehl*[1], *Sanja Zivanovic*[1], *Maurizio Giannotti*[1] *([1]Barry University, Miami Shores, FL; [2]Columbia University, New York)*

It is a common strategy when dealing with nonlinear data sets to manipulate the collected data in order to conform to the linear regression technique. A nonlinear transformation of the measurements is carried out to achieve a linear relationship between the variable. The standard linear fit technique, however, relies on the assumption of normally distributed data and when data is nonlinearly transformed normality is generally lost. Consequently, the use of the linear fit equations may be unjustified. We analyze this problem starting from the probability distributions of the original and the transformed measurements and discuss its application in some interesting cases.

31. A Novel Graphical User Interface for Analyzing and Visualizing Astrophysical Simulation Data

Wesam Azaizeh[1], *Daria Vasilyeva*[2], *Michael Wise*[1], *Sanja Zivanovic*[1], *Maurizio Giannotti*[1] *([1]Barry University, Miami Shores, FL; [2]Columbia University, New York)*

We present MESAPlot: an open-source, dynamical, and user friendly python graphical interface for studying the output from the software MESA (Modules for Experiments in Stellar Astrophysics). MESA is an open source code used by thousands of astrophysicists worldwide to simulate stars. MESAPlot organizes the hundreds of convoluted and voluminous data files produced by MESA, providing access to thousands of publication-quality figures. In addition, MESAPlot provides several tools for efficiently studying MESA results. The interface was released for use in August of 2014 and is under continued development. It is currently used in several research institutes in North and South America, Europe, and Asia.

32. Mechanochemistry: A greener route to the synthesis of biologically relevant porphyrins

Diana Cordero, Tamara D. Hamilton (Barry University, Miami Shores, FL)

Porphyrins and their derivatives are highly sought-after for their biological applications, light-harvesting and catalytic properties. Specifically, their presence in vertebrates as oxygen-transport systems makes synthetic porphyrins attractive models for biological studies. Use of porphyrins for these purposes has been hindered however, due to difficulties in their synthesis, requiring high cost in time, skill, and financial resources to obtain synthetic porphyrins in large amounts. We have previously shown that solvent-free synthesis of meso-substituted porphyrins is successful using mechanochemistry (*Shy et al., Faraday Discuss.*, 2014, 59-69). Our target molecules are relevant compounds for biological studies that are currently synthesized in low yields (porphine <10%; bis-pocket porphyrin 1%) or in very high- dilution conditions to give moderate yields (300L benzene for 10g OEP –– 52% yield). Mechanochemical protocols for the synthesis will be presented, with characterization using Ultraviolet-Visible Spectroscopy, ^{1}H Nuclear Magnetic Resonance, and Mass Spectrometry. Our protocols will be compared with those presented in literature using green chemistry metrics.

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33. Roles of muscarinic M1-M5 receptors in regulating the cholinergic system and new drug therapies for a number of neurological and peripheral disorders

Jose Diaz, John Boulos (Barry University, Miami Shores, FL)

The cholinergic system is expressed in neuronal and in non-neuronal tissues. Acetylcholine (Ach) is one of the best-characterized neurotransmitters. Its central roles in cholinergic areas and synapses both within the central and peripheral system are well known. Ach completely synthesized the nervous system and can locally contribute to modulate cell proliferation, survival and apoptosis. In recent years, the possible involvement of muscarinic Ach receptors in different pathologies has been investigated. However, the lack of selective muscarinic receptor ligands has for a long time limited the therapeutic treatment based on muscarinic receptors as targets. The characterization of antagonists for the five muscarinic receptors have been made practical by radioligand binding techniques, using [3H] N-methylscopolomine as a ligand, on membrane preparations from cells transfected with constructs for a single muscarinic receptor subtype. The identification of new pharmacological approaches to regulate the cholinergic system is relevant considering that the cholinergic system and its functions are impaired in a number of disorders such as Alzheimer's and Sjogren's disease. This review focuses on the potential effects produced by muscarinic receptor activation in different pathologies. Several selective and non-selective muscarinic agonists and antagonists that have been approved for clinical trials and treatment of several disorders will be discussed. Preclinical pharmacological data together with clinical studies are important to evaluate the therapeutic potential of select muscarinic receptors in order to be used for the treatment of neurological and peripheral disorders.

34. Occurrence of D-Aspartic Acid in Marine Bivalve Mollusks.

Ramon Gutierrez, Ayelet Delascagigas, Travis Comnick, Dr. George Fisher (Barry University, Miami Shores, FL)

For centuries marine bivalves (particularly oysters) have been thought to possess aphrodisiac properties. In recent years researchers have shown that the amino acid D-aspartic acid (D-Asp) occurs endogenously in several species of bivalve mollusks. D-Asp has also been found in the nervous and endocrine systems of many vertebrates and invertebrates, where D-Asp has physiological importance as a neurotransmitter and a hormone regulator. We have analyzed D-Asp in some marine bivalve mollusks such as oysters, clams, and mussels. D- and L-Asp were isolated from homogenized tissues and separated from other amino acids by anion exchange chromatography. The D- and L-Asp were then derivatized with o-phthaldialdehyde (OPA) and N- acetyl-L-cysteine (NAC) to form a pair of fluorescent diastereomers which were separated and quantified by high performance liquid chromatography (HPLC) on a reversed phase C-18 column eluted isocratically with sodium citrate-methanol (NaCit-MeOH) buffer, and fluorescence detection. It was found that approximately 1-5% of total aspartic acid exists as the D-Asp enantiomer. The presence of D- aspartate in these marine bivalve mollusks could indicate a physiological importance in tissue development.

35. Synthesis and allosteric properties of bitopic muscarinic antagonists for treatment of chronic airway diseases

Kalthoum Hammoud, John Boulos (Barry University, Miami Shores, FL)

This research focuses on the discovery of bitopic muscarinic antagonists which may target inflammatory cells in the lungs of patients affected with chronic obstructive pulmonary disease (COPD). COPD is the fourth leading cause and responsible for more than 2.5 million deaths worldwide. Several selective M_1-M_3 and non-selective muscarinic antagonists have been approved and are currently in late clinical stage for treating COPD. We have discovered the most potent bitopic antagonist, KH-5, which was found to fully antagonize

M_1, M_3, M_5 receptors in functional biological assays. KH-5 may possibly be a drug candidate for treatment of COPD with limited neurological adverse effects since it is incapable of crossing the blood brain barrier by having a positively charged quaternary ammonium group. KH-5 has demonstrated significantly higher functional selectivity for M_1, M_3, M_5 receptors over M_2 and M_4 receptors which are primarily located in peripheral smooth tissues. Long acting muscarinic receptor antagonists have shown significant improvement of forced expiratory volume (FEV1), exacerbation frequency and dyspnea associated with COPD/Asthma and better quality of life.

36. Entrainment sublimation as a green purification method for porphyrins

Victoria Hoelscher, Tamara D. Hamilton (Barry University, Miami Shores, FL)

The synthesis of porphyrins is notoriously time- and resource-consuming, largely because of the purification methods needed to isolate the product often one or several chromatography columns requiring many liters of solvent to purify less than1g of product are standard procedure. This is because several byproducts, including polypyrroles, chlorins, and phlorins, are produced alongside the porphyrin. Our objective of finding more environmentally-benign routes to porphyrins has led us to explore entrainment sublimation using tetraphenylporphyrin (TPP) as a model compound. Since TPP sublimes at around 400 °C, the procedure has been carried out and optimized near this temperature using a tube furnace with Pyrex processing tube and nitrogen as a carrier gas. The purified yields from those experiments at varying heating rates, times, and gas flows, will be reported.

37. Preliminary study of an estrogen receptor heterodimer inducing compound

Shanika Kingston[1], Carlos Coriano[2], Taryn James[2], Wei Xu[2] ([1]Barry University, Miami Shores, FL; [2]University of Wisconsin-Madison, Madison)

Estrogens are the primary female sex hormones responsible for regulation of cell growth and differentiation of the different tissues. The physiological effects of estrogens are primarily mediated by two estrogen receptors: ERa and ERß. In hormone dependent diseases such as breast cancer ERa has been shown to accelerate cellular proliferation, while ERß shows a protective effect. The ligand binding domain of these receptors mediates dimerization where homodimers (ERß/ß or ERa/a) or heterodimers (ERa/ß) are formed. Although the function of each homodimer is well understood, the biological role of the ERa/ß heterodimer is still undetermined due to the lack of selective heterodimer-inducing compounds. Recently, the Xu Lab (University of Wisconsin-Madison) identified a compound that could selectively induce the ERa/ß heterodimer and utilized to evaluate the biological response of cell lines that express both receptors. A series of ligand binding, luciferase, and cell viability assays were performed to outline the usefulness of a set of experiments to be used in a larger screening of the cellular effects of the compound that could help us decipher the heterodimer's role.

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38. Comparing four syntheses of tetraphenylporphyrin (TPP) using E-factor and EcoScale as measurements for evaluating greenness

Shanika Kingston, Tamara D. Hamilton (Barry University, Miami Shores, FL)

Greener methods for synthesizing compounds and performing experiments have been employed in undergraduate labs. However, there is a lack of opportunities for students to quantitatively measure the "greenness" of a specific synthesis. Eco-Scale and E-factor are two established metrics, which were utilized to determine the greenness of four routes to tetraphenylporphyrin (TPP). TPP is a heterocyclic compound substituted at the oxidatively sensitive "meso" carbon positions. The Adler synthesis is the usual route for TPP and other tetra-substituted porphyrins. However, it uses a caustic solvent. Greener syntheses have been developed through solvent-free routes: gas phase synthesis, microwave synthesis, and our own mechanochemical synthesis using a mortar and pestle. UV-Vis spectroscopy, Thin-Layer Chromatography (TLC), and ^{1}H-NMR spectroscopy are used to characterize TPP before and after purification. EcoScale and E-factor were calculated and compared for each synthesis to determine the "greenness" of the four routes. This project is being developed as an undergraduate laboratory teaching green chemistry principles and their evaluation.

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39. The role of muscarinic receptor agonists in Alzheimer's disease

Allison Lewis, John Boulos (Barry University, Miami Shores, FL)

Alzheimer's disease is a degenerative brain disorder which attacks nerve cells in all parts of the brain cortex as well as some other supporting structures. As a consequence, affected individuals experience memory loss, dramatic changes in thinking processes, inhibited coordination, and eventual death. Currently, there is no cure. Two significant abnormalities have been observed in the brains of affected individuals: neurofibrillary tangles and sticky beta-amyloid proteins. The abnormalities have been linked to reduced levels of the neurotransmitter, acetylcholine. Acetylcholine has been proven crucial for normal memory function and learning. When present in the brain in normal quantities, it acts as an agonist and binds to M1 muscarinic receptors. This research is directed towards synthesizing functionally selective M1 agonists that can closely mimic the behavior of acetylcholine. For this purpose, two organic compounds were synthesized starting from 4-methyl-2-thiopene carboxaldehyde in five consecutive reaction steps. All products, intermediate and final, were analyzed and characterized by H-NMR and FT-IR Spectroscopy. Compounds will undergo radioligand assays on muscarinic cell lines to determine binding affinity (Ki) in competitive assays with the antagonist N-methylscopolamine (NMS). Functional selectivity (a shift from EC50 of Carbachol) and intrinsic cellular activity will also be measured.

40. Chemical observations of copper toxicity

Rachael Michel (Barry University, Miami Shores, FL)

Copper has been found to be a powerful catalyst for enzymes in our bodies. Several studies were conducted to observe copper toxicity because of its rapid dissociation in certain environments, large amounts of copper is deposited in the body. Many studies have been conducted primarily to observe copper with different reactants. Also, observing other chemical reactants which behave similarly to copper. A yersiniabactin, a bacteria has been studied to show how it can reduce copper from Cu (II) by binding to copper and reducing its catechol-mediated reduction to Cu(I). Data was gathered from UV-Vis Spectroscopy and Atomic Absorption Spectroscopy to observe these findings. In addition, Mass Spectroscopy was used to classify different characteristics of copper binding. The observations of other like metals were taken into account to further explore how copper binds to metal binding sites during infections. The occurrence of copper toxicity was found to be inhibited.

41. Towards porphyrin-walled metal-organic polyhedra

Cindy N. Molina, Tamara D. Hamilton (Barry University, Miami Shores, FL)

Porphyrins are cyclic macromolecules which can contain one of many different metalatoms in their centers. Their conjugation and unique structure gives them several useful properties, which is why they are widely utilized and researched. Metal- organic polyhedra (MOPs) are molecular assemblies that consist of metal ions as the corners, and organic ligands as the faces or edges of the structure. They can be used for isolation of reactive intermediates, catalysis, and encapsulation. Porphyrins have a flat, square structure, making them ideal for the faces of MOPs. The purpose of this research is to synthesize a new type of MOP with metalloporphyrin faces in the hopes of enhancing catalytic ability. This will be done using tetrasubstituted exodentate porphyrins as the faces of the MOPs. For this pur- pose tetrakis (2, 3-dimethoxy) porphyrin (2, 3-diOMEP), and tetrakis (2-pyridyl) porphyrin (2PP) have been synthesized and purified. The methyl groups of 2, 3- diOMEP were removed using boron tribromide to yield tetrakis (2, 3- dihydroxy) porphyrin (2, 3-diOHP). Both porphyrin ligands were then co-crystallized with several metal salts with expectation of forming metal-organic assemblies. These assemblies can be characterized using X-ray crystallography and electrospray ionization mass spectrometry (ESI-MS).

42. Synthesis of Functionally M2-Selective Agonists for Potential Use in Treatment of Cardiovascular Diseases

Peter Nwokoye, John Boulos (Barry University, Miami Shores, FL)

Muscarinic receptors are expressed throughout the cardiovascular system. Specifically, M2 agonism affects conduction of electrical impulses through the atrioventricular node and produces a decrease in the contraction of the ventricles when cAMP is above the basal level. We have synthesized functionally M2-selective compounds with both a tetrahydropyridinyl and thiophene moiety that are linked by the novel NCCSC backbone. Six compounds were synthesized in a series of multistep organic reactions. These compounds were characterized by NMR and FT-IR. Radioligand binding and functional biological assays were also carried out. All compounds were found to completely inhibit the binding of the antagonist [3H]-N-methylscopolamine, in radioligand assays, suggesting high affinity for the receptors. Compounds with the quarternary ammonium group (7A, 7B, and 7C) were found to have higher affinity than their tertiary ammonium counterparts (6A, 6B, and 6C). All compounds except 6B were found to be functionally M2-selective. Compound 7A attained 76% Emax of carbachol (a full agonist used as reference), thus suggesting partial agonism. Further structural optimization by varying the position of the R-group on the thiophene ring may lead to full agonism. Such compounds can have profound benefit in the therapeutic treatment of cardiovascular diseases, such as ischemic damage and the deleterious effects associated with heart failure.

43. Synthesis and design of functionally selective muscarinic agonists for type II diabetes therapeutic applications

Latania Richardson, Allison Lewis, John Boulos (Barry University, Miami Shores, FL)

The acetylcholine muscarinic M3 receptor (M3R) influences the regulation of glucose homeostasis via pancreatic ß-cells' insulin release, and by obstructing the signaling in the hypothalamus and the brainstem. Second generation antipsychotics (SGAs) contain antagonistic affinities for M3 receptors, which have been identified as the prime candidate for the SGA-induced insulin dysregulation that leads to type II diabetes. This research focuses on the synthesis of organic compounds that may serve as agonists or the M3 receptors. We hypothesize that target compounds would be functionally selective M3 agonists based on their molecular structures and functional groups. These compounds are intended as mimics of acetylcholine and other cholinergic agonists in the brainstem. A series of heterocyclic compounds containing both a tetrahydropyridinyl and substituted

thiophene ring were synthesized and characterized. Synthesis involved multi-step organic reactions, extraction, crystallization, and filtration. All intermediate and final compounds were characterized by Proton Nuclear Magnetic Resonance (1H-NMR) and Infrared (IR) Spectroscopy. Final compounds were further characterized by elemental analysis. Compounds will undergo radioligand assays to determine binding affinity, receptor selectivity, and intrinsic cellular activity. Understanding the factors that influence glucose homeostasis, insulin dysregulation, and the receptors that mediate these functions will allow us to improve current therapeutic drug applications.

44. Expanding the scope of mechanochemical porphyrin synthesis

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

Synthetic porphyrins have been studied for their demonstrated catalytic, optical, and magnetic properties. However, synthetic protocols for porphyrins require a large amount of environmentally toxic solvents and only a relatively low amount of product is produced. Hence, it is problematic to synthesize porphyrins on a large scale. The alternative mechanochemical protocol makes it possible to eliminate the solvent used in the cyclization step (Shy, H. *et al. Faraday Disc*. 2014, 170, 56-69). Ball-mill grinding an equimolar amount of pyrrole and an aldehyde with an acid catalyst followed by oxidation of a mixture of reduced-porphyrin precursors and purification produces tetra-meso-substituted porphyrins. The obtained yields are comparable to or better than those obtained in solvent-based methods. Porphyrins synthesized mechanochemically have been characterized using UV-Vis spectroscopy and ^{1}H-Nuclear Magnetic Resonance. A series of tetra-aryl and tetra-alkyl-substituted porphyrins, including sterically hindered porphyrins, have been successfully isolated and characterized with the mechanochemical synthetic protocol. In addition, preparation and addition of Montmorillonite K10 clay (Freeman *et. al. Synthetic Commun*. 1999 *29*, 1843-1855) was attempted as a catalyst for the mechanochemical synthesis, and results will be presented. This study shows that a wider scope of porphyrins is successfully synthesized and isolated via mechanochemistry.

45. Stress, anger and intentions to quit among college students

Rosita Boncheva, Guillermo Wated (Barry University, Miami Shores, FL)

Although initially research concerning stress and intentions to leave was primarily focused on working individuals, further exploring of the subject has suggested that college students' intention to quit school, likewise, can be impacted by stressful situations (Pisarik, 2009). Numerous studies have focused on the traditional predictors of college success such as high school grade point average and SAT scores (e.g., Sparkman et al., 1998). Nevertheless, personality traits seem to have an equally important impact on college students' accomplishment. The purpose of the present study was to examine the manner in which stress induced by students' responsibilities may cause an anger-based self-schema to become salient, leading toward a student's intent to quit college. Participants were 125 (98 women, 27 men) college students enrolled in a private university in the Southeastern region of the United States. To assess intentions to withdraw from college one item was used. Anger reaction was measured using the Dimensions of Anger Reactions scale (Novaco, 2009). To measure levels of stress, the Perceptions of Stress scale (Cohen, Kamarck& Mermelstein, 1983) was employed. Test for mediation was conducted according to Baron and Kenny's (1986) guidelines. First, intention to withdraw was regressed on stress. The effect of stress was statistically significant, $F(1, 123) = 5.85$, $p = .017$. Next, anger was regressed on stress. The regression equation was also statistically significant, $F(1, 123) = 19.08$, $p < .001$. Finally, intention was regressed on anger and on stress. When controlling for anger, the effect of stress disappeared. Thus, the mediation effect was supported. These findings have important implications in terms of providing the resources needed for students to reach graduation successfully.

46. Condom use self-efficacy in Latino/a adolescents

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Research has shown that Latino/a adolescents report earlier age of sexual debut, and are more likely to engage in risky sex, specifically inconsistent or no condom use (Youth Risk Behavior Surveillance Survey, YBRSS, 2012). Earlier sexual initiation and risky sex contribute to health disparities in Latino/a youth. Effective condom use is shown to dramatically decrease the likelihood of sexual transmitted infection (STI) and teen pregnancy. The Theory of Planned Behavior (TPB; Ajzen, 1991) explains behavioral outcomes as influenced by the individual's attitudes, subjective norms, intentions, and perceived control beliefs. To further explore the sex-risk disparities within Latino adolescents, the current study sought to evaluate an adolescent's condom use self-efficacy using a TPB perspective. Greater condom use self-efficacy has been shown to be a proximal predictor of condom use behavior among Latino adolescents (e.g. Malcolm et al., 2014).To test the hypothesis that attitudes, subjective norms, perceived control, intentions to use condom would predict condom use self-efficacy, the sample for this study was drawn from an archived study on Latino/a health (COPAL; Schwartz, et al., 2012). Participants were adolescents ($N = 300$; mean age = 14.51; $SD = .88$). They completed measures of subjective norms, attitudes, intentions, perceived control beliefs as well as condom use self-efficacy. Results from multiple regression analysis indicated that attitudes about condom use (ß = .24, $t = 3.84$, $p < .001$) and perceived control about condom use (ß = .23, $t = 3.26$, $p < .001$) were positively associated with condom use self-efficacy, $R2 = .17$, $F(4, 297) = 14.73$, $p < .001$. Subjective norms and intentions to use condoms were not significant predictors of condom use self-efficacy. These findings have important implications for preventive interventions that seek to reduce health disparities among Latino/a adolescents.

47. Gender differences in perception of body image among Asian, Hispanic and Black emerging adults

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Despite the fact, the US population is increasingly more diverse, individuals with a minority ethnic background including Blacks, Hispanics and Asians continue to be underrepresented in research. Such evidence extends to minority emerging adults (EA; 18-29 years old) which represented about 18% of the US population in 2015 (Pew Research Center, 2016). One psychological factor associated with health outcomes among EA is the perception of body image. Perception of body image is associated with disordered eating and such outcomes differ by gender and ethnicity (Gillen & Lefkowitz, 2012). The current study seeks to replicate these findings and extend current knowledge by examining gender and ethnic differences in perception of body image in a sample of EA who self-identify as Blacks, Hispanics and Asians. The sample N = 3779 with a mean age = 20.24, SD = 3.37 was drawn from a larger archival national data set of college students (MUSIC; Schwartz et al., 2011). A 2X3 factorial ANOVA revealed a statistically significant interaction effect of gender and ethnicity on perception of body image $F(2, 2961) = 3.06$, $p < .05$,). The interaction effect was small (η^2 = .02%) and showed that the effect of gender on body image depended on whether an emerging adult self-identified as Asian, Black or Hispanic. In addition, how ethnicity affected body image depended on whether the emerging adult was male or female. Current findings support previous research and suggest that perception of body image differs among Asian, Black, and Hispanic emerging adults.

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St. Thomas University

Differential gene expression in drought-tolerant and drought-susceptible Andean native potato varieties from Peru. Laynet Cornelio (1), Indira Perez (1), Carlos Vazquez(1), Diana Martinez (2), Olga Patricia Ponce (2), Emi Murata (2), Yerisf Torres (2), Luz Noemi Zuniga (3), Gisella Orjeda (2), Carlos Merino Mendez (2). (1)School of Science, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054, (2) Universidad Peruana Cayetano Heredia, Unidad de Genomica, Av. Honorio Delgado 430, SMP, Lima, Peru, (3) Instituto Nacional de Innovacion Agraria, Estacion Experimental Santa Ana, Real No. 507, El Tambo – Huancayo, Peru.

Potato (*Solanum tuberosum*) is the world's most important non-grain food crop and is central to global food security. Commercial potato varieties are very sensitive to drought injury, which results in slow growth, small tuber formation and tuber deformation. Andean native potatoes are ideal candidates for gene expression studies associated with drought. Because of their high genetic diversity, they are well adapted to the harsh environmental conditions that prevail in the high Andes, including drought. The Universidad Peruana Cayetano Heredia (UPCH, Lima, Peru), in collaboration with the Instituto Nacional de Innovacion Agraria (INIA, Huancayo, Peru) and St. Thomas University (STU, Miami Gardens, FL), are in the process of studying changes in gene expression in native potatoes associated with early and late drought responses, as well as after recovery from drought conditions. Using RNA-seq analysis, the UPCH has identified a large number of candidate genes associated with drought. UPCH and STU students conducted a drought experiment with both tolerant and susceptible native potato species, using an aeroponics growth system at the INIA Experimental station in Huancayo. After selecting seven drought-associated candidate genes from the RNA-seq analysis, and designing primers for their amplification, quantitative RT-PCR (RT-qPCR) is being used to look for differentially expressed genes in the drought tolerant varieties.

Bacterial Community Patterns Associated with Different Earthworm-based Organic Fertilizers. Joana Almeida and Dora Pilar Maul. School of Science, Technology and Engineering Management, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054.

While many bacterial species are commonly found in all types of soil, the bacterial community found in a particular type of soil depends on the structure of the soil, the vegetation, the nutrients and climate characteristics associated with it. Among the organic fertilizers, worm tea, made from earthworm castings is known to increase the beneficial bacterial population in the soil, thus providing the plants with more nutrients. Worm tea fertilizers are prepared with fresh castings brewed under oxygenated conditions with common sucrose and nitrogen additives. During the spring of 2015, an experiment conducted at the STU Organic Garden tested the effect of three different recipes for earthworm-based liquid fertilizers (worm teas) on the growth of arugula (*Eruca sativa*) plants. The purpose of this study was to compare bacterial communities associated with soil fertilized with the different types of worm teas where the arugula plants grew. Using soil bacterial DNA isolation, primer design, polymerase chain reaction and agarose gel electrophoresis we were able to visualize to some extent the abundance and diversity of the bacterial community associated with soil fertilized with each type of worm tea. Bacterial universal primers revealed abundance of bacteria in all three worm tea-fertilized soil as well as in the control. Specific primers designed for a subset of bacterial species showed that bacterial community patterns differed among all three types of fertilized soils.

The role of CSPGs in neuronal differentiation of stem cells from the adult zebrafish brainstem.

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In the mammalian central nervous system (CNS), neurons fail to regenerate their axon after injury due at least in part to the presence of growth-inhibitory molecules such as chondroitin sulfate proteoglycans (CSPGs). However, in adult zebrafish (*Danio rerio*) certain CNS neuron populations regenerate their axon after an injury in the presence of CSPGs. To investigate the axonal growth response of zebrafish brainstem neurons in the presence of CSPGs, we developed and characterized a unique primary culture system. This heterotypic culture contains neurons, glia, and stem/progenitor cells. Our preliminary *in vitro* data showed the presence of distinct populations of stem cell-derived neural progenitor cell populations that can differentiate into mature neurons and extend processes into CSPG-rich terrains. In the present study, we investigated a potential role for CSPGs in the differentiation of adult zebrafish brainstem-derived stem cells into neurons. We hypothesized that CSPGs promote the differentiation of stem cells into neurons to enable CNS repair. Using our unique culture system, we examined whether specific concentrations of CSPGs combined with laminin as a growth-promoting substrate play a role in the degree of neuronal differentiation seen after 7 days in culture. Cellular/morphological analysis of CSPG/laminin substrate cultures revealed a more prominent neuronal-like differentiation pattern when compared to a laminin alone substrate condition. Future studies will need to investigate these cellular populations using immunocytochemical and molecular *in situ* techniques and attempt to gain a better understanding of the roles of CSPGs and stem cells in CNS regeneration as seen in teleost fishes.

The role of putative stem and neural progenitor cell populations following traumatic brain injury in adult zebrafish.

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Although post-embryonic neurogenesis is limited in the mammalian brain, zebrafish (*Danio rerio*) retain multiple proliferative neurogenic and stem cell niches throughout adult life. The focus of our research is to study how traumatic brain injury (TBI) affects the induction of neurogenic progenitor cell fates in the adult zebrafish brain. We hypothesize that TBI will induce an endogenous, quiescent population of progenitor cells that act to integrate and enable the regenerative response seen following injury in the fish. Preliminary data have shown prior to injury, the putative stem and neural progenitor markers Sox-2, neuroD1 and nestin were expressed around and near ventricular areas of ventral brainstem regions. Furthermore, following TBI, (focal brainstem injury) an increase in Sox-2/PCNA immunoreactivity was observed in brainstem regions outside the ventricular location that correlates with the injury site. We are currently examining brainstem regions for nestin, sox-2 and Neurod1 expression post- TBI and hope to correlate recovery following TBI to the migration and differentiation of stem progenitor cells at the injury site.

***In vitro* citrus micropropagation as a potential system for the study of Huanglongbing disease (HLB).** Jose Calera (1), Dora Pilar Maul (1), T. Greg McCollum (2). (1) St. Thomas University, 16401 NW 37th Ave, Miami Gardens, FL 3354, (2) USDA-ARS-US Horticultural Research Laboratory, 2001 S. Rock Rd., Fort Pierce FL 34945.

Huanglongbing (HLB), also known as citrus greening disease, is caused by *Candidatus Liberibacter asiaticus (*CLas), a bacterium that lives only in citrus phloem. The Asian citrus psyllid (*Diaphorina citri*) is the vector responsible for spreading CLas from tree to tree. In addition to yellowing of leaves and shoots, HLB causes fruits to become hard and bitter, rendering them unmarketable. In Florida, increasing annual yield losses due to a HLB are currently a big threat to the citrus industry. There is no effective treatment against HLB; once trees begin to exhibit symptoms they continue to decline. HLB is an especially challenging disease for research because it is caused by an insect-vectored, phloem-limited bacterial plant pathogen, and because research on citrus in general is difficult. We are interested in developing the simplest model system possible to study the effects of CLas infection on citrus. The objective of this project was to determine if the use of *in vitro* citrus plants can be used to study the effects of CLas infection on citrus. 26-month old *in vitro* Key lime plants were exposed to ACP known to be infected with CLas and then tested to determine if infection had occurred and if HLB symptoms subsequently developed. Twenty days following transfer to potting mix, DNA was extracted from tissue samples and assayed for CLas using quantitative PCR. We found that 20% of the plants exposed to the psyllids were successfully infected with Clas. Seedlings are being monitored to determine if symptoms of HLB become apparent.

Contrasting effects of vermiculture-based fertilizers on development of *Eruca sativa*. Luis Cendan, Vanessa Jean Francois, CarlosVazquez and Dora Pilar Maul. School of Science, St. Thomas University, 16401 NW 37th Avenue, Miami Gardens, FL 33054.

Vermicomposting is a relatively simple and inexpensive agricultural process which uses earthworms as an agent of organic breakdown, reducing waste material into nutrient-rich compost which can improve soil fertility and aeration. Vermicompost-based fertilizers promote growth and activity of beneficial bacteria, fungi, and protozoa in the rhizosphere, thus providing plants with abundant macro and micro nutrients. The objective of this experiment was to compare earthworm-based fertilizers on leaf length and dry weight in arugula (*Eruca sativa*), a widely used salad vegetable. A long vegetable-bed was built in the STU Research Organic Garden and divided into four plots of equal size; each plot was filled with organic soil and planted with five rows of arugula seeds. After seed germination each plot was fertilized with a different type of worm tea. Worm tea solutions (T1, T2, and T3) contained varying amounts of molasses or corn syrup, fish emulsion and a seaweed solution supplementing earthworm castings from red wigglers (*Eisenia fetida*). The control plot received only water. Each group was fertilized with its corresponding treatment twice weekly with 7.5 L worm tea/plot. All groups were equally irrigated with water twice daily by a synchronized drip irrigation system. Metric measurements included the length of the longest leaf of each plant and the dry weight after dehydration in an oven at 80 °C for 4 days. Treatment T3, containing fish emulsion, molasses, and seaweed solution showed plants with longer leaves and higher dry weight than all the other treatments including the control group.