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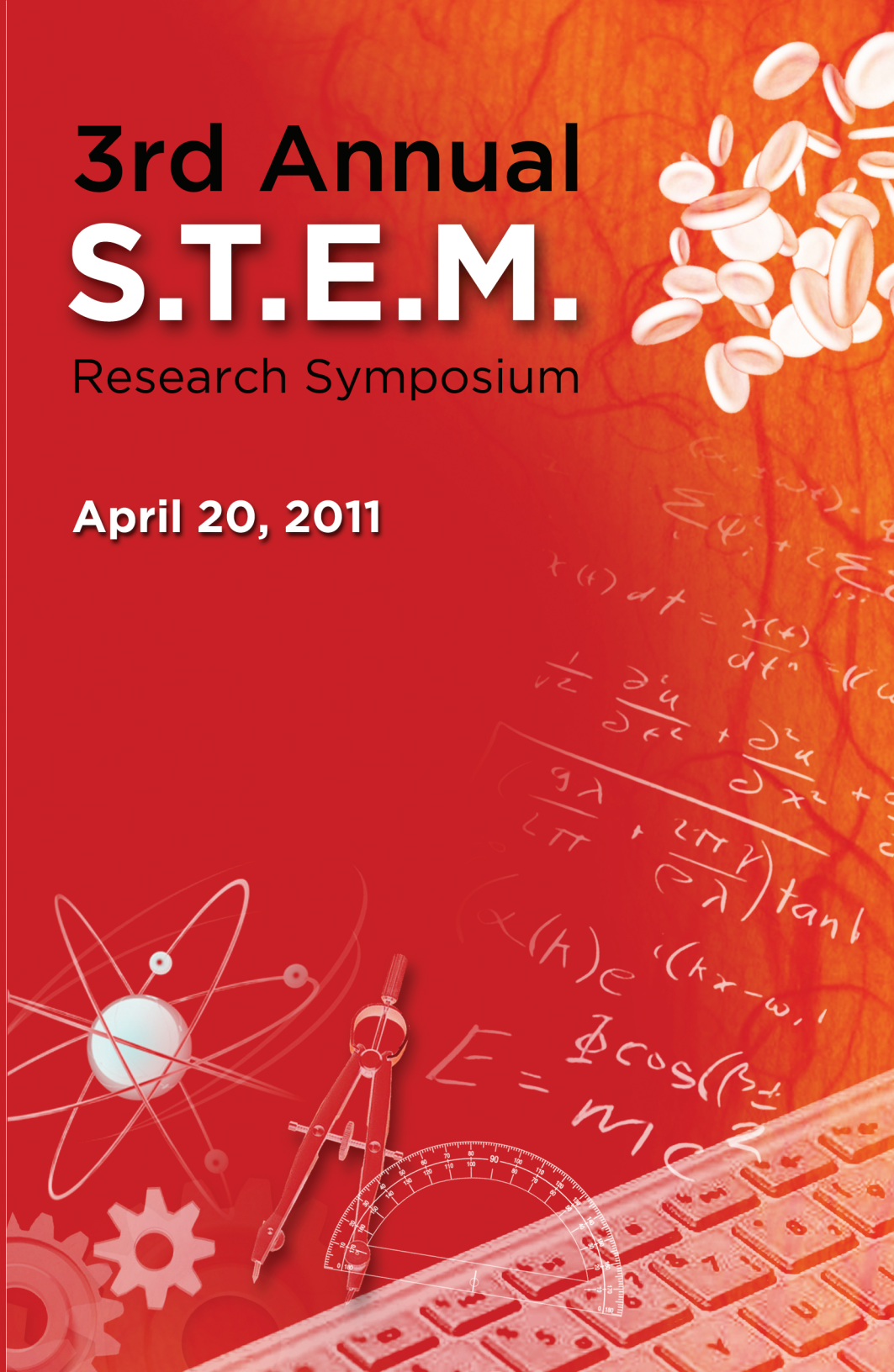
3rd Annual S.T.E.M.

Research Symposium

April 20, 2011



3rd Annual S.T.E.M. Research Symposium

This research symposium aimed at engaging the Barry community in learning about and share in the excitment 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, information technology, mathematics, psychology, and physics.

DAY

Wednesday, April 20, 2011

TIME

11:00 AM - 1:00 PM

PLACE

Andreas 111

Barry University, Miami Shores, FL

Organized by Members of Barry University's STEM Committee:

Chakib Chraibi PhD, Khaled Deeb PhD, Christoph Hengartner PhD, Peter Lin PhD, and Zuzana Zajickova PhD.

We gratefully acknowledge these sponsors from Barry University:

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Special thanks to:

Dr. Flona Redway, Director of MARC/RISE program, Ms. Michelle Aznarez, Ms. Audra Bartram, and Ms. Karen Jarvis for assisting with the Symposium.

BARRY UNIVERSITY - COLLEGE OF ARTS & SCIENCES

Department of Biology

1. Does killifish, *Fundulus heteroclitus*, exhibit temperature dependent sex-determination mechanisms in the lab?

Jodi-Ann Browning-Bent, Y.-W. Peter Lin, and Teresa Petrino-Lin (Department of Biology, Barry University, Miami Shores, FL)

With the rise in ocean temperature, it is important for us to know which species will be affected by this. Research conducted has shown that some fish experience temperature dependent sex-determination (TSD) during early development, similar to that of reptiles, while others experience genotypic sex-determination (GSD). TSD and GSD are sex determining mechanisms that determine the sex of an offspring based on the effects of temperature or genotype respectively. Our hypothesis is that temperature will determine the sex of killifish, *Fundulus heteroclitus*. Two ten gallon tanks, containing four immersed nurseries, were setup on a chiller system at 19°C in our laboratory aquarium. A heater was submerged into one tank to raise the water temperature to 28°C and the water temperature for each tank was maintained at 20±1°C (CW) and 28±1°C (WW). Fish eggs were fertilized *in vitro*; milt (fish seminal fluid) and eggs were collected separately by gently pressing on the abdomens of the male and the female respectively. These eggs were fertilized and maintained in the desired water temperature. The nursery container was raised slightly from the water in order to mimic the high and low tide experienced in their natural habitat, and to encourage the release of the fish from their chorion. Results are ongoing to determine the sexes of the fish by their genital papilla.

Supported by NIH-NIGMS MBRS RISE Grant R25 GM059244-09, Barry University; Department of Energy Grant DE-FG02-06CH11438, Barry University

2. *Polycomb* gene expression in developing zebrafish (*Danio rerio*) embryos.

Susana Chan[1], Sean Feinberg[1], Stephanie Bingham[1], Gerhild Packert[2], Y.-W. Peter Lin[1], Teresa Petrino-Lin[1]. ([1] Department of Biology, Barry University, Miami Shores, FL; [2] College of Health Sciences, Barry University, Miami Shores, FL)

The *Polycomb* (*Pc*) group genes were identified in many species as a group of genes that maintain transcription patterns of homeotic genes during development. Previously, we have identified and cloned zebrafish *Pc1*, *Pc2* and *Pc3*. We hypothesize that these genes are differentially expressed during development. In order to determine the spatial and temporal expression patterns of the *Pc* genes in the zebrafish embryo, the isolated clones were used to synthesize antisense RNA probes to carry out *in situ* hybridization experiments. Zebrafish is an ideal model organism to carry out *in situ* gene expression studies in vertebrates because they do not have intrauterine development and the embryo is translucent. To collect the embryos, the zebrafish were placed into breeding tanks with a 2:1 female-male ratio under controlled photoperiod (14L:10D) and constant temperature 28.5°C. Embryos were collected, staged, and fixed at various developmental time points. In preparation for synthesis of the antisense RNA probe, sequence analysis of the *Pc* clones was performed to determine the orientation of the inserted DNA in relation to the restriction sites and promoters located in the pGMT vector. Plasmids linearized with restriction enzymes SpeI or SphI were used as templates in reverse transcription reactions with digoxygenin-labeled UTPs to obtain the antisense mRNA that will be used for the *in situ* experiments.

Determination of the expression profile of *Pc* genes will be an important step in understanding the role of these genes during embryonic development.

Supported by NIH-NIGMS MARC: T34 GM008021-27, Barry University; Barry University Minigrant (to TP and PL); Department of Energy Grant No.-DE-FG02-06CH11438.

3. Changes in cardiac contractility of *ex vivo* whole heart preparations in response to increased intracellular [taurine] and [caffeine].

Precious de Verteuil, Blandine Victor, and Brenda Schoffstall. (Department of Biology, Barry University, Miami Shores, FL)

Energy drinks have become more widely used by Americans in today's fast paced life style. These caffeinated energy drinks contain a wide variety of additives. Caffeine, one of these common additives, has been extensively studied and is said to increase strength and frequency of contraction when absorbed in cardiac muscle cells. Taurine, however has not been as extensively studied, but is thought to affect the calcium (Ca^{2+}) transients in cardiac muscle cells. It is thought that taurine in combination with caffeine produces a synergistic effect, actually accentuating the effects of caffeine alone on cardiac contraction. We have used zebrafish whole heart preparations as a model to study the effects of exposure to varying levels of caffeine and taurine on cardiac contraction. Effects of high levels of caffeine alone were consistent with previous investigations. Exposure to high levels of taurine alone caused a decrease in percent shortening fraction and heart rate. We found that with exposure to high concentrations of taurine and caffeine combined, there is a decrease in percent shortening fraction and heart rate that is more pronounced than that with taurine alone. High levels of caffeine and taurine combined causes over a 45% decrease in both the rates of contraction and relaxation. Our data indicate that exposure to the two additives combined enhances the effects seen with taurine, rather than caffeine, alone. Our results suggest that exposure to high doses of caffeine and taurine, such as those levels found in energy drinks, may have damaging effects on normal human hearts leading to reduced cardiac performance, and ultimately heart failure.

Supported by NIH-NIGMS RISE Grant, R25 GM059244-09, Barry University

4. Identification of cell types producing interferon-gamma (IFN γ) in the brain and periphery of simian immunodeficiency virus (SIV) infected macaques.

Gina Guillaume[1], Kenneth Witwer[2], and M. Christine Zink[2]. ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Johns Hopkins University, Baltimore, MD)

Animal models of HIV infection are important in studies of organs such as the brain, which are inaccessible in humans until death. One consistent animal model is the accelerated SIV/macaque model, in which *Macaca nemestrina* (pigtailed macaques) are dually inoculated with a neurovirulent simian immunodeficiency virus (SIV/17E-Fr) and an immunorepressive SIV swarm (SIV/Delta B670). Ninety percent of the animals develop nervous system disease within three months of infection. Here, we examine IFN g during the acute, latent, and terminal stages of infection. IFN g is prominently involved in the stimulation of cellular immunity. However, the identities and relative contributions of cell types producing IFN g during SIV infection, especially in the CNS, have not been fully characterized. This study uses locked nucleic acid (LNA) *in situ* hybridization to identify sources of IFN g mRNA in the CNS and the periphery of SIV infected macaques. Additionally, the effects of treatment with minocycline and Highly Active Anti-Retroviral Therapy (HAART) on IFN g production were examined.

Surprisingly, neurons and astrocytes appeared to be producing IFN g in uninfected macaques. In the spleen, the white pulp expressed high levels of IFN g. Further cellular co-localization studies may confirm these results.

Supported by NIH Grants: MH085554, Johns Hopkins University; NIGMS RISE, R25 GM059244-09, Barry University

5. Exercising fish: stimulating cardiac regeneration pathways in zebrafish *(Danio rerio)*.

Maxime Jean[1], Vanessa Inchausti[1], Julie Cadet[1], Brittany Kraft[2], and Brenda Schoffstall[1] (Department of Biology, Barry University, Miami Shores, FL; [2]Department of Biological Science, Florida State University, Tallahassee, FL)

Humans respond to stress by enlargement of the ventricular tissue, a condition called cardiac hypertrophy. Various disease states can lead to pathological hypertrophy and damaged cardiac tissue is replaced by scar tissue that does not contract like normal heart tissue. In humans, the ability of these cardiomyocytes to divide and regenerate working heart tissue is negligible, thus pathological hypertrophy is the only available response. In contrast, adult zebrafish (*Danio rerio*) hearts have the capability to efficiently regenerate working heart tissue. Identification of signaling pathways involved in this regeneration response could lead to treatments for human cardiac pathologies; thus zebrafish has become a new model for the study of cardiac regeneration. Previous studies utilized apex amputation to identify regenerative genes; our hypothesis is that rigorous forced swimming exercise, an alternative non-invasive model, stimulates upregulation of these same regenerative genes. Here we present data from three trial groups which were used to establish experimental protocols and collect preliminary data for future larger scale experimental groups. We found no significant difference in heart rates or body weights between control non-exercised fish (NEx) and exercised fish (Ex). When comparing ratios of ventricular surface area/body length, we find a significantly higher ratio in Ex, indicating ventricular enlargement; however, the numbers of nuclei per cross sectional area are similar between NEx and Ex, indicating regenerative proliferation of Ex cardiomyocytes. Our future interests are to use our model to identify genes upregulated during cardiac regeneration. Identified pathways could be applied to future treatment of human cardiac disease.

Supported by NIH-NIGMS RISE Grant, R25 GM059244-09, Barry University.

6. Characterization of self-reported asthma in morbidly obese women.

Alton Johnson Jr.[1], Mercedes Proctor[2], Andrew Bilderback[2], Cynthia Rand[2], and Emmanuelle Clerisme-Beaty[2] ([1] Department of Biology, Barry University, Miami Shores, FL; [2] Pulmonary and Critical Care Medicine, Johns Hopkins University Medicine, Baltimore, MD)

Observational studies have shown obesity to be associated with increased risk of asthma and changes in lung volumes that may mimic asthma. The objective of this study was to examine differences in pulmonary function profile, respiratory symptoms, and quality of life in morbidly obese women based on self-reported asthma. Cross-sectional analysis was performed on adults recruited from the Johns Hopkins Bariatric Center. The following measures were obtained: demographics, anthropometrics, respiratory symptoms questionnaires, general health questionnaire, pulmonary function test, and methacholine challenge test. The study population consisted of 42 women with mean age of 42 years; the majority was African American. Based on the St. George's respiratory symptoms questionnaires, asthmatics had increased report of respiratory symptoms in the following domains: Symptoms, Impact and Total.

Compared to the normalize data, both groups had lower quality of life based on the Physical Health score and Mental Health score on the SF-36. Asthmatics had lower Mental Health scores than non asthmatics. There was a trend for those with self-reported asthma to have significantly lower FEV_1/FVC ratio. In conclusion, obese women had a significant decrease in overall quality of life and increased report of respiratory symptoms. Asthmatic obese women had significantly more respiratory complaints and lower quality of life.

Supported by NIH/NHLBI grant R25 HL084762, Johns Hopkins University, NIH grant K12RR01767, Johns Hopkins University and NIH-NIGMS RISE Grant, R25 GM059244-09, Barry University.

7. A new role for the glycoprotein ependymin in regulating vertebrate nervous system patterning?

Elizabeth Nguyen[1], Gabriela Toro[1], Jonothan Colón[1], Gabrielle Johnson[1], Stephen Ekker[2], Anand Chandrasekhar[3], and Stephanie Bingham[1,3] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Mayo Clinic Cancer Center, Rochester, MN; [3] University of Missouri-Columbia, Columbia, MO)

The events that control nervous system development within the hindbrain are poorly understood. Due to their amenability to genetic manipulation, zebrafish are an ideal model system for studying these events. Genetic screens of zebrafish have helped link genes to their functions in patterning vertebrate nervous systems. In this screen, zebrafish embryos were injected with morpholinos, which are antisense reagents, in order to disrupt gene function and observe resulting phenotypes. We used transgenic zebrafish expressing green fluorescent protein in the neurons of the hindbrain to easily visualize the motor neurons as they developed within live embryos and effectively identify atypical motor neuron organization. We found that knockdown of the *ependymin* gene (*epd*) resulted in severe organizational defects of cranial motor neurons in the hindbrain. Ependymin is a brain-specific glycoprotein previously identified to play a role in neural plasticity and refinement. Our results suggest that in addition to these latter roles, *epd* is important for the initial stages of neuronal patterning. Due to the lack of commercially available *epd* antibodies, we created a GFP-mediated morpholino assay that verified the efficiency of the morpholino. To further examine the function of *epd*, we made a DNA construct to synthesize *epd* mRNA *in vitro*. This will allow us to validate the specificity of the observed phenotypes via co-injection of *epd* mRNA and *epd* morpholino. The DNA construct will also be used to generate an *in situ* probe to localize *epd* expression. These studies will allow us to clearly define the role of ependymin in nervous system development.

Supported by NIH grant NS040449 (AC), a supplement to NS040449 (SB), MBRS RISE grant R25GM059244, Barry University (EN) and the Life Sciences Undergraduate Research Opportunity, University of Missouri-Columbia (GT).

8. Effect of embryonic ethanol exposure on zebrafish cranial motor neuron development.

Anna-Gaye Nicholson, Nella Delva, Christine Lynch, Lanzi Sinaise, Julie Cadet, Kellyn George, and Stephanie Bingham (Department of Biology, Barry University, Miami Shores, FL)

The nervous system is highly susceptible to the effects of teratogen exposure; as it is one of the first organ systems to begin developing throughout embryogenesis and beyond. In this study, we are concerned with the effects of ethanol exposure on the developing embryo; specifically, the incidence and severity of defects to the cranial motor neurons and craniofacial structures. Embryonic exposure to ethanol may result in developmental delays and severe cognitive deficits. In humans, ethanol exposure at critical periods of development may result in nervous system and cranial defects known collectively as Fetal Alcohol Syndrome. Using zebrafish embryos as a model system, this study sets out to mimic the effects of ethanol exposure in humans and identify critical periods of development. We treated the zebrafish

embryos with different concentrations of ethanol at different stages of development, and for varying periods of time. In so doing, we hope to identify the critical period for ethanol exposure as it pertains to cranial motor neuron defects. Treated embryos were immunostained with the Islet-1 antibody or green fluorescent protein antibodies to visualize effects on the cranial motor neurons. Preliminary results suggest cranial motor neuron mispatterning may arise even in the absence of obvious morphological defects in the developing embryo.

Supported by NIH MBRS RISE grant R25 GM059244-10, Barry University.

9. Genetic interactions between *cdc13-1* and yKU80 mutant alleles on yeast telomeres.

Lauren Sanchez[1], Gina Guillaume[1], Elizabeth LeBlanc[1], and Leticia Vega[1] ([1]Department of Biological Sciences, Barry University, Miami Shores, FL)

Telomeres are the physical ends of eukaryotic chromosomes that function to protect DNA ends from degradation and from end to end fusion. Telomeres consist of stretches of repeated C/G-rich DNA ending with 3' single stranded G-rich overhangs. The maintenance and function of telomeres are facilitated by the enzyme telomerase and by accessory proteins such as Ku and Cdc13p. Cdc13p is an essential, G-strand binding protein that functions in telomere protection and in telomerase recruitment. *cdc13-1* is a temperature sensitive allele of CDC13, that is defective for telomere end protection. Ku is a non-essential heterodimer composed of Ku70 and Ku80. Ku plays multiple roles in DNA metabolism including: non-homologous end joining, recombination and end protection. Ku also interacts with TLC1, the RNA template of the telomerase enzyme. This study examines the effect of mutations in yKU80 on *cdc13*-1 strains. We will also determine genetic interactions between *yku80* mutants and Pif1p, a helicase that inhibits telomerase activity. We previously showed that *cdc13-1* strains deleted for *PIF1* display hyper-elongated telomeres and increased temperature resistance. Telomere elongation in *cdc13-1, pif1*Δ strains partially depends on the Ku-TLC1 interaction. Using a genetic library of *yku80* mutations generated by Bertuch et al., we have introduced the *yku80* alleles into the *cdc13-1* background. The goals of these experiments are to determine the effects on viability and on telomere end protection of the various *yku80* mutant alleles in *cdc13-1* strains. We hope to identify a *cdc13-1, yku80* double mutant that mimics the phenotypes of *cdc13-1, pif1*Δ strains. If such a yku80 mutant exists in our library, the mutant may be defective in an interaction with Pif1p.

Supported by NIH-NIGMS MBRS RISE Grant: 2R25 GM059244-10, Barry University and NIH-NIGMS/NCI MBRS SCORE grant, 5SC 2CA 138567, Barry University.

10. Genetic pathways that influence the location of telomere addition events following chromosome breakage.

Lauren Sanchez[1], Margaret Platts[2], and Katherine Friedman[2] (Department of Biology, Barry University, Miami Shores, FL; [2]Vanderbilt University, Nashville, TN)

Telomeres are repetitive DNA sequences found at the 3' ends of chromosomes that prevent nucleolytic digestion and block inappropriate DNA repair mechanisms. Telomerase is a ribonucleoprotein enzyme that elongates chromosomes by adding TG-rich sequences to existing chromosome ends. In yeast, telomerase can also add a telomere at a double-strand break. This *de novo* telomere addition, otherwise known as telomere healing, can be beneficial when a break cannot be repaired, but must be tightly regulated. Rare telomere addition events can be captured in a 12 kb region of chromosome V. These events do not occur randomly. Instead, about 50% of the events occur within an 84 bp "hotspot" that is

highly TG-rich. We have found that Rap1p, a protein that binds double-stranded telomeric repeats, stimulates telomere addition within this sequence. Furthermore, in a strain lacking Pif1p, a negative regulator of telomere addition, the rate of new telomere addition is stimulated even several kb telomere-proximal to the hotspot, which are sequences containing very little telomere-like sequence. Rrd1p normally facilitates telomere healing at such sequences. We hypothesize that telomere addition events stimulated in a strain lacking Pif1p will depend upon Rrd1p. Strains lacking either *RRD1* alone or *RRD1* and *PIF1* were created and are currently being analyzed for the location of telomere addition events. The data obtained from this experiment will help us to further understand how cells heal double-stranded breaks and prevent mutations from occurring.

Supported by NSF Grant, MCB-0721595, Vanderbilt University, and NIH-NIGMS RISE Grant 2R25 GM059244-10, Barry University

11. P15, p16 and p21 are not required for TGF-β induced inhibition of human myeloid leukemia cells in culture.

Shakima St. Clair[1], Graham Shaw[2], and Xiaotang Hu[1] ([1]Depatment of Biology, Barry University, Miami Shores, FL; [2]College of Health Sciences, Barry University, Miami Shores, FL)

The normal cell cycle is controlled by cyclin dependent kinase (cdk) which is activated by binding to cyclin. The cdk-cyclin complex then activates numerous cell proteins by phosphorylating them. There are two families of cdk inhibitors: CIP/KIP and INK. The CIP/KIP members $p21^{WAF1/CIP1}$, $p27^{KIP1}$ and $p57^{KIP2}$ can bind to and inhibit both cyclin D-cdk4/6 and cyclin-E/A-cdk kinases. The INK members consist of $p15^{INK4B}$, $p16^{INK4A}$, $p18^{INK4C}$ and $p19^{INK4D}$. These only bind to and inhibit cdk4 and cdk6. Transforming growth factor beta (TGF-β) is a protein that controls many functions in the cell such as restricting cell growth, and regulating differentiation and apoptosis. TGF-β induced growth inhibition within hematopoietic cells has been reported to be the result of down-regulating several cdks and cyclins, along with up-regulating cdk inhibitors. Our previous studies have shown that TGF-β significantly up-regulates cdk inhibitor, p27, and down-regulates cdk4 and cyclin 3. This study investigated whether other cdk inhibitors play any important role in TGF-β-mediated cell cycle control in several human myeloid leukemia cell lines. TGF- β significantly inhibited proliferation of MV4-11 and TF-1 cells with up-regulation of p27 and down-regulation of multiple cdks and cyclins including cdc2, cdk2, and cyclin A, but not cyclin E. Surprisingly, TGF-β had no significant effect on the expression of cdk inhibitors, p16 and p15. We were not able to detect significant expression of p21 in either proliferating or G1 MV4-11 and TF-1 cells. Our data suggest that p15, p16 and p21 are not required for TGF-β-induced inhibition of human myeloid leukemia cells in culture.

Supported by Barry University Scholarship Grant; USPHS/NIH grant; NIH-NIGMS MBRS RISE: R25 GM059244-10 Barry University.

12. A morpholino-based screen to identify genes involved in vertebrate nervous system patterning.

Gabriela Toro[1], Elizabeth M. Nguyen[1], Stephen Ekker[2], Anand Chandrasekhar[3], Stephanie Bingham[1,3] ([1]Department of Biology, Barry University, Miami Shores, FL; [2]Mayo Clinic Cancer Center, Department of Biochemistry and Molecular Biology, Rochester, MN; [3], Division of Biological Sciences and Bond Life Sciences Center, University of Missouri, Columbia, MO)

The spatio-temporal regulation of gene expression tightly controls events that take place during development. We are interested in identifying the genes involved in the process of patterning neurons in

the vertebrate nervous system. In order to do so, we have performed a screen using the anti-sense reagent called morpholinos to target candidate genes expressed in the developing nervous system. By comparing nervous system patterning in morpholino-treated and control embryos, we can gain insights into the specific role(s) played by a given gene and therefore increase our understanding of the molecular events that coordinate the organization of the vertebrate nervous system. We used transgenic zebrafish expressing green fluorescent protein (GFP) in their cranial motor neurons as a tool to effectively identify and analyze nervous system disruptions produced in response to treatment with specific morpholinos in the live embryo. The embryo microinjection process was done at the 1 to 4-cell stage; embryos were allowed to develop until the GFP-labeled neurons were readily visualized (36-48 hours post fertilization). Of the 17 morpholinos tested, 4 produced abnormal hindbrain motor neuron phenotypes, ranging from decreased neuronal induction to incomplete neuronal migration and midline crossing suggesting that these genes may play important roles in nervous system development. In follow-up studies, we will characterize the expression patterns of the morpholino-targeted genes to better comprehend their roles in patterning the vertebrate nervous system.

Supported by the Life Sciences Undergraduate Research Opportunity Program, University of Missouri-Columbia (GT), NIH-NIGMS RISE Grant, R25 GM059244-10, Barry University (EN), NIH grant NS040449 (AC), and NIH supplement NS040449-S1 (SB).

Department of Physical Sciences

13. Organic synthesis of novel muscarinic agonist for treatment of Alzheimer's disease.

Ariadne Alcantara and John Boulos (Department of Physical Sciences, Barry University, Miami Shores, FL)

Alzheimer's disease is a degenerative disease of the brain from which there can be no recovery. The disease attacks the nerve cells in all parts of the cortex of the brain as well as some surrounding structures so impairing a person's ability to govern emotions, coordinate movements and remember things. Two significant abnormalities have been observed in the brains of people affected: the presence of neurofibrillary tangles and a sticky protein called β-amyloid. They are both associated with reduced levels of the neurotransmitter acetylcholine, which is needed in the processes of memory and learning. Acetylcholine, a muscarinic agonist, is known to bind the muscarinic receptor M_1 in the nervous system. Our research is directed toward the synthesis of an organic compound that can mimic the effects of acetylcholine at central muscarinic receptors. For this purpose 1-(5-methyl-2-thiophene methyl)-1-methyl piperidinium iodide was synthesized starting from 5-methyl-2-thiophene carboxyaldehyde in six consecutive reaction steps. The chemical structure of each intermediate in individual steps was characterized utilizing nuclear magnetic resonance and Fourier transformation infrared spectroscopy. The final product synthesized will be submitted for elemental analysis and determination of binding affinity with muscarinic receptors.

14. Synthesis of heterocyclic salts as potential muscarinic agonists for Alzheimer's application.

Jessica Bevlin and John Boulos (Department of Physical Sciences, Barry University, Miami Shores, FL)

Alzheimer's disease (AD) is a neurodegenerative disorder characterized by loss of memory, judgment and language functions and by the loss of specific neurons which project from the basal forebrain to the hippocampus and cerebral cortex. Degeneration of these nerve cells results in a decrease of neuronal markers such as the universal neurotransmitter acetylcholine and the enzymes choline acetyltransferase and esterase.

The cholinergic hypothesis is based on the fact that while basal forebrain neurons which express the M_2 muscarinic receptor are at risk of degenerating, the cortical neurons expressing the M_1 subtype which synapse with them are not altered. In theory, one could design and synthesize muscarinic selective M_1- agonists that would activate the cortical neurons. Such an approach has proven very difficult to achieve because of the lack of 3-dimensional structural information about the muscarinic binding site(s). To date, three pharmacologically distinct muscarinic receptors and five cloned muscarinic receptors (m1-m5) have been identified. These receptors share high amino acid homology, specifically at the transmembrane regions where agonist binding is believed to occur. Therefore, it appears difficult to design selective agonists which can differentiate between these subtypes. Efficacious agonists would have to activate specifically neurons expressing the M_1-subtype while having little effect on neurons expressing other types of receptors. My research is involved with the synthesis of two heterocyclic compounds which conform to the 5-atom rule imposed by Shulman's model for muscarinic receptor binding affinity and intrinsic cellular activity. The two salts were synthesized from furfuryl alcohol in several steps. First, the alcohol was converted to furfuryl chloride which was then coupled with pyridine to form the furfuryl pyridinium salt. The salt was then reduced with sodium borohydride to yield the corresponding heterocyclic base. The base was then converted to both the hydrochloride and methyl iodide salts. Both salts will be sent out for elemental analysis and receptor binding assays on cell lines that have been transfected with the different subtypes of muscarinic receptors.

15. Synthesis and characterization of creatine ascorbate.

Jonothan Colón and Tony Wallner (Department of Physical Sciences, Barry University, Miami Shores, FL)

Creatine, a supplement used to enhance physical performance in athletes, has limited solubility within the human body. It is believed that synthesizing creatine in a salt form will therefore increase its bioavailability. The purpose of this research was to synthesize creatine abscorbate, an organic salt in various solvents, to obtain maximum yield. Once the synthesis was optimized, the degradation of the salt under different conditions (pH from 3-7.5 and temperatures of 4°C**,** 25°C, and 37°C) was characterized using NMR spectroscopy. The characterization and optimal reaction conditions for the synthesis of creatine ascorbate will be discussed as well as the results of the degradation studies.

16. Understanding the relationships between ubiquitin-conjugating enzymes and the ubiquitin ligase enzymes as they interact with Msh2 in *Saccharomyces cerevisiae*.

Brian Garner[1], Timothy Arlow[2], and Alison Gammie[2] ([1]Department of Physical Sciences, Barry University Miami, FL; [2]Princeton University Princeton, NJ)

In 2009, roughly 57,000 deaths in the United States were due to colorectal cancer. Hereditary nonpolyposis colorectal cancer (HNPCC) accounts for 5–10% of all colorectal cancer cases. Specifically, HNPCC is caused by mutations in genes responsible for DNA mismatch repair (MMR) such as *MLH1, MSH2, PMS1, PMS2* and *MSH6.* Msh2 forms a heterodimer with either Msh6 (MutSα) or Msh2 (MutSβ) which upon binding to mismatched DNA recruits specific enzymes to repair the mispaired region. We are investigating the degradation of Msh2 to better understand HPNCC pathology. We have preliminary evidence that Msh2 degradation is due to ubiquitination and proteasomal degradation. To understand how Msh2 is ubiquitinated we are looking into the ubiquitination pathway and specifically at Msh2 interactions with ubiquitin-conjugating enzymes (Ubc or E2) and the ubiquitin ligases (Ubl or E3). We are testing null mutants of the E2s: *ubc2*Δ, ubc4Δ*, ubc5*Δ*, ubc7*Δ*, ubc8*Δ*, ubc10*Δ, *ubc11*Δ and *ubc13*Δ,

to determine which are responsible for the possible ubiquitination of Msh2. Studies are also being conducted to identify which subset of E3s interacts with Msh2. Future studies will employ mass spectrometry to map the sites of Msh2 ubiquitination and other post-translational modifications. These studies will provide insight into the molecular regulation of MMR components.

17. Creatine orotate stability and kinetics analyzed using NMR?

Brian Garner and Tony Wallner (Department of Physical Sciences, Barry University, Miami Shores, FL)

Interest in creatine exists due to its popularity as a nutritional supplement for increasing muscle size, endurance, and performance based on numerous studies. Creatine salts are becoming popular due to physiological benefits and increased solubility in water compared to creatine monohydrate. NMR (Nuclear Magnetic Resonance) was used to determine the degradation of creatine orotate investigated in pH levels from 2.0 to 11.5 for a period of 20 days and at temperatures of 4°C, room temperature and 37°C. Results are compared to previous data on the degradation of creatine monohydrate. Titrations of acidified creatine and creatine orotate were also performed to determine the pKa values of the compounds and this data was compared to NMR analysis at various pH values. Creatine orotate is also in the process of being characterized using x-ray crystallography and high performance liquid chromatography.

by NIH-NIGMS MARC: T34 GM008021-27, Barry University.

18. Photopolymerized preparation of hybrid monoliths.

Afua Gyapong, and Zuzana Zajickova (Department of Physical Sciences, Barry University, Miami Shores, FL)

In the last two decades there has been an increasing need for the improvement of speed of analysis in high performance liquid chromatography. To find a solution for this, the concept of monolithic column was introduced. Monoliths serve as a highly porous separation media and are usually made of silica or polymer interconnected skeletons. Their high porosity permits use of high flow rates, and therefore allowing for faster analysis. In this research study, preparation of the hybrid monoliths containing both silica and polymer functionalities was done directly inside of a pretreated UV transparent fused silica capillary (100 µm i.d.). Capillary filled with a solution containing a 3-(trimethoxysilyl)propyl methacrylate, an aqueous acid catalyst (HCl), a porogen (toluene), and a photoinitiator (2,2-dimethoxy-2-phenylacetophenone) was irradiated with ultraviolet light at 254 nm for 5 minutes. Unreacted moieties were eliminated from the column with an extensive ethanol rinse. The homogeneity of prepared monoliths was observed utilizing optical microscope and separation ability is currently being studied with liquid chromatography. The use of capillary with a micrometer range internal diameter requires minimal sample volumes and generates small quantities of solvent waste therefore leading to more green applications.

19. Esters: synthesis, use and identification.

Kadi Karam (*Department of Physical Sciences, Barry University, Miami Shores, FL)*

The chemical compounds known as “esters” were studied. This research was conducted in order to look at the methods by which esters can be synthesized. Saponification, the process by which esters are

hydrolysed to make soap, was also studied. These syntheses were explained with the aid of mechanisms that were inclusive of structural formulae. A comparison based on the way in which soaps and detergents clean was analyzed. The removal of dirt from clothing and other surfaces by these cleaning agents was discussed and the way in which soaps and detergents react with hard and soft water was looked at. Interestingly, naturally occurring esters found in plants and animals contribute to various tastes, fragrances and naturally occurring aromas. Benzyl benzoate is the ester molecule that acts as a base for the synthesis of many perfumes and colognes and methyl salicylate is the ester molecule that contributes to the taste and therapeutic aroma of wintergreen. The identification of the functional groups present in the molecular structures of these two common esters was examined by studying their spectra produced from a chemical technique known as infrared spectroscopy (IR spectroscopy).

20. D-Aspartic acid in frog tissues.

Shahad Khomeis, Nathan Gonzalez, and George Fisher (Department of Physical Sciences, Barry University, Miami Shores, FL)

The D-enantiomer of aspartic acid (D-Asp) is an endogenous amino acid found in the nervous and endocrine systems of many marine and terrestrial animals where it has physiological importance in neurotransmission and hormone regulation. Previous researchers found D-Asp in the ovaries and Harderian gland of the green frog *Rana esculenta*. We report here finding D-Asp in the frog nervous system. We analyzed several nervous and non-nervous tissues from grass frogs (*Rana pipiens*) for the presence of D-Asp by HPLC. D-Asp was found primarily in the nervous tissues: brain, brain stem, spinal cord, sciatic nerves (~25 to 45 nmoles D-Asp/g tissue; 3% to 20% of total D- plus L-Asp). No D-Asp was found in non-nervous tissues: heart, lung, muscle. However, small concentrations of D-Asp were found in liver. In related electrophysiology studies, the action of D-Asp on motor neurons of *R. pipiens* was determined. Ten second applications of D-Asp were normalized to 10 second applications of 100 μM N-methyl-D-Aspartate (NMDA). D-Asp responses for 0.1, 0.3 and 1 mM were 15, 61 and 130% of NMDA control responses, respectively. These results demonstrate that D-Asp is present in the frog nervous system and may have a physiological role in neurotransmission. *Supported by: NIH-NIGMS MARC U*STAR grant, T34 GM008021, Barry University*)

*Supported by NIH-NIGMS MARC U*STAR grant, T34 GM008021, Barry University.*

21. Parkinson's disease (PD): a pharmaceutical approach.

Jeremy Klubes (Department of Physical Sciences, Barry University, Miami Shores, FL)

Within this research review, the concept of Parkinson's disease (PD) will be examined from an analytical perspective. Although there are no cures for PD at the moment, the disease has been studied for the sake of thoroughly understanding what occurs and what could be done to extend the life of the victim as much as possible. PD has been classified as a dopamine deficiency due to the degeneracy of neurons in the substania nigra region of the brain. When an excess amount of glutamate is produced within the body, these neurons become overexcited and eventually die. The compound Tyrosine found naturally within the body is converted by the process of tyrosine hydroxylase and made into the prescription drug Levodopa, consisting of dihydroxyphenylanaline (DOPA). Levodopa is given to patients of PD as a dopamine precursor so that the body can synthesize it into dopamine by means of DOPA decarboxylase. However after using Levodopa for a long period of time the body becomes resistant to it, causing the drug to no longer have the same effect it once did, including the introduction of a movement disorder known as dyskinesia. The best approach towards understanding how to prevent a rapid onset of symptoms for PD

(including the formation of dyskinesia) is determined by studying the chemical's structure, how it is metabolized by the body and the potential of the counteracting compounds used in the form of prescription drugs.

22. Photografting of silica monoliths with octadecyl functionality for applications in reversed-phase chromatography.

Marc Knezevic[1], Zuzana Zajickova[1], and Frantisek Svec[2] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]The Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA)

The efficiency of capillary liquid chromatography, commonly utilized for separation of mixture of compounds, can be improved by use of porous interconnected materials known as monoliths. These serve as stationary phase within a capillary column. Monoliths are recognized to have a high porosity and a high surface area therefore allowing for fast analyses and increased column efficiency. Currently, much attention is geared towards silica-based monoliths particularly due to its established procedure for its preparation. In order to increase the adeptness of these columns during reversed-phase liquid chromatography, the surface chemistry of these materials was altered via a novel and fast approach called photografting. Silica monoliths were first prepared inside a UV transparent capillary via a sol-gel synthesis. Further, the silanol groups on the monolith surface were activated by introducing an etching step which was followed by an on-column reaction with 3-((trimethoxysilyl)propyl) methacrylate (MPTMS) in the presence of toluene. The monolithic surface was subsequently exposed to UV radiation (254 nm for 1 minute) to initiate polymerization of octadecyl methacrylate (C 18) using benzophenone as radical initiator, and isopropanol as a suitable solvent. Optical and scanning electron microscopy were used to view the cross sections and morphologies of the prepared silica monoliths. As a result of surface modification, prepared monoliths were able to separate non-polar alkylbenzenes using a mobile phase consisting of a mixture of acetonitrile and water. The monoliths showed better baseline separations and methylene selectivity using lower percentages of acetonitrile in the mobile phase. Future studies should focus on identifying optimal irradiation conditions during photografting in order to achieve efficient separations in a minimal amount of time.

Supported by the Office of Science, Office of Basic Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231 and the Department of Energy (DOE)/National Science Foundation (NSF) Faculty and Student Team (FaST) program.

23. Synthesis, characterization and kinetic degradation study of di-creatine maleate followed by NMR.

Brittany Kuhl and Tony Wallner (Department of Physical Sciences, Barry University, Miami Shores, FL)

Di-creatine maleate, a creatine salt, was synthesized using maleaic acid in combination with creatine monohydrate. Creatine is used commercially as a nutritional supplement. Its growing popularity due to correlations between increased muscle size, endurance and enhanced performance has produced numerous studies to enhance its solubility and bioavailability. The role of solvent on reaction yield was studied. NMR was used to verify the creatine salt formulation and analyze the samples degradation in an aqueous solution at room temperature (27 degrees Celsius) and body temperature (37 degrees celsius). The di-creatine maleate data were compared to pure creatine monohydrate and a consumer sample to observe any differences. Samples of di-creatine maleate were further analyzed using NMR at pH levels of

2, 6, and 7 to replicate different biological systems. Degradation and solubility comparisons were made between all samples.

24. Solid state synthesis of a series of tetra-substituted porphyrins.

Paula Mackin and Tamara Hamilton (Department of Physical Sciences, Barry University, Miami Shores, FL)

Solvent-free chemistry is becoming more important due to the industrial demand for waste reduction and cost efficiency. Traditionally porphyrins are synthesized using large amounts of solvent by way of an acid-catalyzed condensation between pyrrole and an aldehyde. The reaction mixture is then oxidized to produce the porphyrin. We are investigating a solvent-free approach involving grinding of reactants with an acid catalyst in a Wig-L-Bug to produce significant amounts of porphyrin after oxidization. The method has proven effective using benzaldehyde as a reactant to produce tetraphenyl porphyrin (TPP) in significant yields. TPP has characterized using UV-Vis spectroscopy, ^{1}H Nuclear Magnetic Resonance, and Mass Spectrometry. To investigate the general applicability of the approach, a series of substitued benaldehydes were ground in the Wig-L-Bug in the presence of pyrrole and toluene sulfonic acid as a catalyst. The product was then oxidized and analyzed by UV-VIS to confirm the presence of porphyrin.

25. Photopolymerized Sol-Gel Hybrid Silica Monolithic Columns for Capillary Liquid Chromatography.

John Stefancin[1], Zuzana Zajickova[1], and Frantisek Svec[2] ([1]Department of Physical Sciences, Barry University, Miami Shores, FL; [2]The Molecular Foundry, Lawrence Berkeley National Laboratory, Berkeley, CA)

In recent years, monolithic columns have attracted considerable attention for use in capillary liquid chromatography (CLC) because of the multiple advantages they offer over particle packed columns. A monolith is a type of separation medium consisting of a continuous, highly porous structure that forms an interconnected skeletal backbone. The objective of this project is to prepare photopolymerized *in-situ* formed sol-gel hybrid silica monoliths for applications in CLC. A photopolymerized hybrid monolith is prepared in less than one hour and combines both properties of organic and inorganic materials. A solution of 3-(trimethoxysilyl)propyl methacrylate in the presence of an aqueous acid catalyst (HCl), a porogen (toluene), and a photoinitiator (azobisisobutyronitrile) was irradiated with ultraviolet light in a pretreated 100 μm internal diameter fused silica capillary at 365 nm. Homogeneous photopolymerized sol-gel hybrid silica monoliths exhibit a total porosity of 74% with 64% being through pores and the remaining 10% being mesopores. The characterization of the monoliths was carried out using reversed-phase and inverse size-exclusion chromatography. Efficient chromatographic separation of low molecular weight alkyl benzenes was achieved under optimized isocratic conditions within 5 minutes. The methylene selectivity of the column in the mobile phase containing 60% acetonitrile in water was 1.143. The column efficiency was 58 500 plates/m for uracil and 44 000 plates/m for benzene. The monolithic columns prepared in this study are advantageous to many fields including biochemistry, drug discovery, and environmental analysis, as they allow for the expeditious and efficient separation, quantification, and identification of individual components of mixtures of compounds.

Supported by the Office of Science, Office of Basic Energy Sciences, of the U.S. Department of Energy under Contract No. DE-AC02-05CH11231 and the Department of Energy (DOE)/National Science Foundation (NSF) Faculty and Student Team (FaST) program.

26. Application of the Boltzmann transport equation to the evolution of chemical reactions.

Stefanie Sveiven and Maurizio Giannotti (Department of Physical Sciences, Barry University, Miami Shores, FL)

We investigate the use of the Boltzmann transport equation for the evolution of chemical reactions. We show that, with some minimal assumptions, the Boltzmann transport equation, which is an integro-differential equation for the distribution functions, can be modified in a standard differential equation for the evolution of the number of molecules. The equation can be solved analytically in some particular cases, such as simple binary reactions. We propose a possible generalization to more general cases, which can, however, be studied only numerically.

27. New bounds on axions from astrophysical observations.

Cathleen Whitton and Maurizio Giannotti, (Department of Physical Sciences, Barry University, Miami Shores, FL)

Axions are hypothetical particles, whose existence is a consequence of the Peccei-Quinn solution of the strong CP problem, one of the most puzzling problems in the physics of fundamental interactions. These elementary particles could also explain the dark matter component of the universe, another major problem in modern physics. Today, the improvements in experimental and theoretical astrophysics research have opened new possibilities to understand the properties of these particles. We will discuss some new astrophysical bounds on the axion, from the analysis of recent astrophysical observations, and propose a new possibility for its detection.

Department of Psychology

28. The implications of burdensomeness expectancies for avoidance in interracial interactions.

Monica Barreto[1], Celeste Doerr[2], and Ashby Plant [2] ([1]Department of Psychology, Barry University, Miami Shores, FL 33161; [2]Florida State University, Tallahassee, FL 32306)

The current work examines Black /African American participants' expectancies in interracial interactions. We are interested in concerns about representing one's minority group to an uninformed majority group member, termed burdensomeness expectancies. Specifically, we test whether alleviating burdensomeness expectancies results in more positive responses to a White confederate. We expected participants who anticipated interacting with a culturally informed confederate to respond with less of an avoidance focus and with more approach-related behaviors than participants who believe their interaction partners are ill-informed. Participants in a control group were predicted to give responses between those of the other two groups.

Supported by NIH-NIGMS MARC Grant: 5T43 GM00821-26, Barry University

29. Culture and gender differences in the use of backchannels: Hispanic *vs*. American *vs*. Hispanic-Americans.

Monica Barreto and Stephen Koncsol (Department of Psychology, Barry University, Miami Shores, FL 33161).

The purpose of this study was to investigate the use of backchannels, meta linguistic utterances, e.g., "hmm," within pilot sentences, across gender and three cultural populations: Hispanics, Americans, and Hispanic-Americans. While considerable research has been done on other linguistic populations (e.g., Japanese, German, and British), little research has been done to date on Hispanic use of backchannels. It is speculated that Hispanic men and women may use backchannels with greater frequency and more intensity than other cultures. No research exists regarding the use of backchannels by bilinguals, such as those used by Hispanic-American men and women. Comparing gender and cultural populations yielded statistical difference.

Supported by NIH-NIGMS MARC Grant: 5T43 GM00821-26, Barry University.

30. Time pressure and the scholastic assessment test (SAT).

Karla Rivera-Torres and Dr. Michael DeDonno (Department of Psychology, Barry University, Miami Shores, FL)

The College Board (2009) suggest that the time given on the Scholastic Assessment Test (SAT) is appropriate for students, however the time given may be negatively impacting student's performance. Van der Lube, et al., (2001) found that time pressure increased forced responses on cognitive tasks. Participants were undergraduate students attending a university in South Florida (56 women, 14 men) (*Mage* = 20.0,3 *SD* = 1.91), included one Asian/Pacific Islander, 34 Black, 22 Hispanic, and 13 White. Participants were randomly divided into a time-limit and a no-time-limit group. Participants completed a math and verbal practice SAT test. Instructions were based on the SAT practice manual. The math test included 20 questions and the verbal test included 35, each with a 25-minute time limit. Performance on the timed math test had lower scores ($M = 5.68$, $SD = 2.42$) than performance under no time limit ($M = 7.49$, $SD = 3.32$), $t(68) = 2.385$, $p = .02$. Performance on the timed verbal test ($M = 13.12$, $SD = 3.407$) did not differ from performance under no time limit ($M = 13.76$, $SD = 4.563$), $t(68) = .608$, $p = .545$. The low performance on the math timed limit test is significant. The SAT math test score may not be an accurate representation of the test takers' true math ability. There was no difference in performance under the verbal timed limit test. It is possible that a decrease in effort and the use of less effective strategies due to the time limit may be impairing high performance in the math test. It may be beneficial for universities who use the SAT score as acceptance criteria, to consider alternative measures for applicant's math ability.

31. The influence of parenting styles in the formation of academic self-efficacy in young adults.

Iliana Gonzalez and Linda Bacheller (Department of Psychology, Barry University, Miami Shores, FL)

The way parents interact with their children can have either negative or positive effects on the development of the child during and beyond adolescence. Therefore, different child rearing styles may influence an individual's emotional stability, self-discipline, responsibility, self- efficacy, and school performance. Despite the complexity of different child rearing styles,

the most socially accepted theory is that there are four categories of parenting styles: authoritarian, authoritative, permissive and neglectful (Baumrind, 1991). Underlying these categories of parenting styles are two broad dimensions of control/demanding, and warmth/caring. It is the combination of these two dimensions that define a specific parenting style. Research indicates that the type of parenting style may influence the child's perception of their academic abilities. Academic self-efficacy is defined as "the belief in one's capabilities to organize and execute courses of action required to produce given attainments" (Bandura, 1997, p. 3). It is believed that self-efficacy could influence the course of action a person chooses to pursue, the amount of effort and time spent on goals, and how determined a person is in the presence of challenges and failures (Chemers, Hu, & Garcia, 2001). The present investigation considers the link between parenting styles and academic self-efficacy in young adults. Participants will be approximately 127 college students 18 to 25 years old. It is expected that college students whose parents employed an authoritative parenting style within the household will have an increased sense of academic self-perception; unlike authoritarian, permissive, and neglecting parenting which are more likely to be associated with a decrease in academic self- perception.

Supported by NIH-NIGMS MARC Grant 5T34 GM008021-27, Barry University

32. Teacher and parent agreement on ratings of preschool interactive peer play.

Iliana Gonzalez [1] and Rebecca Bulotsky Shearer[2] ([1]Department of Psychology, Barry University, Miami Shores, FL; [2]Department of Psychology, Child Division, University of Miami, Coral Gables, FL)

Developmental research supports the positive association between interactive peer play experiences through which children acquire the social skills needed to successfully understand different points of view, share, and accept other peers within their group (Gagnon & Nagle, 2004). Furthermore, engagement in positive interactions with peers promotes the development of cognitive, linguistic, and social-emotional competencies that prepare children for kindergarten (Hampton & Fantuzzo, 2003). A comprehensive understanding of children's behavior is critical to inform of early interventions. The purpose of this study was to examine the relationship between teacher assistant and parent. Interactive peer play in the school year was rated using the teacher and parent versions of the Penn Interactive Peer Play Scale (PIPPS-Teacher; Fantuzzo, Sutton-Smith, Coolahan, Manz, Canning, & Debnam, 1995; PIPPS-Parent; Fantuzzo, Mendez, & Tighe, 1995). The PIPPS was collected from teachers and parents from 465 urban Head Start preschool children across 8 centers in Miami-Dade County. Bivariate correlation analyses were conducted to assess relationship between parent and teacher ratings. The results revealed significant correlations between all corresponding dimensions for the parent and teacher version; Play Interaction ($r = .24$, $p < .01$), Play Disruption ($r = .21$, $p < .01$), and Play Disconnection ($r = .10$, $p < .05$). The results demonstrated congruence between parent and teacher reports of preschool children's social competence in the context of interactive peer play. Furthermore, the results indicated the importance of obtaining multiple points of view from informants across proximal contexts, in order to comprehensively assess the strengths and needs of low-income children.

Supported by NIH-NIGMS MARC Grant 5T34 GM008021-27, Barry University.

33. Students' perceptions regarding the importance of minority faculty at predominantly white institutions.

Karla Rivera-Torres and Pamela Hall (Department of Psychology, Barry University, Miami Shores, FL)

The present study examined college students' attitudes about the benefits of having minority faculty at an ethnically diverse university in South Florida. Prior studies have shown that minority faculty can help predominately white institutions retain minority students (Jones, Castellanos & Cole 2002; Alexander & Moore, 2008). However, student's attitudes about how they can benefit from minority faculty at institutions in South Florida have not been assessed. 114 undergraduates rated statements that measured their attitudes about minority professors using a 5-point Likert scale: (1 = *strongly disagree*, 5 = *strongly agree*). Additionally, they completed three open-ended statements pertaining to how they could benefit from minority professors, as well as a demographic questionnaire. Findings revealed that the majority of students, regardless of their ethnicity, felt they could benefit from having minority faculty at their university. They felt that minority professors would offer wider diversity, role models/mentorship, different perspectives and cultural enrichment to the university.

Department of Mathematics and Computer Sciences

34. UML design for an automated registration system.

Valendie Alix, Islande Belizaire, Denist Oscar, James Haralambides (Department of Mathematics and Computer Sciences, Barry University, Miami Shores, FL).

Software engineering is a discipline concerned with the overall theories, methods, tools and production for professional software development. Through the use of systematic and organized approaches in the production of software, engineers are able to produce high-quality software within specific organizational and financial constraints. Without software engineering, computers today would have no functionality; it remains as the essential building block of technology systems in present day society. The design and implementation phase is the stage in which an executable software system is developed. Designing a system allows for complete understanding of the system's principle components and finding additional requirements and functionalities that may be needed or wanted. One popularly used design description language is called UML diagramming (Unified Modeling Language). The design process of this system will involve the usage of UML diagramming. Unified Modeling Language (UML) is a standardized general-purpose modeling language in the field of object-oriented software engineering. UML includes a set of graphic notation techniques to create visual models of object-oriented software-intensive systems. Each UML diagram is designed to let developers and customers view a software system from different perspectives and in varying degree of abstraction. Examples of these diagrams (system modeling) include use case, class, interaction and state diagrams. The Automatic Registration System (A.R.S.) will act as an information system whose primary purpose is to manage and provide user access to the course registration database, all while maintaining user confidentiality, security, usability and data integrity. This system is designed to accept different types of data and information provided by the user to register for courses. This research project involves design of the system through UML modeling, with each UML diagram representing a different view of several processes within the system.

35. Embedded sound processing - implementing the echo effect.

Valendie Alix, Daniel Brescia, Denist Oscar, James Haralambides (Department of Mathematics and Computer Sciences, Barry University, Miami Shores, FL).

Digitized audio is derived from sound reproduction of analog information by representing analog waveforms with a stream of digital bits. The main purpose of having a system with digital audio is to have the ability to store, retrieve and transmit signals without jeopardizing the loss of sound quality. Digitization of audio signals allowed for the application of various effects that enhance the quality of the

signal, eliminate undesired frequencies, or produce a better listening experience. Some of the most common effects include amplification, fading (in or out), noise removal, inverting, echoing, etc. In this project we will generate a parameterized echo effect using programmable logic. Hardware implementations of signal processing algorithms are characterized by increased flexibility and an increased performance over software designs. The echo effect is produced via repetition of the original signal after a delay and a decay factor have been applied to it. The delay parameter defines the amount of time that elapses before copies of the signal are repeated. The decay factor reduces the amplitude of the repeated signal until it eventually dies out. The effect will be hardwired in a Spartan 3E board. The audio file will be stored in the core memory of the board as a collection of frequency samples. The embedded design will make use of a memory reader module, a digital-to-analog converter, a controller module, and input and output interfaces to facilitate parameterization of the effect and sound reproduction. The memory reader is responsible for the retrieval of stored digital information while the controller combines audio samples representing different timing intervals to generate the echo effect. The job of the digital-to-analog converter is self-explanatory; it converts the signal to its corresponding analog form and forwards it to a computer speaker for reproduction.

36. Embedded image processing-edge detection on FPGAs.

Islande Belizaire, Orin Harris, Wadner Joseph, James Haralambides (Department of Mathematics and Computer Sciences, Barry University, Miami Shores, FL).

Edge detection in image processing is the process of identifying sharp intensity transitions in images that are edited on the pixel level. Such transitions may be identified by computing intensity differences of neighboring pixels. The process is improved by taking into consideration the direction of such transitions using the image's gradient component. The algorithmic design we are going to follow computes horizontal and vertical differences of pixel intensity. The differences produced in both directions are combined and the result is normalized. This technique has a tendency to produce thin edges. An additional computation of the gradient component of the image (edge direction) helps retain the stronger edges while at the same time eliminate the weaker (lower intensity) ones. Image processing applications are computationally intensive as processing of images takes place on individual pixels or groups of pixels repeatedly. Field Programmable Gate Arrays (FPGAs) have an inherent degree of parallelism since the gate array is a collection of fine grain processing elements. In this project, we will implement the above mentioned edge detection technique using an FPGA board, namely, the Spartan 3E board. The image, computations of pixel intensity differences, and the gradient component will be stored in the FPGA's core memory. Pixel intensities will be represented in the RGB model. To improve the performance of the design, horizontal and vertical transitions, the normalization process, and the gradient component will be computed in parallel. An additional speed-up can be achieved if dual-port memory is used to store intermediate images. The original image and the image identifying the image's strong edges will be displayed simultaneously on a computer monitor through a VGA component. The VGA component will convert pixel information to monitor frequencies that will be forwarded to the VGA port of the board.

37. Unleashing Parallel Processing Power.

George Burri, Khalil Martin, Chakib Chraibi (Department of Mathematics and Computer Sciences, Miami Shores, FL).

The concept of parallel processing is not new; it has been theorized on for decades, and put into practice in many high level applications. But at what point will parallel processing become commonplace? As

modern processors reach their minimum size and maximum power, increased computational power will need to be drawn from multiple processors. But how can the workload be divided among two, three, four, or even a whole network of processors? This presents a specific challenge as traditional programming is sequential; that is, everything is computed one step at a time. With parallel processing however, multiple computations are happening simultaneously. Obviously, this can greatly complicate a scenario; depending on what operations are dependent on others, and if they must occur in a certain order. Using two processers may be able to effectively halve the time it takes to complete the computation of a certain algorithm, but there is a tradeoff as to the amount of time it takes to effectively divide the workload. The purpose of this research is to experiment with different algorithms of varying complexities. The same computational task will be completed using both traditional sequential processing and then with parallel processing. The amount of time each process takes will be instrumental in determining the effectiveness of parallel over sequential processing. Some tasks are expected to see substantial performance gains, while some simpler ones may perform worse, due to the added overhead of parallelizing the code. The research focuses on different ways of optimizing existing algorithms to enhance performance while running across multiple processors, such that execution can take place as efficiently as possible.

38. Music synthesis using programmable logic.

George Burri, Khalil Martin, James Haralambides (Department of Mathematics and Computer Sciences, Miami Shores, FL).

Embedded design is a flexible, but yet powerful, field in modern computing. Field Programmable Gate Arrays allow for the reconfigurable implementation of a large variety of functions and interconnections where circuit mapping is supported through Hardware Description Languages (HDLs). In this project, an FPGA board was programmed as a music synthesizer. The operations performed by the board include taking user input from a keyboard, digitally synthesizing notes using fundamental frequencies stored digitally to board memory, and performing digital-to-analog conversions to generate audio outputs. In order to faithfully reproduce a musical note, the fundamental frequencies of instrument notes must be determined beforehand in the frequency domain, using the software application 'Octave'. A recorded sample of a note being played on an instrument is used as input, allowing the software to create a frequency graph. Fundamental frequencies are digitized and normalized. Data generated through this process is programmed into the ROM memory of the FPGA board. A controller module generates synchronized interactions among the various models involved in the music synthesis process, namely, the keyboard module, the memory reader, and the digital-to-analog converter. The board reacts to user input from a standard computer keyboard; when a key is pressed, the keyboard module produces a specific code that corresponds to the key. If the key is valid, the code is used to determine which note to synthesize. The fundamental frequencies that correspond to the note are read from memory using the memory reader module and are synthesized to produce the sound that matches the note. The output digital audio stream is then sent to the digital-to-analog converter module. The resulting analog stream is amplified and sent to external speakers for reproduction. Although this problem is of average complexity, it demonstrates the versatility of programmable hardware and embedded design.

39. Detection thresholds of different waveforms throughout a frequency range of 10-250 Hz among male and female college-age students.

Kitzia Colliard[1], Ana M. Jimenez[1], Ricardo Jimenez[2] ([1]Department of Biology; [2] Department of Mathematics and Computer Sciences, Barry University, Miami Shores, FL).

The purpose of this study is to identify detection thresholds on the skin of three different waveforms throughout a frequency range with the use of a vibrotactile device, i.e., the C2 tactor from EAI systems. There are four main distinct types of mechanoreceptors found in the skin that respond to different vibration stimuli; specifically, the Pacinian corpuscles, Merkel disks and Meisner's corpuscles will be tested. Each type of mechanoreceptor responds differently to vibration stimuli; therefore to ensure specific stimulation of all the tested mechanoreceptors different frequency-wave types: sinusoidal, saw-tooth and square, at different frequencies ranging from 10Hz-250Hz will be used. These parameters are being used because of their special interest as tacton cues in human-computer interaction (HCI). The first phase involves the development of the project itself, including the IRB protocol and the recruitment of the test subjects. The subject population to be tested will be both male and female college students ranging in age from 18 to 25 years old. It is estimated that about 16-20 individuals will participate in the study. The second phase will consist of the testing itself and the data collection leading to the interpretation and general findings of the study. By identifying the minimum tactile thresholds for each waveform at their respective frequencies, we will provide empirical data that can be of great benefit to HCI for the effective design of tactons.

40. Fibonacci numbers in finance.

Lekernsay Missick, Victor Pan (Department of Mathematics and Computer Sciences, Barry University, Miami Shores, FL).

Fibonacci numbers are a sequence where each term equals the sum of the previous two: 1, 1, 2, 3, 5, 8, 13, 21, 34, 55, . . . The "34", for example, belongs in the sequence because it equals 13 + 21. We study the applications of Fibonacci numbers in technical analysis in finance.

41. Gann fans and stock markets.

Michael Perozo, Victor Pan (Department of Mathematics and Computer Sciences, Barry University, Miami Shores, FL).

In this presentation, we study the relations between the Gann fan angles and the time and prices in the stock markets. Some examples are given to illustrate the relations.

BARRY UNIVERSITY - COLLEGE OF HEALTH SCIENCES

42. Laboratory testing and data analysis of environmental water samples performed by Barry University student researchers.

Ganesh Crooks, Patrice Henry, Quinton Katler, Federico Lin, Charles Litchfield, Ian Noga, Stephen Obeng, Samuel Pierre, Leonard Pierre, Nahstajia Pinnock, Chony Seng, Erick Velis, Kendra Warren, Linda Ying. (College of Health Sciences, Barry University, Miami Shores, FL).

Between January and March 2011 Barry University students performed laboratory testing of water samples obtained from West Broward County, Florida. Before carrying out testing procedures students received a one day training session on use of equipment, laboratory safety training and a lecture on how to perform basic data analysis. Water samples were obtained on a weekly basis and each student was provided with a 100 ml sample of the original collection. All tests were performed within a 48 hour window. Each student was responsible for measuring pH, turbidity, conductivity, dissolved oxygen and for performing a microbiological assay. At the end of the 9-week period each student completed a

statistical analysis on his/her individual data set. Results showed significant variations between individual data sets and reasons for these variations will be discussed.

Supported by DARPA grant HR0011-10-1-0064 to Barry University

BARRY UNIVERSITY - SCHOOL OF ADULT AND CONTINUING EDUCATION

Department of Information Technology

43. Using PerpWatchers to protect the community with access to felony information.

Todd Jaspers, Jay Glen, Joseph Castellin, and Khaled Deeb (Department of Information Technology, Barry University, Miami Shores, FL)

There are many sites throughout the internet that provide access to criminal data. Most local counties provide access for citizens to look up felony or criminal information if a name is provided. Some websites even provide information showing where the felon is in relation to the user's home. There are no sites that currently exist which provide access to this data, both felon and sexual offender information with distance and locality; this is where PerpWatchers comes in. PerpWatchers provides the ability for users to protect their families by knowing the criminal history of all of their neighbors near and far. In addition to the basic features of PerpWatchers, the user also has access to additional tools and resources. PerpWatchers can be useful to both the family and business owner alike. School and daycare administration will find PerpWatchers useful in ensuring that their facilities are free from criminal influence. Parents will find PerpWatchers useful by ensuring that their children have a safe route to and from school. PerpWatchers keeps its customers informed with up-to-the-minute notifications of any changes in felony or sexual offender information in the area. PerpWatchers stands to become a staple in protecting the family by helping them know their neighbor.

BARRY UNIVERSITY: ROADS (RESEARCH OPPORTUNITIES AND DIRECTIONS IN SCIENCE) STUDENT CLUB

44. Using Assessing Evolutionary Relatedness of Skeletal Muscle Protein Expression Profiles in Aquatic Species.

Alec Davila, Chelsea Baker, Chris-Ann Xavier, Cyndie Derne, Daphne Petit Homme, Elvis Camacho, Erline Dolce, Giselle Vega, Jenycce Montenez, Joshua Tapia, Marica Ilich, Nicholas Morales, Nicole Lopez, Peter Tamburello, Talia Guardia, and Brenda Schoffstall. (Department of Biology, Barry University, Miami Shores, FL)

Phylogenetics—the study of evolutionary interrelation between different species of organisms—is based on various types of data. Gene sequences, morphological characteristics, and other phenotypic expressions can be used for classification of organisms using a phylogenetic tree, or cladogram. We researched the evolutionary relatedness between several wild type aquatic organisms by analyzing protein expression patterns of their muscle tissue. We were particularly interested in the relationship between killifish (*Fundulus heteroclitus*) and zebrafish (*Danio rerio*) because several research labs at Barry University often work with these two types of fish as research models. We also included cod (*Gadus morhua*), peppermint shrimp (*Lysmata wurdemanni*), and blue mussel (*Mytilus edulis*) in our protein expression survey. Our hypothesis was that different aquatic organisms would have either slightly different (cod vs. killifish) or dramatically different (zebrafish vs. mussel) protein expression patterns,

based on differences in habitat and physiology. We also predicted that mussel would be the most primitive species, and it should have the fewest number of proteins in common with more diversified species. The study was conducted by obtaining a small sample of skeletal muscle from each species, running a SDS-PAGE protein electrophoresis gel, and staining the gel with Coomassie blue to visualize muscle protein banding patterns. Using ImageJ computer software to analyze gel pictures, we plotted graphs representative of the banding patterns and determined molecular weights of major protein bands by comparison to a prestained protein standard. We quantified protein relationships between species, and found that zebrafish and killifish shared the greatest number of common major skeletal muscle proteins (13), while shrimp shared the fewest in common with any of the other species (between 3-5). We concluded that, based on protein banding patterns, shrimp were the most evolutionarily primitive, and zebrafish were the most diverse. Finally, we compared published phylogenetic relatedness of these species to our results based only on protein expression.

Supported by NIH-NIGMS RISE Grant, R25 GM059244-09, and NIH-MARC T34 GM009021, Barry University.

MIAMI-DADE COLLEGE

Department of Mathematics

45. Teaching math using robots.

Ignacio Naranjo, Stervens Pauleus, Alex Barahona, Justino Moncada, Derrick Bertrand, Yadier Manzanares. (Department of Mathematics, Miami Dade College, North Campus, Miami, FL)

In the presentation, a real robot moving and picking up objects will be shown as well as the model of the position of the robot hand using homogeneous matrices.

ST. THOMAS UNIVERSITY

School of Science, Technology, and Engineering Management

46. The role of L1.1 over-expression in axonal growth from adult zebrafish primary brainstem neurons over growth-inhibitory chondroitin sulfates.

E. Bajuelos[1], F. Shabazz [1], A. Tapanes-Castillo [1], M. Oudega [2], and J. Plunkett [1]. ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2] Center for Neuroscience, University of Pittsburgh School of Medicine, Pittsburgh, PA).

Axon regeneration depends on the balance of growth-inhibiting and growth-promoting influences. Chondroitin sulfate proteoglycans (CSPGs) inhibit axonal regeneration in the injured mammalian spinal cord. However, zebrafish regenerate their axons beyond the injury site despite the presence of CSPGs. It has been shown that axon growth from zebrafish neurons depends on the presence of the growth-promoting L1cam homolog, neuronal adhesion molecule L1.1 (nadl1.1). Our goal is to understand how L1.1 affects the response of zebrafish neurons to CSPGs *in vitro*. We hypothesize that L1.1 over-expression will result in more neurons crossing into and growing in CSPG areas. We first cloned the L1.1 full-length cDNA into an AAV-EGFP vector, and then transfected our L1.1-EGFP dual expression construct into primary adult zebrafish brainstem neurons using electroporation. Cells were then cultured

in the presence of CSPGs. We are currently determining how L1.1 over-expression affects axon growth on CSPGs.

Supported by U.S. Dept. of Defense Grant W81XWH-10-1-0617, St. Thomas University.

47. Primary neuronal brainstem culture from adult zebrafish: interactions with an inhibitory chondroitin sulfate proteoglycan-rich environment.

F. Shabazz [1], A. Tapanes-Castillo [1], K. Vajn [2], M. Oudega [2], and J. Plunkett [1]. ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2] Center for Neuroscience, University of Pittsburgh School of Medicine, Pittsburgh, PA).

In contrast to mammals, adult zebrafish (*Danio rerio*) recover functionally from a complete spinal cord injury. After trauma to the zebrafish spinal cord, chondroitin sulfate proteoglycans (CSPGs) are expressed at the injury site. It has been well documented that CSPGs inhibit axonal regeneration in the injured mammalian spinal cord, which contributes to the lack of endogenous functional restoration. Previous work in our laboratory has demonstrated that brainstem neurons in the adult zebrafish can regenerate their axon beyond a spinal cord lesion despite the presence of these inhibitory molecules. This ability is not characteristic for all brainstem neurons; different populations exhibit distinct regenerative responses, including failure to regenerate beyond the lesion site. To investigate the axonal growth response of zebrafish brainstem neurons to CSPGs, we developed a primary neuronal culture system using adult brainstem cells from wild-type zebrafish. We hypothesized that our culture would contain different neuronal populations that would respond distinctively to CSPGs presented under controlled culture conditions. Our results supported this hypothesis revealing three different populations of brainstem neurons with regard to their response to CSPGs in vitro. One population outside of CSPG-rich areas extends neurites that are repelled upon contact with CSPGs. Another population outside of CSPG-rich areas extends neurites that grow into and across the CSPG environment. The third population remains exclusively within CSPG-rich areas and extends neurites across CSPG-rich areas. Our results suggest that the ability to grow across and beyond a CSPG-rich area is intrinsic to the neuron. This ability or disability to grow across CSPGs likely involves unique sets of axon growth-related genes.

Supported by U.S. Dept. of Defense Grant W81XWH-10-1-0617, St. Thomas University.

48. The effect of L1.1 down regulation in axonal growth from adult zebrafish primary brainstem neurons over growth-inhibitory chondroitin sulfates.

M. M'boge[1], F. Shabazz [1], A. Tapanes-Castillo [1], M. Oudega [2], and J. Plunkett [1]. ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2] Center for Neuroscience, University of Pittsburgh School of Medicine, Pittsburgh, PA).

The mammalian central nervous system is unable to regenerate descending axons and regain motor function following spinal cord injury resulting in paralysis. In contrast, zebrafish have the ability to regenerate after a spinal cord injury and regain most of their motor function. The balance of both growth-promoting and growth-inhibiting molecules influences the regenerative capacity of zebrafish neurons. In mammals, Chondroitin Sulfates Proteoglycans (CSPGs), which are expressed at the injury site, have an inhibitory effect on axonal regrowth. Strikingly, zebrafish can re-grow axons past the injury site in the presence of CSPG molecules. This ability depends on the expression of the growth-promoting L1cam homolog, neuronal adhesion molecule L1.1 (nadl1.1). To this end, we have developed an *in vitro* model to study the response of zebrafish neurons to CSPGs. Our goal is to study how L1.1 down regulation

affects the response of zebrafish neurons to CSPGs. Our hypothesis is that reduced L1.1 expression will decrease axonal outgrowth, as well the number of neurons crossing into and growing in CSPG areas *in vitro*. We are currently using a morpholino based approach to reduce L1.1 expression in primary adult zebrafish brainstem neurons. We will then analyze their response to CSPGs presented in culture.

Supported by U.S. Dept. of Defense Grant W81XWH-10-1-0617, St. Thomas University.

49. Feeding of *Gratiana graminea* larvae on tropical soda apple and other selected Solanaceous plants.

Hyaptia Mata[1], D. Amalin[2], Amy Roda[2] and Catharine Mannion[3] ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2]USDA, APHIS, SHRS, Miami, FL 33158; [3]TREC, IFAS, UF, Homestead, FL 33031).

Biological control agents (BCAs) are used to control pests such as insects, mites, weeds and plant diseases. Tropical soda apple (TSA), *Solanum viarum*, a persistent weed first discovered in Glades County, FL in 1988, and which is spreading throughout the US, is a good target for BCAs). A BCA which is being requested for release in Florida is *Gratiana graminea*. This project's aim was to determine if *G. graminea* will feed on Solanaceous plants other than Tropical Soda Apple. Plant-host specificity tests were conducted with first instar larvae of *G. graminea* on three Solanaceous plants: *Solanum melangona* (eggplant), *Solanum torvum* (turkey berry), and *Solanum viarum* (TSA). First instar larvae of *G. graminea* were introduced in each of the above plants. The average rating and percent leaf consumption per plant was calculated and recorded. Leaf consumption analysis was completed using an Image Processing software, Image-Pro® 5.1.0.20, Media Cybernetics, Inc. Results on matured plants show that eggplant and TSA are equally preferred by *G. graminae* adults in the no-choice test. TSA plants were highly preferred by *G. graminae* adults followed by eggplants in the choice test. Turkey berry plants were the least preferred in both tests. Seedlings show that all test plants were equally preferred in the no-choice test. This study shows that *G. graminae* are not highly specific to the target plant, TSA, and cannot be released if they continue feeding on non-target plants, such as eggplant, an important crop in the US.

50. Developing a sensitive assay for the detection of avocado sunblotch viroid (ASBVd).

Marcela Jaramillo[1], Vanessa Sanchez[1], D. Pilar Maul[1], David Kuhn[2], Cecile Tondo[2] , and Raymond Schnell[2] ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2]USDA-ARS, SHRS, Miami, FL 33158).

Avocado sunblotch viroid (ASBVd) is an infective single-stranded circular RNA molecule of 247 nucleotides that causes an important disease in *Persea Americana* Mill., the common avocado. ASBVd-infected avocado trees show a decline in tree vigor with sunken yellow lesions on the fruit, rendering them unmarketable. Because infected trees can be asymptomatic for prolonged periods, a sensitive method for detection of the viroid is crucial to the maintenance of healthy avocado orchards and germplasm collections. An end-point RT-PCR assay with specific ASBVd primers has been developed to detect the viroid in partially purified RNA extracts from avocado leaves and flowers. However, ambiguous results were obtained when using this assay in the germplasm collection at the National Germplasm Repository at the Subtropical Horticulture Research Station (SHRS) in Miami, FL. Fourteen plants diagnosed as ASBVd-infected in a 2000 survey were found to be negative in a 2009 survey. We have developed a real time SYBR green RT-PCR assay specific for ASBVd that is at least 10 times more sensitive in ASBVd detection than previous assays. In addition, the new assay allows comparison of viroid titers among trees and among different tissues within a tree.

51. Developing in-vitro methods for organogenesis and somatic embryogenesis in *Hippeastrum*.

Luisa De Souza[1], D. Pilar Maul[1], and Alan Meerow[2] ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2]USDA-ARS, SHRS, Miami, FL 33158).

Hippeastrum (Amaryllidaceae), is a genus of bulbous tropical plants that has been developed into an economically important and popular group of mostly tetraploid or triploid hybrids. Diploid hybrids with desirable characteristics are considered to be good sources for novel traits in tetraploid commercial cultivars. However, in order to overcome cross-fertilization barriers between ploidy types, as well as self-incompatibility at the diploid level, it is necessary to first induce tetraploidy in diploid *Hippeastrum* plants. One procedure to induce doubling of chromosomes consists in exposing in vitro *Hippeastrum* tissues to antimitotic agents, such as oryzalin. Tetraploid-induced cells can then be used to generate tetraploid plants through organogenesis or somatic embryogenesis. Few reliable organogenesis and no somatic embryogenesis procedures that produce large number of in-vitro plantlets are available. We have compared the response of leaf and bulblet explants of diploid *Hippeastrum* cultivars to the auxin 2,4-dichlorophenoxyacetic acid (2,4-D) for callus formation, a first step towards organogenesis or somatic embryogenesis. After incubation in the dark with either 1 or 2 mg/L 2,4-D for 0, 1, 3 or 5 weeks, explants were transferred to Murashige and Skoog media. Calli have been obtained in both proximal leaf- and bottom bulblet sections in most media combinations with bulblets showing a more rapid response. Calli evaluations for organogenesis or somatic embryogenesis responses 10 weeks after initial incubation with 2,4-D are reported.

52. Molecular characterization of primary neuronal cultures from adult zebrafish.

M. Sierra [1], H. Mata [1], F. Shabazz [1], A. Tapanes-Castillo [1], M. Oudega [2], and J. Plunkett [1]. ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2] Center for Neuroscience, University of Pittsburgh School of Medicine, Pittsburgh, PA).

Unlike mammals, adult zebrafish (*Danio* rerio) have the remarkable ability to recover function following a complete spinal cord injury (SCI). Our lab has established a primary adult zebrafish brainstem neuronal culture model to study this regenerative response in vitro. Our goal is to molecularly characterize these brainstem cultures, as well as to identify and quantify the different cell populations present. We are currently working towards a base-line analysis of cells grown in serum-containing media. We hypothesize that our primary adult zebrafish brainstem cultures contain different types of cells that can be identified with different antibodies. We have tested a panel of antibodies recognizing proteins expressed in differentiating neurons, proliferating cells, and glia. Our data revealed populations of cells that expressed: (1) the neuronal specific marker HuC (Human neuronal protein C), (2) the regeneration-associated protein GAP43 (Growth associated protein 43), and (3) the cellular proliferation marker PCNA (Proliferating cell nuclear antigen) positive cells. Preliminary results also indicate a neuronal population that expresses the serotonergic marker, TPH2 (tryptophan hydoxylase).

Supported by U.S. Dept. of Defense Grant W81XWH-10-1-0617, St. Thomas University.

53. Differential expression of neurocan and PTPσ following CNS injury in the adult zebrafish (*Danio rerio*).

A. Wood [1], F. Shabazz [1], A. Tapanes-Castillo [1], M. Oudega [2], and J. Plunkett [1]. ([1] School of Science, Technology, and Engineering Management, St. Thomas University, Miami Gardens, FL; [2] Center for Neuroscience, University of Pittsburgh School of Medicine, Pittsburgh, PA).

In contrast to mammals, adult zebrafish (*Danio rerio*) recover functionally from a complete spinal cord injury. After trauma to the zebrafish spinal cord, chondroitin sulfate proteoglycans (CSPGs) are expressed at the injury site. It has been well documented that CSPGs inhibit axonal regeneration in the injured mammalian spinal cord, which contributes to the lack of endogenous functional restoration. Neurocan (Ncan) is a member of the family of growth-inhibitory CSPGs. Previous work in our laboratory has demonstrated that brainstem neurons in the adult zebrafish can regenerate their axon beyond a spinal cord lesion despite the presence of these inhibitory molecules. The transmembrane protein tyrosine phosphatase, PTPσ has been shown to bind to neural CSPGs such as neurocan. Moreover, genetic deletion of PTPσ elicited axon regeneration in the adult mouse spinal cord. We hypothesized that Ncan and PTPσ would be expressed only in injured CNS tissue. Using RT-PCR, we found specific Ncan mRNA expression in injured CNS tissue and no expression in uninjured tissue. In contrast, our results for PTPσ showed mRNA expression in uninjured CNS tissue and no expression in injured tissue. Our results suggest that Ncan is indeed upregulated and PTPσ is down regulated in response to CNS insult. Future directions include determining the expression of Ncan and PTPσ mRNA following spinal cord injury and determining the effects of reducing PTPσ on axon regeneration.

Supported by U.S. Dept. of Defense W81XWH-10-1-0617, St. Thomas University.

BARRY UNIVERSITY - COLLEGE OF ARTS & SCIENCES

Department of Biology

54. Determining the role of Pif1p in meiosis.

Christian Bureu, Elizabeth Leblanc, and Leticia Vega (Department of Biology, Barry University, Miami Shores, FL)

Telomerase is a reverse transcriptase that maintains telomeric DNA. Pif1p is a helicase that negatively regulates telomerase (Zhou et. al., 2000) and helps to maintain mitochondrial function (Lahaye et. al., 1991). Pif1p is encoded by the PIF1 gene and exists in two forms: nuclear and mitochondrial. Wild type strains express both forms of PIF1, however strains containing the pif1-m1 allele express the nuclear form of Pif1p while strains containing the pif1-m2 allele express the mitochondrial form. Thus far, studies have mainly looked at the function of Pif1p during the mitotic cell cycle. Several studies suggest that there may be a role for Pif1p during meiosis. Two genomic studies, Chu et al., (1998) and Primig et al., (2000), examining the transcriptional profile during sporulation in budding yeast demonstrate that Pif1p is expressed in meiosis in both the W303 and the SK backgrounds. Additionally, a genomic wide screen designed to identify genes required for meiotic cell cycle progression in Saccharomyces cerevisiae found that PIF1 delete strains exhibit reduced sporulation efficiency and increased frequency of dyads rather than tetrads (Marston et. al., 2004). We are characterizing which form of Pif1p, nuclear or mitochondrial, is essential for meiosis to progress, as well as characterizing the expression levels of Pif1p during meiosis. To accomplish this, sporulation was induced in a wild type strain and in a pif1-m2 mutant to compare their ability to sporulate. Preliminary results indicate that during sporulation, numerous triads and dyads formed instead of the expected tetrads in the pif1-m2 strain, suggesting that nuclear Pif1p is involved in meiosis, but not essential to its progression. To determine expression levels of Pif1p throughout meiosis, cells will be sporulated synchronously and samples of culture will be taken throughout sporulation. Pif1p expression levels from these samples will be measured.

Supported by NIH-NIGMS/NCI MBRS SCORE grant, 5SC 2CA 138567 to LRV; NIH-NIGMS MARC Grant 5T34 GM008021-27, Barry University.

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