



# 44th Annual MACUB Conference Seton Hall University South Orange, New Jersey October 29, 2011



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**IN VIVO** is published three times yearly during the Fall, Winter, and Spring. Original research articles in the field of biology in addition to original articles of general interest to faculty and students may be submitted to the editor to be considered for publication. Manuscripts can be in the form of a) full length manuscripts, b) mini-reviews or c) short communications of particularly significant and timely information. Manuscripts will be evaluated by two reviewers.

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## 2012 Benjamin Cummings/MACUB Student Research Grants

Application is now open

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# MACUB 2011 Conference Poster Presentation Award Winners

## COMMUNITY COLLEGE

### Microbiology and Immunology

Rick Loh and Andrew Nguyen  
*Chemokine Production in Inflammatory Bowel Diseases*  
Queensborough Community College, Bayside, NY

Mengjia Lin<sup>1</sup>, May Myat Moe<sup>1</sup>, Engred Vanegas<sup>1</sup>, Kristen LaMagna<sup>2</sup> and Daniel Moloney<sup>2</sup>  
*The Effect of Various Compounds on the Prevention and Degradation of Staphylococcus Aureus Biofilms*  
<sup>1</sup>Queensborough Community College and <sup>2</sup>Stony Brook University, Stony Brook, NY

### Developmental Biology and Genetics

Kevin Chavez, Marjorie Morales, Patricia Schneider and Urszula Golebiewska  
*Comparative Genomics of Mycobacteriophage EricB Reveals Evolutionary Stability in Protein-Coding Regions*  
Queensborough Community College, Bayside, NY

### Environmental Biology and Ecology

Syed Nawaz, Ron Tillman and Christina Colon  
*The Distribution and Development of Horseshoe Crab Eggs (Limulus polyphemus) on Plumb Beach, Jamaica Bay, New York, and Negative Impact of Human Activity on Hatching Rate*  
Kingsborough Community College, Brooklyn, NY

### Biochemistry, Biophysics and Biotechnology

Daniel Andre Novoa<sup>1</sup>, Rafael Duran<sup>1</sup> and Sanjai Kumar<sup>2</sup>  
*Development of Nek2 Substrates Based on C-Nap1 Using Fmoc-based Solid Phase Peptide Synthesis*  
<sup>1</sup>Queensborough Community College, Bayside, NY and <sup>2</sup>Queens College, Flushing, NY

### Physiology, Neuroscience and Clinical

Ibukun Ikotun<sup>1</sup>, Christopher Welsh<sup>2</sup>, Edward J. Catapane<sup>2</sup> and Margaret A. Carroll<sup>2</sup>  
*The Presence of Octopamine in Ganglia and Tissues of Different Classes of Bivalve Molluscs*  
<sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College, Brooklyn, NY

Christiana Ojo<sup>1</sup>, Michael Nelson<sup>2</sup>, Trevon Adams<sup>2</sup>, Edward J. Catapane<sup>2</sup>, and Margaret A. Carroll<sup>2</sup>  
*Adenylyl Cyclase Inhibitors Reverse the Neurotoxic Effects of Manganese on Post-Synaptic Dopamine D2 Receptors*  
<sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College, Brooklyn, NY

Stephanie Perdomo<sup>1</sup> and Maria Luisa Cotrina<sup>2</sup>  
*Effect of High Ammonia on Neonatal Neuroglial Cells*  
<sup>1</sup>Queensborough Community College, Bayside, NY and <sup>2</sup>Columbia University/University of Rochester, NY

# MACUB 2011 Conference Poster Presentation Award Winners

## SENIOR COLLEGE

### Microbiology and Immunology

Dharm Patel, Genevieve Fasano and Michael A. Palladino  
*Effects of Lipopolysaccharide-induced Inflammation on Hypoxia-inducible factor-1 Expression  
in the Rat Testis*  
Monmouth University, West Long Branch, NJ

### Developmental Biology and Genetics

Camille Menendez, Scott Frees and Paramjeet S. Bagga  
*Development of a Bioinformatics Tool for Prediction of Evolutionarily Conserved Regulatory Motifs  
in Human mRNAs*  
Ramapo College of New Jersey, Mahwah, NJ

### Environmental Biology and Ecology

Angelo Montero, Edwin Pena, Megan Dunham and Carolyn Bentivegna  
*Performing Fluorescent Spectrometric Analyses to Distinguish the Excitation Wavelengths  
of Common Polycyclic Aromatic Hydrocarbons from Vitamins E and A in Fish Oil*  
Seton Hall University, South Orange, NJ

### Biochemistry, Biophysics and Biotechnology

Bryan Martin, Carlos Rivera, Victoria Schroeter and Dennis Rhoads  
*Changes in Expression of AMPA Receptors in Response to Chronic Alcohol and Tianeptine*  
Monmouth University W. Long Branch NJ

Eric Muller<sup>1</sup>, Marcia Correa<sup>1</sup>, Garner Soltes<sup>2</sup>, Mark Rose<sup>2</sup>  
*Determination of Fus3p MAP Kinase Phosphorylation Sites in the Formin Bni1p  
During the Mating Response of *Sacchromyces cerevisiae**  
<sup>1</sup>Iona College, New Rochelle, NY and <sup>2</sup>Princeton University, Princeton, NJ

### Physiology, Neuroscience and Clinical

Theodore R. DaCosta and Angela V. Klaus  
*Viability of Cultured Chick Cardiomyocytes is Not Affected by 24-Hour Treatment  
With High Fructose Medium*  
Seton Hall University, South Orange, NJ

# MACUB 2011 Conference Poster Presentation Award Winners

## MASTERS

Marni S. Crow<sup>1</sup>, Marlene Healey<sup>2</sup>, Carlos A. Molina<sup>1</sup>  
*The Proteasomal Degradation of ICER is Implicated in Melanoma Transformation  
Where Ras is Mutated*

<sup>1</sup>Montclair State University, Montclair, NJ and  
<sup>2</sup>University of Medicine and Dentistry of New Jersey, Newark, NJ

Michael C. Gutkin, Christopher P. Corbo, Linda A. Raths and Zoltan L. Fulop  
*Identification of Proliferating and Immunologically Active Cells  
in Surviving Organotypic Culture of Adult Zebrafish (*Danio rerio*) Optic Tectum*  
Wagner College, Staten Island, NY.

## DOCTORAL

Kari Wiedinger  
*The Effects of Glucocorticoids on Microglia Cell Function*  
Seton Hall University, South Orange, NJ.

## MACUB 2011 Conference Poster Abstracts

### Effects of Modified Green Tea Polyphenols on *Bacillus megaterium* Sporulation. Sylvia Akuwudike and Lee H. Lee, Montclair State University, NJ.

Sporulation of *Bacillus megaterium* was studied by using the combination of heat with different modified Green Tea polyphenols: GTP (mixed Green Tea Polyphenol), EGCG (Epigallocatechin gallate), and LTP (Lipophilic Green Tea Polyphenol). Green Tea polyphenols treatment have shown to inhibit growth of different bacteria and also affect bacterial sporulation. *Bacillus megaterium* spores were induced through process of starvation for 2 hours in sterile deionized water and then heated at 90°C for 20 minutes. The heated samples were treated with 10% of GTP, EGCG or LTP for 1 hour or 24 hours respectively and then plated onto nutrient agar plates with a countable range of 150 to 300 CFU (colony forming unit). The non-starved cells and starved cells without treatment were used as controls. The viability of *Bacillus megaterium* spores in 10% GTP treated samples showed 90% inhibition compared to the control after 24 hours-incubation at 37° C in both 1 hour and 24 hours treated samples. In the presence of 10% LTP and EGCG for 1 hour and 24 hours, no viable cells or colonies of *Bacillus megaterium* were detected. The results for both 1 hour and 24 hours treated samples were very similar, which suggested that these natural products retained stability and effectiveness in inhibiting growth of bacterial spores. This experiment suggest that these natural antimicrobial products could potentially be useful in the food industry as a mean of preventing food spoilage caused by spore-forming bacteria. This could also be used as antiseptics to prevent spore contamination in medical device.

### Investigations of Distyly and Self-incompatibility: Presence of $\alpha$ -dioxygenase in the Genome of *Primula polyantha*? Joel J. Alexander, II and Farshad Tamari, Kingsborough Community College, Brooklyn, NY.

Our research revolves around distyly in *Primula polyantha* of the plant family Primulaceae. Distyly is the occurrence of two floral morphologies in a given species. Short-styled plants have short pistils and long stamens and long-styled plants have long pistils and short stamens. Some distylous plants are self-incompatible. These plants do not produce seeds following self- and intra-morph pollinations. Distyly has been found in approximately 28 angiosperm families and was first identified in the Primulaceae. Of late, investigations have focused on the molecular genetics of distyly and self-incompatibility. One gene in particular,  $\alpha$ -dioxygenase, has received some attention in the genus *Turnera* of the Turneraceae. Our research focuses on two main questions: 1. Does the gene  $\alpha$ -dioxygenase appear in the genome of *P. polyantha*? And if yes, 2. Are there differences in the sequence of the gene compared to that of *Turnera* and also between short- and long-styled plants? We hypothesized that  $\alpha$ -dioxygenase is present in *P. polyantha* and that it will show sequence identity with that of *Turnera* and also between short- and long-styled plants. To do this, we extracted DNA from 8 short- and long-styled plants of *P. polyantha*. Presence of DNA was ascertained using agarose gel electrophoresis. This was followed by amplification of part of the gene using PCR with primers against *Turnera*-specific  $\alpha$ -dioxygenase. The samples were then sent out for sequencing. Where sequences are reliable, there is 100% identity in the sequence of  $\alpha$ -dioxygenase for *Primula* compared to *Turnera* and for short- compared to long-styled plants in our study. This work was supported by grants 2R25GM06003-05 of the Bridges to the Baccalaureate Program of NIGMS and grant 0537101091 of the CSTEP Program of the NYS Department of Education and a President's Faculty Innovation Award to F.T.

### Analysis of the sperm-specific histone H1 linker-like protein in 12 species of *Drosophila*. Zain A. Alvi<sup>1</sup>, Tin-Chun Chu<sup>1</sup>, Valerie Schwaroch<sup>2</sup> and Angela V. Klaus<sup>1</sup>. <sup>1</sup>Seton Hall University, South Orange, NJ and <sup>2</sup>Baruch College, City University of New York, NY.

Current evolutionary theory states that protamines and protamine-like proteins evolved from histone linker-like proteins. Collectively, these three types of proteins are referred to as sperm nuclear binding proteins (SNBPs). The current study is aimed at analyzing putative nucleotide and protein sequences in the histone H1 linker-like proteins in 12 *Drosophila* species based upon the reference sequence of one histone linker-like protein (MST77F) found to be involved in chromatin remodeling in sperm nuclei in *Drosophila melanogaster*. Our initial analysis indicates that MST77F is conserved in the melanogaster species subgroup, but not conserved in the rest of the subgenus *Sophophora* or subgenus *Drosophila*. The initial analysis was conducted using NCBI BLAST. The best matches from each *Drosophila* species were aligned using CLUSTALW. A local alignment algorithm based application called T-Coffee was used to find conserved regions among the 12 *Drosophila* species. The H1 linker-like protein and conserved domains in MST77F were then analyzed with BindN – RF and BindN+ for all potential DNA binding sites. Additionally, DNA Binder, a DNA binding predictor, was used to verify that MST77F and the conserved regions are DNA binding proteins or regions. The convergence of these results for T-Coffee, DNABinder, BindN-RF and BindN+ allowed for the determination of putative DNA binding domains in MST77F. An analysis of the percentage and total number of amino acids found in the matches for MST77F was conducted using Graphpad Prism 5.0. Additionally, we have designed primers to isolate and sequence MST77F regions in the genomes of *D. simulans* (*D. melanogaster*'s close relative), and *D. pseudoobscura*. Our overarching hypothesis is that the types of SNBPs present in the sperm nucleus will affect the pattern of chromatin condensation, which in turn will affect the species-specific shape of the sperm nucleus. We thank the Seton Hall Department of Biological Sciences for funding this work.

### Safe Handling and Disposal of Chemical Waste. Melissa Anthony<sup>1</sup>, Anthony McKenzie<sup>2</sup>, Peter Pohlot<sup>2</sup> and Joe Pavlak<sup>2</sup>, <sup>1</sup>Medgar Evers College, Brooklyn NY and <sup>2</sup>Brookhaven National Laboratory, Upton, NY.

In recent years the USEPA began fining institutions for violating the Resource Conservation and Recovery Act Hazardous Waste Program. To meet the compliance statute to reduce the chemical footprint of a laboratory such as Brookhaven National Laboratory (BNL), removal of old and unused chemicals was the main focus of this plan. Examining waste generated by researchers and moving it to satellite areas was a priority. Chemicals and/or waste were classified as extremely hazardous, hazardous, non-hazardous, and/or non-regulated. Each chemical was evaluated and characterized based on potential hazard. The information was recorded on a "Non-Radioactive Waste Control Form." If the contents were deemed hazardous by USEPA criteria, the containers received red hazardous stickers. If USEPA criteria don't restrict the chemical but a Department of Transportation (DOT) criterion does, it receives green non-hazardous stickers. If neither USEPA's nor DOT consider the contents hazardous then it is placed in a drum and considered as Non-Hazardous/Non-Regulated. Most chemicals at BNL are in the computerized Chemical Management System (CMS) and have received an identification barcode upon arrival. If there is a unique barcode on the container to be removed, it was recorded and later removed from the CMS. Once characterized, the chemicals were moved from satellite accumulation areas to 90-day accumulation rooms. Once there, all Non-Radioactive Waste Control Forms were given to Waste Management, and the chemicals were disposed of properly. This summer, we removed 397 pounds of hazardous waste and 979 pounds of non-hazardous waste which could have easily found itself in our waterways if it wasn't removed according to the USEPA and DOT standards. Through constant reinforcement of safety, USEPA, and DOT guidelines, we learned how valuable removal of waste is, not just for safety purposes, but also for the well being of the environment, our health, and the health of future generations.

**Imaging Primary Cilia in Pancreatic Cancer Tumor Initiating Cells.** Gina M. Auricchio, Jennifer M. Bailey, Florencia McAllister, Anirban Maitra and Steven D. Leach, Johns Hopkins University School of Medicine, Baltimore, MD.

Primary cilia are microtubule rich projections emanating from the apical surface of epithelial cells. Primary cilia are responsible for the transduction of growth factor and morphogenetic signaling pathways, including the hedgehog, wnt and platelet-derived growth factor pathways. Initial observations in the field of pancreatic cancer have suggested the absence of primary cilia in human pancreatic intraepithelial neoplasia (PanIN) and pancreatic ductal adenocarcinoma. While absent in the majority of pancreatic cancer cells, primary cilia have been identified in differentiated acinar cells undergoing an acinar to ductal metaplasia. This metaplasia is well characterized in pancreatic injury and regeneration models and accelerates tumor formation in the presence of acinar specific KrasG12D mutations. Thus, we are addressing the hypothesis that primary cilia, while not expressed in bulk tumor populations, are maintained in pancreatic tumor-initiating cells. To address this hypothesis, we have used confocal microscopy to quantify the percentage of cells within low-grade human PanIN lesions that express a primary cilium. Performing confocal microscopy on a human PanIN tissue array (n=23), we have determined that in 15% of PanIN lesions, 13-30% of the cells are expressing a primary cilium, as is evidenced by staining for acetylated alpha tubulin (AAT). We have also employed confocal microscopy to image mPanIN lesions from a mouse model of pancreatic cancer that expresses the most common mutation in pancreatic cancer, KrasG12D, specifically in the acinar compartment of the pancreas.<sup>2</sup> In this mouse model, we visualize primary cilia in cuboidal epithelium present in transitional lesions that we hypothesize are the earliest mPanIN initiating cells. These data are informative regarding the earliest initiating events in pancreatic cancer. This research was supported by the PANCAN-AACR Pathway to Leadership grant to JMB. We would like to acknowledge Donald and Evelyn Spiro for their funding to Gina Auricchio.

**Sensory Motor Integration of Gill Lateral Cilia in the Bivalve Mollusc, *Crassostrea virginica*.** Zeekanapi Bandaogo, Patrick Akande, Margaret A. Carroll and Edward J. Catapane, Medgar Evers College, Brooklyn, NY.

Lateral gill cilia of *Crassostrea virginica* and *Mytilus edulis* are controlled by a reciprocal serotonergic-dopaminergic innervation. Most other bivalves also have lateral cilia which respond to serotonin and dopamine when applied to the gill. While the motor aspects of this control have been well studied, the sensory side has not. Here we examined effects of sensory cues on beating rates of lateral cilia of the gill of *C. virginica*. Beating rates were measured in whole animal preparations. Irritating the mantle rim caused a 70% drop in beating rates that lasted for at least 15 minutes. Similarly, shining a light on the mantle rim decreased beating rates by 50%. Applying crab extract to the chambers had the strongest sensory effect, reducing the beating rates to zero. When the branchial nerve, which emanates from the visceral ganglia and directly innervates the gill, was cut the crab extract did not have any effect on the cilia. In other experiments, when the cerebrovisceral connective, which emanates from the cerebral ganglia and goes to the visceral ganglia, was cut the basal cilia rate was lower than controls and the crab extract was still effective in further slowing the beating rate. Since the mantle rim is a major site of sensory cells in the animal, we excised the rim from the animals and applied crab extract. The absence of the mantle rim prevented the crab extract from affecting the cilia beating rates. The study demonstrates a sensory-motor integration of the beating rates of the lateral cilia which involves the sensory rim of the mantle and the visceral and cerebral ganglia. It appears that the animals may be interpreting the sensory cues as hostile. In their natural environment, they would then close their shells, reducing their water pumping rates with a corresponding drop in cilia beating rates.

**Potential Synergistic Effect of Fruit Peel Solutions on Antiseptics and Antibiotics.** Daniel Barnes, Kaitlyn Esposito and Tin-Chun Chu. Seton Hall University, South Orange, NJ.

Prior studies suggested compounds present in fruit peels have had antibacterial effects. In this study, three fruit peel solutions including grape, mango, and orange peel solutions were evaluated. Both gram negative bacteria, *Escherichia coli* and *Enterobacter aerogenes* as well as gram positive bacteria, *Bacillus subtilis* and *Staphylococcus epidermidis* were used in this study. Bacterial growth with and without the fruit peel solutions were monitored by spectrophotometer and the growth curves have been generated accordingly. Over a six hour period monitored, grape peel solution showed the best inhibition on the bacteria tested; 42.5% inhibition on *E. coli*, 51.0% inhibition on *E. aerogenes*, 100% inhibition on *B. subtilis* and 56.3% inhibition on *S. epidermidis* when 5% Grape peel solution is added. Disc diffusion methods were used to evaluate the synergistic effect of fruit peel solutions and various antiseptics. Grape peel solution also showed synergistic effect of some antibiotics such as neomycin and streptomycin against *S. epidermidis* while Kanamycin against *E. coli*.

**More Taxa or More Characters - Which Dataset Is Better?** Stefan Barone<sup>1</sup>, Valerie Schawaroch<sup>1,2</sup>. <sup>1</sup>Baruch College, NY and <sup>2</sup>American Museum of Natural History, NY, NY.

What is a sufficient amount of taxa and characters to sample in order to generate a robust evolutionary hypothesis? The *Drosophila melanogaster* species group is well suited for addressing this question because it has a varying number of taxa sampled for several genes. This investigation will analyze data previously published in Schawaroch (2002) and DaLage, *et al.* (2007). Phylogenetic analyses were performed on combined and separate datasets with either complete or incomplete taxon sampling. Missing gene sequence was coded with question marks (?). All analyses were heuristic searches employing a maximum parsimony criterion in PAUP\*. Comparisons were made amongst the trees generated from the various analyses above, Schawaroch (2002) and DaLage, *et al.* (2007) for the recovery of clades previously established by morphological investigations. The stability of these clades was examined with measures of Bremer and bootstrap values. The results of this study will not only provide a hypothesis of phylogenetic relationships within the *melanogaster* species group, but insight on how increasing the amount of characters or taxa affects the reconstruction of phylogenies. In addition, this study examines the affects of missing data (?) on phylogenetic reconstruction. The early phases of this project were supported by a Benjamin Cummings/MACUB Student Research Grant and the WSAS of Baruch College.

**The Integrated Water Front Plan - How Brooklyn Bridge Park Fits In.** Michelle Batchu, Mamuna Faizi, Jennifer McCormick, Lauren Clark, Melissa Magenta, Alina Zhyvotovska and Kathleen Nolan, St. Francis College, Brooklyn, NY.

The Brooklyn Bridge Park is a new park that opened in Brooklyn, NY in 2010. St. Francis College students have conducted over 3000 surveys on park usage and are using the results to help inform future usage of the park. Students have also participated in seining activities sponsored by the park in order to determine the level of biodiversity and have compared it to that of Fire Island. The Brooklyn Bridge Park has increased public access to the waterfront, which is one of the key ecosystem characteristic on the New York Harbor Estuary Restoration Plan. This project has allowed students to collect data and see connections between biology, park development and urban planning.

**Ultrastructural analysis of the male reproductive tissues of *Drosophila pseudoobscura*.** Michael Beaury, Robert W. Yates and Angela V. Klaus. Seton Hall University, South Orange, NJ.

High resolution details of the tissue morphology of fruit fly male reproductive tracts is available for very few species, and only *Drosophila melanogaster* has been characterized in a systematic manner. In the current work, we characterized the ultrastructural morphology of the testes, seminal vesicles and accessory glands of *Drosophila pseudoobscura* using transmission electron microscopy (TEM). We are particularly interested in *D. pseudoobscura* because we have recently developed a novel system for culturing *D. pseudoobscura* sperm in vitro. The walls of the testes and seminal vesicles are composed of an outer pigment layer and an inner smooth muscle layer, similar to what has been reported for *D. melanogaster* and *Anastrepha ludens*. The epithelium of the seminal vesicles in *D. pseudoobscura* has a convoluted morphology that is similar to what has been reported in *D. bifurca*. This is interesting because these species are very distantly related and the gross morphology of their seminal vesicles is very different. Additionally, we have identified a novel membrane specialization that forms between developing spermatogenic cysts and the basal epithelium in *D. pseudoobscura* pupal testes. The structure is usually associated with large "voids" that may represent coiling cysts. We thank the Seton Hall Department of Biological Sciences for funding this work and Dr. Sara Guariglia (College of Staten Island, Advanced Imaging Facility) for valuable assistance with TEM.

**Atlantic Ribbed Mussels (*Geukensia demissa*) from Plum Beach, Jamaica Bay and Fort Wadsworth, Staten Island are not Separate Mussel Populations.** Dennis Delfor Bejarano, Gary Sarinsky, Craig Hinkley. Kingsborough Community College, Brooklyn, NY.

Our goal is to examine species and genetic diversity within New York bays to evaluate the health of these ecosystems. As a first step, we examined whether Atlantic ribbed mussels from Plum Beach in Jamaica Bay and Fort Wadsworth in Staten Island are separate populations. Our hypothesis was that mussels from these two locations represent separate populations. To test this hypothesis, we extracted DNA from gill and mantle tissue of mussels and then amplified a region of the cytochrome oxidase I gene using the polymerase chain reaction (PCR). The correct sizes of the PCR products were verified by agarose gel electrophoresis and then the PCR products were sequenced by Elim Biopharmaceuticals. The ten mussel sequences can be placed into ten haplotypes, which implies there is a large degree of variation within the ribbed mussels from Plum Beach and Fort Wadsworth. Estimates of average evolutionary diversity ( $d$ ) for ribbed mussels from Plum Beach was  $d = 0.01302$  (S.D. = 0.00324) and from Staten Island  $d = 0.01237$  (S.D. = 0.00338). Using a two-tailed t-test with  $\alpha = 0.05$ , we failed to reject the null hypothesis that average diversity between the two groups was the same,  $p$ -value = 0.7642. Phylogenetic tree analysis showed that the DNA sequences from Plum Beach and Staten Island were not grouped into separate clades. These data suggest that the ribbed mussels from Plum Beach and Staten Island represent one population and we therefore reject our hypothesis that there are two populations. In conclusion, our data indicates there is one population of ribbed mussels and there is a large amount genetic variation within this population. This work was supported by grants 2R25GM06003-05 of the Bridges to the Baccalaureate Program of NIGMS and grant 0537101091 of the CSTEP Program of the NYS Department of Education.

**Adenosine Receptor Expression in the Adolescent Brain Following Chronic Caffeine and Alcohol Consumption.** Patrycja Bolewska, Kelly Jenkins and Dennis Rhoads, Monmouth University, W. Long Branch NJ.

Consumption of caffeinated alcoholic beverages is a growing and alarming trend, particularly among students. Previous work from this lab has modeled caffeine/alcohol co-consumption in adolescent Long-Evans rats and showed that caffeine dependency made prior to alcohol consumption lessened severity of subsequent alcohol withdrawal symptoms. The present study was designed to probe the underlying changes in the adolescent brain occurring as a response to chronic alcohol, caffeine or the combination of alcohol and caffeine. Preadolescent Long-Evans rats were given regular water or caffeinated water during a 10-day pretreatment period. Following this period, 4 groups were established: 1) rats continuing regular tap water; 2) rats continuing caffeinated water; 3) rats from the water group switched to an alcohol-containing liquid diet; and 4) rats from the caffeine group switched to an alcohol- and caffeine-containing liquid diet. After an additional 20 days, microsomal and synaptosomal fractions were isolated from the brain using subcellular fractionation. Western blot analysis was used to probe two receptors, Adenosine A1 and Adenosine A2a, the primary targets of caffeine in the brain. The A2a receptor was detected in all fractions at the expected mass of 45kDa. We found that there were no statistical differences in A2a receptor density among treatment groups. The A1 receptor was also detected at the expected mass of 39kDa. Work is continuing to test for differences between treatment groups. The findings of our research can contribute to a better understanding of alcohol withdrawal and of the possible implications of combining caffeine and alcohol in beverages.

**Development of an Assay for the Effects of Prostaglandin Receptor EP4 on Osteoblast Differentiation.** Kathleen Carpio and Thomas Owen, Ramapo College of New Jersey, Mahwah, NJ.

Osteoporosis is a common bone disease that results from the gradual thinning of bone tissue, with an associated loss of bone density and increased fracture risk. Prostaglandin E2 (PGE2) is a small molecule that regulates many physiological functions, including maintenance of bone mass, through its binding to any of four cell surface receptors (EP1-EP4). Studies performed in both *in vitro* and *in vivo* model systems have shown that the EP4 receptor is the primary PGE2 receptor through which bone mass is regulated. To further examine the role of EP4 in bone mass, ROS 17/2.8 rat osteosarcoma cells were stably transfected with a plasmid from which the EP4 receptor is overexpressed on the cell surface or were left untransfected. Half of the untransfected ROS cells and half of the ROS-EP4 cells were treated at plating with PGE2 (1000 nM final) while the other half of each cell line was treated with DMSO vehicle (0.1% final). Over the 12 day experiment, the media was replaced every 3 days with the same media as at plating. At days 6 and 12 after plating, half of each type of cell culture (both vehicle and PGE2 treated) was harvested for measurement of alkaline phosphatase enzyme activity, a marker of osteoblastic activity. A preliminary assay for alkaline phosphatase activity confirmed that the cells exhibited enzymatic activity. This project was supported by a grant from the Ramapo College Foundation.

**Role Of Sit-1 In Osteoblast Function.** Sarah Carrante<sup>1</sup>, Tom Owen<sup>1</sup>, Fayez Safadi<sup>2</sup> and Steve Popoff<sup>2</sup>, <sup>1</sup>Ramapo College of NJ, Mahwah, NJ and <sup>2</sup>Temple University School of Medicine, Philadelphia, PA.

Bones are constantly reshaped throughout life by the balanced action of two cell types: osteoblasts, which form bone and osteoclasts, which resorb bone. Osteoporosis is a decrease in bone mass, which occurs when the actions of these two cell types become unbalanced. Our overall goal is to discover novel genes involved in bone formation to better understand osteoblast function. In previous studies by our collaborators at Temple University School of Medicine, 160 genes involved in the regulation of bone mass in rats were isolated. We have identified one of these genes as Sit-1, a member of a family of transmembrane adapter proteins, which recruit other signaling proteins to the cell membrane. Sit-1 has been reported only in the context of T-cell receptor activation and has not been previously reported in bone. In T-cell receptor signaling, Sit-1 is phosphorylated by the non-receptor tyrosine kinase c-src. It has long been known that by either knocking out the c-src gene in mice or downregulating its expression in cultured osteoblasts, bone formation increases. We propose that Sit-1 may be a crucial part of the c-src signaling pathway related to regulation of bone mass by osteoblasts. To address this question, we have cloned full-length rat Sit-1 in an expression vector and are designing siRNAs to silence its expression in order to carry out functional studies in cells. We will analyze the effects of either Sit-1 overexpression or Sit-1 silencing by measuring changes in the osteoblast marker enzyme alkaline phosphatase in ROS 17/2.8 osteoblasts. This research was partially funded by the Benjamin Cummings/MACUB Research Grant.

**PC12 Cells as a Model for Ion Channel Interaction and Vesicle Release Feedback Mechanism in Neurosecretory Cells.** Paul Castellano, Jennifer C. Guercio, and Elena Petroff, Montclair State University, Montclair, NJ.

Neurotransmitter release is a way of neuronal communication in the chemical synapse. The large conductance  $Ca^{2+}$ - and voltage-activated  $K^+$  (BK) channels are important regulators of neurotransmitter release. They regulate action potential firing and provide repolarization of the presynaptic membrane. We have previously shown that Acid-Sensing Ion channels (ASICs) interact with BK and inhibit them at normal pH. This inhibition is relieved at acidic pH (Petroff et al, PNAS, 2008), and both of these channels are present at the presynaptic membrane. We hypothesize that, upon the release of the synaptic vesicle in neurons or the secretory vesicle in secretory cells, the extracellular environment is acidified, leading to the release of BK inhibition by ASICs. This may generate a feedback mechanism to control vesicular release. Our previous data shows that, consistent with our hypothesis, synaptic transmission in cultured neurons from ASIC knockout mice is increased compared to the wild type neurons. We are using neurosecretory rat pheochromocytoma (PC12) cells as a model of the presynaptic terminal and are studying  $Ca^{2+}$  transients leading to vesicle release and the effect of pH on these transients. We hypothesize that since membrane repolarization would be achieved more rapidly in acidic pH, due to the BK channel opening, the  $Ca^{2+}$  transient would be smaller when compared to normal pH conditions. As a control, we use bafilomycin to block the vesicle proton pump to prevent pH changes in the environment when vesicles are released. (This work is supported by an R15 NIH grant to EP.)

**Influence of Antioxidants on Cellular Migration and Protection from Oxidative Stress.** Vivian Chang, Jazmin Juarez and Dorothy Lobo. Monmouth University, West Long Branch, NJ.

Resveratrol is a strong antioxidant and natural phytoalexin often found in red grapes and wine. It has been seen to have positive effects on metabolism and anti-cancer activity. Currently, our lab has been studying the regulation of cadherins, important proteins for cellular adhesion, in normal fibroblasts and fibrosarcoma cells. It is also being investigated whether antioxidants, such as resveratrol and N-acetylcysteine (NAC), can influence the control of cadherins, proliferation, or migration. Dishes of HT-1080 fibrosarcoma cells were treated with 10, 25, and 50  $\mu$ M resveratrol, resulting in inhibited cellular proliferation. While  $H_2O_2$  inhibited both proliferation and cell migration, causing cells to senesce, NAC showed not to have such an inhibitory effect. NAC treatment also did not protect the cells against  $H_2O_2$ -inhibition. Currently, we are testing if treatment with resveratrol can provide protection against  $H_2O_2$ -inhibition of proliferation/migration or alter expression of cellular signaling proteins, including cadherins.

**Comparative Genomics of Mycobacteriophage EricB Reveals Evolutionary Stability in Protein-Coding Regions.** Kevin Chavez, Marjorie Morales, Patricia Schneider and Urszula Golebiewska, Queensborough Community College, Bayside, NY.

Mycobacteriophages are viruses that infect members of the genus *Mycobacterium* which includes the pathogen *Mycobacterium tuberculosis*. The phages inject their double-stranded DNA into the mycobacterium and then use the host cell transcriptional and translational machinery to generate new infectious phage particles. Phages can acquire host genes and many mycobacteriophage gene sequences are similar to those of the mycobacteria. Recombination also results from horizontal gene transfer between phages during infection with multiple viruses. As a result of these events, the majority of mycobacteriophage genomes have mosaic architecture. Comparative genomic analysis can provide insight into the evolution of mycobacteriophages. The aim of this project was to analyze the genome of mycobacteriophage EricB which was isolated by Kevin Bradley of the Howard Hughes Medical Institute (HHMI) National Genomics Research Initiative. After sequencing by HHMI, the EricB genome was provided to us for annotation and additional analysis. Initially, we used the bioinformatics software bundled into HHMI workflow, including the programs GenBank, Glimmer, Apollo, GeneMark, GeneMark TB, tRNA Scan-SE, ARAGORN, Gene Browse, and Phamerator. The annotations were performed in Apollo and Phamerator was used to make comparisons with other mycobacteriophages. We further expanded the analysis of EricB using additional tools including the Geneious platform and NCBI Blast. The genome was found to have mosaic architecture which included transposing mycobacteriophage mobile elements, HNH endonuclease, holin, and temperature-sensitive repressor proteins. Comparative genomics revealed nucleotide differences between its closest phage relative, Jeffabunny in the A6 cluster, and identified intron splicing. Analysis also revealed a frameshift tail protein due to a ribosomal slippage sequence as well as a plasmid partitioning system to aid in infection. Further studies will include analysis of the ParA segment of the plasmid partitioning system. Kevin and Monica are participants in the NIH Bridges to the Baccalaureate Program at Queensborough Community College.

**Investigating Scientific Evidence about Effectiveness of Scientific Oils from Different Cultures. Chamir Chouloute and Kumkum Prabhakar. Nassau Community College, Garden City, NY.**

Historically, oil-derived from plants had been a component in treating ailments in the human body. Use of these oils extends from different parts of the world and for different purposes. Although there is considerable anecdotal information about the medicinal qualities of these oils, little scientific and clinical evidence is available to demonstrate the safety and effectiveness of these culturally used oils. This study involves investigation of garlic, lavender, castor and red palm oil and their influence in prokaryotic and eukaryotic systems. In addition, it explores the effectiveness of oils as an antimicrobial agent against *Escherichia coli* and *Bacillus cereus* and their effect on the growth and development of brine shrimp. Data was collected by measuring zones of inhibition using the disc diffusion method for *E. coli* and *B. cereus*. Various developmental stages of brine shrimp grown in sea water with different oils were recorded with Motic Digital Microscope. The lavender and castor oil revealed considerable antimicrobial activity against *E. coli* and *B. cereus*. Palm oil did not show any inhibitory activity against *E. coli* or *B. cereus*. Surprisingly, there was no halo in the set up with commercial garlic oil, whereas, largest halo was observed by using natural fresh garlic. Brine shrimp cyst hatched differentially in commercial garlic oil, castor oil and red palm oil. Although further research is required, the present data supports medicinal uses of lavender and castor oil as an antimicrobial agent, whereas commercial garlic oil and castor worked best for the growth and development of brine shrimp. This investigation was as an independent study course (Bio 699) under the guidance of Dr. Kumkum Prabhakar in the biology department at Nassau Community College.

**A Pilot Study of Herbivory Using Image J in Two New York City Parks. Lauren Clark, Alina Zhyvotovska, Michelle Batchu, Gaetano Musarella-Conti, Mamuna Faizi, Allen Burdowski and Kathleen Nolan, St. Francis College, Brooklyn, NY.**

The Saint Francis College Biology department is currently conducting a research project Over 500 leaves were collected from 7 different tree species from two different parks. The Brooklyn Bridge Park is a new park that opened in 2010 in Brooklyn. The Riverdale Park is in the Bronx. The leaves were gathered in both Brooklyn Bridge Park and Riverdale Park in order to determine the percentage of herbivory (part of leaf that is missing) in each sample. We used a java based image processing program called ImageJ, produced by the National Institute of Health that is free and downloadable This program provided us with the tools necessary to edit, analyze, display, process and save 8-bit images. The results that we obtained were then combined and used to identify the total percentage of herbivory that occurred in the various types of trees from the two parks. An overall average of less than 4% was obtained for the leaves. In the future the results of these studies could be used to determine specific indicators in the cause of herbivory such as environmental conditions or various animals and insects.

**The Proteasomal Degradation of ICER is Implicated in Melanoma Transformation Where Ras is Mutated. Marni S. Crow<sup>1</sup>, Marlene Healey<sup>2</sup>, Carlos A. Molina<sup>1</sup>. <sup>1</sup>Montclair State University, Montclair, NJ and <sup>2</sup>University of Medicine and Dentistry of New Jersey, Newark, NJ.**

The putative tumor suppressor protein inducible cAMP early repressor (ICER) is targeted for ubiquitin-mediated proteasomal degradation via activation of the mitogen activated protein kinase (MAPK) pathway [1]. We show a direct relationship between Ras/MAPK-mediated melanoma tumorigenesis and the proteasomal degradation of ICER. Using both R545 cells which are isolated from Tyr/Tet-Ras INK4a-/- mice [2] and the transgenic mice themselves allowed for melanoma genesis and maintenance to be controlled by H-RasV12G expression. We found ICER is negatively regulated in R545 cells, completely absent during melanoma genesis and highly expressed in regressing melanomas. The regulation of ICER in Ras-induced transformation is post-translational as indicated by consistent ICER mRNA levels. By inhibiting Ras activity or the proteasome, we found reconstituted levels of ICER indicating that ICER regulation is associated with the RAS oncogene that targets ICER for proteasomal

degradation. Forced expression of ICER in R545 cells displayed a reduced proliferation rate, a reestablishment of anchorage-dependent growth, and inhibition of tumorigenicity in nude mice. We found a marked decrease in cyclin D1 expression in R545 cells as a result of ICER binding the CRE in the promoter region of cyclin.

**Viability of Cultured Chick Cardiomyocytes is Not Affected by 24-hour Treatment With High Fructose Medium. Theodore R. DaCosta and Angela V. Klaus, Seton Hall University, South Orange, NJ.**

Fructose is a six-carbon polyhydroxyketone, and an isomer of glucose, having the same molecular formula (C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>) but different structure. Fructose is a monosaccharide that can be used by the body for energy and is passively transported across membranes via its primary transporter, GLUT5. In the fructose glycolytic pathway, the first step is the phosphorylation of the fructose monosaccharide by fructokinase. Fructose can also be phosphorylated by hexokinase but its affinity is not as strong. Using embryonic chick cardiomyocytes, we have begun studies that will test the ability of the cultured heart cells to take up and metabolize fructose, while looking for the effects fructose has on cardiomyocyte physiology. In the current work, embryonic chick cardiomyocytes were isolated and used to study the effects of high fructose medium on the viability of cultured heart cells. The cultured chick cardiomyocytes were exposed to three concentrations of fructose: 5 mM, 20 mM and 40 mM. The control cultures were grown with glucose only. Cultures were incubated with fructose medium for 24 hours at 37 degrees Celsius and 5% CO<sub>2</sub> and then cell viability was assessed using calcein-AM staining. Viability was 100% for all control and experimental cultures after 24 hours. Our results are consistent with a recent paper that demonstrated for the first time that the GLUT5 transporter is present in rat ventricular tissue (Mellor et al., 2011), Fructose modulates cardiomyocyte excitation-contraction coupling and Ca<sup>2+</sup> handling in vitro, PLoS One 6(9): e25204). Our continuing work will focus on longer term exposure to high fructose medium in cultured chick cardiomyocytes and on the isolation of GLUT5 mRNA from embryonic chick ventricular heart tissue. We thank the Seton Hall Department of Biological Sciences for funding this work. We gratefully acknowledge Dr. Allan Blake and Zain Alvi (SHU) for many helpful discussions.

**Electron Microscopic Analysis of Cell Membrane Integrity When Expressing Tau Pseudophosphorylated at Positions T212, T231 & S262. Leonid Denisenko<sup>1</sup>, Christopher Corbo<sup>1,2</sup>, Alejandra del Carmen Alonso<sup>2</sup>, <sup>1</sup>Wagner College and <sup>2</sup>CUNY College of Staten Island, Staten Island, NY.**

Tau is a microtubule associated protein (MAP) found abundantly in animal neuronal cells. Tau is responsible for stabilizing microtubule structure by binding to tubulin. When tau becomes hyperphosphorylated, it loses its ability to bind to tubulin. This hyperphosphorylation leads to various tauopathies including Alzheimer's disease. Previous research has shown that pseudophosphorylated tau at the specific amino acid residues T212, T231 and S262 (pseudophosphorylated tau, P-tau) will cause the protein to behave much like the disease tau molecule seen in the various tauopathies. P-tau constructs were generated by site directed mutagenesis, switching the serine or threonine with glutamic acid, mimicking the charge of being phosphorylated at this site. Additionally, the hyperphosphorylated tau will aggregate within the cell soma and sequester healthy tau protein causing it also to no longer bind microtubules. The loss of functional tau within the cells will result in cell death, as it is no longer able to maintain structural integrity or conduct intracellular transport of molecules. Neurodegeneration due to hyperphosphorylated tau is believed to be a primary cause of Alzheimer's disease. In this study, scanning electron microscopy was used to show the appearance of membrane blebbing, where portions of the membrane bulge out. Chinese hamster ovarian fibroblasts (CHO) cells were transfected with wild type tau and P-tau. Wild type tau showed minimal to no membrane blebbing while P-tau-positive cells demonstrated blebbing very frequently. The data suggests that pseudophosphorylated tau is linked to cell degeneration either through membrane disruption due to lack of stabilization and that the abnormal protein might be released to the extracellular space suggesting a putative mechanism of disease transmission.

**Growth and Avoidance Behavior in Response to Food Sources in the Red Worm (*Eisenia foetida*). Scott Dorante and Georgia Lind, Kingsborough Community College, Brooklyn, NY.**

My experiment was a nutritional project: Use common foods and test them on red worms. I investigated the size and growth of *Eisenia foetida* fed healthy and unhealthy diets. I thought the food source would make the worms grow bigger or not grow, depending on how healthy the food was for the worms. In addition, the foods seemed to influence worm behavior. Two hundred worms were divided into nine treatments and one control. Each box received 10 g of oats and 10 g of other materials. The control group had 20 g oats. I fed the worms every 5 to 7 days. Later, boxes were switched from cardboard to plastic, with 12 worms in each box. I used soil, newspaper and distilled water throughout the experiment. The first boxes allowed the worms to escape. When they didn't like the foods, some moved out. When the boxes were changed, there were three results. 1) Some of the worms died in the boxes (worm bodies were found). 2) Even with smaller exit holes, some worms left. 3) Some of the food sources did not repel the worms, and worms stayed (or moved in) and grew. Below are some typical results (All average worm mass). Vegetables with oats: twenty worms, start 0.24 g, end, 0.72 g., only five worms stayed. In a similar result: 12 worms, start 0.29 g., end 0.45 g, only 2 worms left. Results for two non-migratory boxes were: start, 12 worms, 0.34 g; end, 12 worms, 0.61g. With fruits and vegetables with oats, worms both grew and were attracted to the box. Start: 12 worms avg. 0.35 g; End: 15 worms, avg. 0.77 g. I conclude that different food sources do result in different growth patterns in red worms. In addition, foods seem to influence worm behavior.

**The Effects of Manganese and Copper on Mitochondrial Membrane Potential in the Gill of *Crassostrea virginica*. Kirby Dorce<sup>1</sup>, Fiona Dailey<sup>2</sup>, Beatrix Boissette<sup>2\*</sup>, Margaret A. Carroll and Edward J. Catapane, <sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College, Brooklyn, NY.**

Accumulations of manganese (Mn) or copper (Cu) is characteristic of the neurodegenerative disorders Manganism and Wilson's Disease, respectively. The mitochondrion is a source and target of oxidative stress. Previously we found gill mitochondria from the oyster *Crassostrea virginica*, treated with Mn or Cu, had impaired oxygen utilization. Oxidative damage causes a loss of mitochondrial membrane potential (MMP) with associated mitochondrial dysfunction. Here we used two fluorescent dyes, TMRM and JC-1, to determine effects of Mn and Cu treatments on MMP. Mitochondria from gill of *C. virginica* were isolated and treated. For JC-1 we compared fluorescence intensities at 525 nm ex and 590 nm em of Mn treated (50 - 150 mM) mitochondria to that of control. Mn treated showed dose dependant decreases in fluorescence of up to 70%. For TMRM we compared slopes of the 573/564 nm ex, 590 nm em fluorescence intensity ratio. Decreasing slope indicates loss of MMP. Treating isolated mitochondria with Cu resulted in a dose dependant reversal in the slopes from 20 to -20 and from 15 to -3, respectively. Cu was significantly more toxic than Mn and both fluorescent dyes were equally effective in demonstrating that short-term treatments with either Mn or Cu could de-energize gill MMP. This information correlates well with our previous findings on the toxic effects of both Mn and Cu on mitochondrial respiration. Identifying the molecular and cellular mechanisms of metal-induced oxidative stress will provide a better understanding of the pathophysiological features of neurodegenerative disorders associated with metal toxicity.

**Analyzing the Effect of Phthalates on the Development of *Drosophila melanogaster*. Lisa Duncan, Joanna Emilio and Heather Cook Wagner College, Staten Island, NY.**

The effect of endocrine disrupting chemicals (EDCs) on human and wildlife health, reproduction and development has been of growing concern over the past couple of decades. EDCs disrupt the production and/or biological activity of chemical messengers known as hormones. Hormones regulate a wide array of fundamental biological processes including homeostasis, metabolism, reproduction, growth and development. EDCs consist of a diverse group of molecules that are both naturally and synthetically produced. This group of compounds includes pharmaceuticals, polychlorinated biphenyls (PCBs), plasticizers, dioxin, pesticides, heavy metals and metalloids. Since EDCs are found in the environment, food and consumer products, humans are routinely exposed to these chemicals through ingestion and inhalation. The goal of this project is to determine whether phthalates, a group of putative EDCs used to make plastics, affect the viability and/or development of the fruit fly *Drosophila melanogaster*. The fruit fly, a classic model organism, should be a very good system for studying the effects of EDC exposure. The *Drosophila* endocrine system shares a number of common features with vertebrate endocrine systems including endocrine glands, circulating hormones and nuclear hormone receptors (NHRs). Our data indicate that the initial concentrations of dioctyl phthalate (DOP) and dipentyl phthalate (DPP) tested do not affect either fly development or viability. Future experiments will test higher concentrations of DOP and DPP and also screen additional phthalates.

**Origin of Fossils Found in Concretions from the Navesink Formation at Big Brook, New Jersey. Randal Edmond<sup>1</sup> and Kristin Polizzotto<sup>1,2</sup>, <sup>1</sup>Kingsborough Community College Brooklyn, NY and <sup>2</sup>American Museum of Natural History, NY, NY.**

In paleobiology, one important question is determining the age and paleoenvironment of fossils. Geologic events such as erosion or uplift that occurred after fossils formed within the Wenonah and Navesink Formations at Big Brook in Monmouth County, New Jersey can make it more difficult to determine these characteristics. We were interested in determining the origin of fossils found in yellow sandy concretions located at the base of the Navesink Formation. We propose that the fossils in these concretions are from the Mount Laurel Formation, which occurs between the Wenonah and Navesink Formations at locations further south, but has not been found in this area of New Jersey. We hypothesize that the Mount Laurel concretions were re-worked into the base of the Navesink during erosion of the Mount Laurel Formation. We collected samples of the concretions at three different sites along the creek bank, using rock hammers and chisels. We took the samples to the American Museum of Natural History in New York, where we broke apart the concretions to extract any visible fossils. We identified and compared all the specimens found within the concretions to published lists of fossils from the Mount Laurel and Navesink Formations. The Mount Laurel and Navesink communities are similar, but the species we found in the concretions indicated a community that probably lived in somewhat shallower water compared to species in the Navesink. Most of the species found were epifaunal (seafloor) and infaunal (burrowing) suspension feeders, and lived in a nearshore, relatively low-energy brackish environment. Finally, we analyzed the sediments and compared them to Mount Laurel and Navesink sediments. The analyses are consistent with our hypothesis that the concretions at the base of the Navesink Formation at the Big Brook site are Mount Laurel in age.

**The Effectiveness of Herbal Supplements as Antibacterial Agents. Kouadio Fienin and Loretta Brancaccio-Taras. Kingsborough Community College, Brooklyn, NY.**

Herbal supplements are readily available at drug and health food stores. This study's hypothesis was herbal supplements would be as effective as commonly prescribed antibiotics in inhibiting the growth of disease-causing bacteria. The following herbal supplements were studied because they are advertised as possessing antibacterial activity: bayberry, licorice root, goldenseal, grapefruit seed extract, echinacea, bilberry, cornsilk, burdock root, marshmallow, and uva ursi. Disks charged with the supplements were placed on Mueller Hinton agar plates inoculated with *Staphylococcus aureus*, *Streptococcus pyogenes*, *Escherichia coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa*. Also, the antibiotics, bacitracin, erythromycin, gentamycin, penicillin, and tetracycline were tested. Plates were incubated for 24 hours at 37°C and zones of inhibition were measured. Results of 5 trials were averaged and the standard error of the mean was calculated. Three herbal supplements displayed antibacterial activity. Bayberry was effective against *S. aureus*, and *K. pneumoniae*, with zones of inhibition of 17.6mm± 1.02 and 12mm± 0.77 respectively. Grapefruit seed extract produced zone sizes of 18mm± 1.02 against *S. pyogenes* and 19.6mm± 1.64 against *S. aureus*. Uva ursi inhibited the growth of *S. aureus* and *S. pyogenes*, with zone sizes of 19.4mm± 1.28 against *S. aureus* and 12mm± 0.71 against *S. pyogenes*. None of the herbal supplements were effective against *E. coli* and *P. aeruginosa*. The activity of bacitracin and penicillin against *S. aureus* and *S. pyogenes* was compared to the anti-Gram-positive activity of herbal supplements to determine if herbal supplements could be used to treat *S. aureus* or *S. pyogenes* infections. Uva ursi and grapefruit seed extract were not as effective as penicillin or bacitracin. However, the experimental results hold promise for future work on using herbal supplement in combination to generate antibacterial activity comparable to currently prescribed antibiotics.

**Effects of Eurasian Water Milfoil (*Myriophyllum spicatum*) on Benthic Macroinvertebrate Communities. Marco Finocchiaro<sup>1</sup>, Scott Evans<sup>2</sup> and Jennifer Cocciardi<sup>3</sup>, <sup>1</sup>Montclair State University, Montclair, NJ. and <sup>2</sup>State University of New York at Geneseo, Geneseo, NY and <sup>3</sup>New York University, NY, NY.**

Eurasian water milfoil (*Myriophyllum spicatum*) has been documented to negatively impact the ecosystem it invades due to its rapid growth rate and its ability to reproduce through fragmentation. It often outcompetes native vegetation and becomes the dominant plant species, and further alters the ecosystem composition. This study investigated the impacts of invasive Eurasian water milfoil on benthic macroinvertebrate communities. Three lakes located in Stokes State Forest, Sussex County, New Jersey were selected for this study. Lake Ocquittunk (LO) is dominated by invasive Eurasian milfoil, Lake Wapalanne (LW) by native spiny coontail (*Ceratophyllum echinatum*), and Sawmill Pond (SP) with a mix of both native and introduced plant species. Ten sites were randomly selected in each lake. One benthic sample (16.5 cm x 16.0 cm) was collected from each site using an Ekman Dredge. Macroinvertebrates from samples were identified and counted. LW was found to have the highest density of 600 macroinvertebrates, the highest taxonomic richness of 17 orders, and the highest Shannon-Wiener diversity index value of 2.11. LO was found to have the lowest density of 167, the second highest amount of taxonomic groups of 14 orders, and the second highest Shannon-Wiener diversity index value of 1.77. SP was recorded to have the second highest density of 453, the fewest taxonomic groups of 13 orders, and the lowest Shannon-Wiener index value of 1.61. The results of this study indicated that the invasive Eurasian water milfoil negatively impacted the benthic macroinvertebrate communities.

**Injury Assessment of Workers in a Connecticut Factory. Renee Fleming<sup>1</sup> and Carrie Redlich<sup>2</sup>, <sup>1</sup>Medgar Evers College, Brooklyn, NY and <sup>2</sup>Yale University School of Medicine, New Haven, CT.**

Injuries at work are a common and preventable problem and an important cause of lost work time, hospitalization and permanent disability. Approximately 3.6 million occupational injuries are treated annually (Schulte) with very variable injury rates. Also companies have been estimated to be paying about 72.9 billion dollars in workman=s compensation premiums (Schulte). OSHA injury logs for years 2007, 2009, 2010 and 2011 were obtained and data entered using Microsoft Excel. Descriptive statistics and analyses were performed and summary charts and tables created using Microsoft Excel. We found that injuries are increasing by year. Between 2009 and 2010 the number almost doubled. Our study showed that material handlers had the highest likelihood of being injured on the job, while machine operators had the highest incidence of injuries. Machine injuries are following a similar trend over the years and the percentage of injuries by job title is significantly different by year. We identified high-risk job titles, most common injuries, high-risk equipment and the specific job times where workers are most likely to get injured. In future we hope to apply these finding to decreasing the injury rates.

***Arabidopsis thaliana* Pleiotropic Drug Resistance (AtPDR13) Plays an Important Role in Root Development \*Elizabeth Y. Flores<sup>1</sup>, Sang Won Han<sup>2</sup> and Marcela Rojas-Pierce<sup>2</sup>, <sup>1</sup>Montclair State University and <sup>2</sup>North Carolina State University, NC.**

To improve plant stress tolerance and ultimately increase the nutritional value of agricultural crops for human consumption, it is essential that we understand how to regulate vacuolar trafficking of membrane proteins. ATP-binding cassette (ABC) transporters have been implicated in the movement of a wide variety of substrates across cellular membranes in plant cells. Pleiotropic drug resistance (PDR) proteins are a sub-family of ABC transporters that carry molecules across the plasma membrane. *Arabidopsis thaliana* PDR13 is a member of the PDR subfamily, but its function is unknown. This project is designed to accurately identify this gene and characterize its function in root development. Three different T-DNA insertion lines were studied to characterize AtPDR13. Gene knockouts provide a direct route to determining the function of a gene product. *AtPDR13* knockout mutants were studied in comparison to the wild type Col-0 to determine their root phenotypes and their response to various stresses. Seedlings were grown on treatments accordingly, scanned and analyzed. Our results suggest AtPDR13 has an important role in the development of lateral roots and elongation of root hairs that are necessary for the absorption of water and nutrients from the soil. AtPDR13 is not involved in NaCl and ABA stresses nor does it participate in the ethylene signaling pathway. Future experimentation of this project includes: identifying where the gene is being expressed using a GUS promoter fusion and tagging with GFP to visualize sub-cellular localization of AtPDR13. Thank you to the Synthetic Biology Research Experience for Undergraduates, the NSF Grant No. 0754010 as well as Dr. Eva Johannes and the Cellular and Molecular Imaging Facility (CMIF) for use of the Zeiss LSM 710 confocal microscope.

**LPS Induced Tolerance in Microglia Cells. Victoria Floriani and Heping Zhou, Seton Hall University, South Orange, NJ.**

Lipopolysaccharide (LPS) is a component of the outer membrane of Gram negative bacteria. It is an endotoxin that elicits an immune response via signal transduction mediated by toll-like receptor (TLR)-4. Microglia cells are the resident innate immune cells of the Central Nervous System. In response to LPS treatment, microglia are activated and produce important inflammatory mediators including cytokines and chemokines. This study was aimed to examine whether and how pretreatment with LPS induces tolerance in microglial cells. ELISA was used to measure the release of pro-inflammatory cytokines including interleukin (IL)-6 and tumor necrosis factor (TNF)-alpha. Microglia cells pretreated with 100ng/ml of LPS exhibited a decrease in cytokine response as compared to control samples in response to stimulation with 1µg/ml of LPS. Our studies will shed light on how microglia responds to repeated infections.

**Utilizing a Community Cichlid Fish Tank for Animal Behavior Studies. James Foo, Francine Foo, Ronald Orlovsky, Bianca Brown, Samantha Jones, and Kathleen Nolan, St. Francis College, Brooklyn, NY.**

A large 100 gallon fish tank, prominently placed in a public place on display at St. Francis College, has served as a unique opportunity for our students to study animal behavior using cichlids. The tank can be partitioned into three viewing regions using vertical stripes of clear adhesive tape. Students can, using timers, view the movement of the fish, one fish at a time. They can record each time a fish moves into a different partition. They might find that some fish are more territorial than others. Separate smaller ten-gallon tanks can then be set up to house individual cichlids. Fish A was introduced into a tank with Fish B, only to see Fish B chase and bite Fish A. The experiment was repeated, but Fish A did not even attempt to face Fish B; it only exhibited avoidance behavior. The reverse experiment was attempted a few days later, in which Fish B was introduced into a tank with Fish A, who became the new aggressor. The fish also changed colors, and their stripes became more prominent. This type of project was an excellent example of the process of science, in which one experiment generated interest in these fish, and prompted many new ideas for future projects

**Assesment of Social Hierarchy in Non-Human Primates. Mark J. Gallardo<sup>1</sup>, Anna V. Rozenboym<sup>1</sup>, Jean E. Tang<sup>2</sup>, Jeremy Hill<sup>2</sup>, Tarique Perera<sup>3</sup> and Jeremy D. Coplan<sup>2</sup>. <sup>1</sup>Kingsborough Community College, Brooklyn, NY, <sup>2</sup>SUNY Downstate Medical Center, Brooklyn, NY and <sup>3</sup>Columbia University, New York, NY.**

Social Hierarchy between non-human primates is highly relevant to their behavioral profiles. Social status has been associated with differences in affiliative and self-care behaviors as well as response to stress. Behavioral studies benefit from hierarchical stratification of animals as it complements other social and physiological variables under analysis. The goal of the study was to develop a methodology for the assessment of social hierarchy under the constraints of group-housing. We hypothesized that by the introduction of limited resources in the form of fruits, social hierarchy can be assessed in social pens of more than two. Further, ranking of the hierarchy using the "fruit method" will correspond to behavioral observation data on dominant and subordinate behaviors exhibited by the animals. Thirteen adult female bonnet macaques participated in the study. Behavioral ratings were carried out three times a week. The "fruit method" was implemented on the same days as behavioral observations. The results indicate that the developed "fruit method" is highly reliable, with between session  $r > 0.88$ . All animals received social ranking within their respective pens. Data obtained in the course of behavioral observations was analyzed by separating animals into two

groups: dominant and subordinate based on their ranking. Two tailed t-tests on individual behaviors elucidated differences between dominant and subordinate groups ( $p < 0.028$ ). The results indicate that two groups of animals differed on such behaviors as dominance threat, aggression, subordinate postures, and uninitiated subordination. In summary, the fruit method was shown to produce valid and reliable results as supported by the data obtained using behavioral observations. This work was supported by grants 2R25GM06003-05 of the Bridges to the Baccalaureate.

**Comparative Analysis of the Male Reproductive System in the Melanogaster Species Subgroup (Genus Drosophila). Marcus Gerald and Angela V. Klaus, Seton Hall University, South Orange, NJ.**

Our lab focuses on cellular and molecular mechanisms of spermatogenesis using species in the genus *Drosophila* as model organisms. We are also interested in comparing male reproductive structures and tissue morphology across a broad range of *Drosophila* species. The work presented here documents the morphology of the male reproductive systems of five species within the melanogaster species subgroup. These species include: *Drosophila melanogaster*, *D. simulans*, *D. sechellia*, *D. yakuba*, and *D. erecta*. The male reproductive systems were dissected whole from anesthetized flies. The structures of interest include the testes, seminal vesicles, accessory glands, ejaculatory bulb and ejaculatory duct. Interestingly, significant differences in pigmentation and morphology were noted, even between closely related species. The species chosen for this study are part of a larger group of 12 *Drosophila* species whose entire genomes have been sequenced. The data presented here will help our understanding of the evolution of *Drosophila* species. Additionally, this work provides the foundation for further studies of tissue morphology using transmission electron microscopy. We thank the Seton Hall Department of Biological Sciences for funding this work.

**Probing Metal-Phosphate Interaction Using Vibrational Spectroscopy. Khrystia Gratia<sup>1</sup>, Dr. Ruel Desamero<sup>2</sup> and Pamela Lebron<sup>2</sup>. <sup>1</sup>Queensborough Community College, Bayside, NY and <sup>2</sup>York College, Jamaica, NY.**

The importance of understanding how phosphate groups interact with metals cannot be understated, as evidenced by its role in stabilizing nucleic acid structures and assisting protein function. We hypothesize that these interactions can be monitored explicitly using vibrational (IR/Raman) spectroscopy. Thus far, there is evidence that the metal phosphate interactions lead to variations in the spectral profile. For instance, a phosphate solution without the metal yield peaks at 991.25 and 1080  $\text{cm}^{-1}$ . Adding enough metal to form a 1:10 phosphate to metal concentration ratio yields an apparent disappearance of the phosphate mode at 991.2 $\text{cm}^{-1}$  as well as a distinct shift of the one at 1080 $\text{cm}^{-1}$ . Data obtained using various metal ions ( $\text{Fe}^{3+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$ ,  $\text{K}^+$ ) and different phosphate compounds ( $\text{Na}_2\text{HPO}_4$ , diethyl phosphate, cytosine monophosphate, nicotinamide adenine dinucleotide phosphate) will also be presented. The same set of experiments were repeated using Raman spectroscopy which revealed data that complement those from the IR experiments. Taken together, the data clearly indicates that the use of vibrational spectroscopy is warranted for monitoring phosphate metal interactions. Future directions include explicit monitoring of the metal-phosphate interactions in nucleic acids and proteins. Khrystia Gratia is a participant in the NIH Bridges to the Baccalaureate Program at Queensborough Community College.

**Methamphetamine Alters Blood Brain Barrier Functions Facilitating Central Nervous System Infection. Jade M. Greco<sup>1</sup>, Eliseo A. Eugenin<sup>2</sup>, Joshua D. Nosanchuk<sup>2</sup> and Luis R. Martinez<sup>1,2</sup>, <sup>1</sup>Long Island University, C.W. Post Campus, Brookville, NY and <sup>2</sup>Albert Einstein College of Medicine, Bronx, NY.**

Methamphetamine (METH) is a major drug of abuse in the United States. METH is a strong addictive central nervous system (CNS) stimulant that mimics and has longer lasting pharmacological effects than cocaine. The blood brain barrier (BBB) is a unique interface that in part functions to prevent microbial invasion of the CNS. Although there is substantial evidence of the effects of cocaine on BBB function, the effects of METH on brain vasculature have not been studied extensively. The encapsulated AIDS-associated pathogenic fungus *Cryptococcus neoformans* (*Cn*) frequently infects the CNS; globally there are ~1 million cases of CNS cryptococcosis every year. In addition, *Cn* is an excellent model organism for the study of CNS susceptibility due to the availability of tools such as specific antibodies and well-established animal models. Hence, we hypothesized that METH alters the innate immunity function and BBB integrity increasing susceptibility to cryptococcosis, including CNS infection. In this study, we demonstrated the detrimental impact of METH on host immune function in response to a systemic fungal challenge. Mice that received METH prior to *Cn* infection displayed increased fungal burden, increased pulmonary inflammation, and decreased survival. METH abrogates normal macrophage function, resulting in an inability to control the disease. Furthermore, our results suggest that METH modifies the expression of adhesion molecules at the level of the endothelial cells of the BBB. Therefore, METH may disrupt the BBB integrity in vitro via the modulation of the expression of tight junction proteins which may result in extensive brain alterations including an increase in the susceptibility of the CNS to cryptococcal infection. We believe this interdisciplinary project may lead to develop better public health strategies to deal with this burden on our society. This work was partially supported by NIH-NIAID grant 1K22A1087817-01A1, Benjamin Cummings/MACUB Research grant, and CW Post-Faculty Research Monetary grant.

**The Effects of the ASIC Channel and Peptides on Glial Proliferation. Jennifer C. Guercio, Arianna Reuven, and Elena Petroff, Montclair State University, Montclair, NJ.**

Glioma, one of the most common and aggressive forms of brain cancers, involves increased glial proliferation. Augmented activity of large conductance calcium and voltage-activated potassium (BK) channels has been shown to accelerate glial proliferation. Our previous studies indicate that Acid Sensing Ion channels (ASICs) inhibit BK current at physiological pH levels, and that this inhibition can be relieved at acidic pH (Petroff et al, PNAS, 2008). ASICs can therefore act as endogenous pH-dependent regulators of BK channel activity, and both normal glia and glioma tissue express BK and ASIC channels. In neonatal, adult mouse wild type, and adult ASIC1a knockout glial cells, charybdotoxin (CTX) inhibited glial growth at both pH 7.4 and 7.0, and similar cell proliferation rates were shown between the wild type and knockout cells. These data suggested that the pH-dependent regulation of glial growth is lost in ASIC1a knockout glia. To further examine ASIC1a and glial proliferation, a wild type peptide (with similar amino acid sequence to ASIC1a's toxin-like domain) and a mutant peptide (alanine replaced by arginine and lysine) were designed. Cultured rat glial cells were grown at pH 7.4 and 7.0, and in both conditions with 100 nm CTX, wild type peptide, or mutant peptide. Our results demonstrate an almost 50% increase in glial proliferation at acidic pH and significant growth

inhibition by CTX at both pHs. The synthetic wild type peptide treatment showed no significant change in proliferation; however, because the mutant peptide could not inhibit BK, the cellular growth doubled when compared to the control conditions. This study is a step towards understanding the regulation of glial cell proliferation by ASIC-BK channel interaction and our long term goal of developing novel approaches to treating gliomas. (This work is supported by the R15 NIH grant to EP and by the Weston Scholars Program).

**Potential Synergistic Effect of Polysaccharides and Antiseptics. Kerly Guerrero, Yansel Nunez and Tin-Chun Chu. Seton Hall University, South Orange, NJ.**

From previous reports polysaccharides extracted from Red Algae have been used to inhibit micro-bacterial growth. *Escherichia coli*, *Enterobacter aerogenes*, *Bacillus subtilis*, and *Staphylococcus epidermidis* were the model organisms used for this experiment. Bacterial growth with and without the polysaccharides (2.5%, 1% and 0.5%) were monitored by spectrophotometer and the growth curves were generated. Over a seven hour period monitored, 2.5% polysaccharides showed the best inhibition on the bacteria tested; 25.39% inhibition on *E. coli*, 25.45% inhibition on *E. aerogenes*, 31.47% inhibition on *B. subtilis* and 52.39% inhibition on *S. epidermidis* when 2.5% polysaccharides is added. Disc diffusion method was used to study the potential synergistic effect of polysaccharides and various antiseptics. The mouthwash containing sodium fluoride and 5% polysaccharide had a greater zone of inhibition than its control counterpart and the mouthwash containing alcohol and the mouthwash containing methanol, thymol, and eucalyptol.

**Identification of Proliferating and Immunologically Active Cells in Surviving Organotypic Culture of Adult Zebrafish (*Danio rerio*) Optic Tectum. Michael C. Gutkin, Christopher P. Corbo, Linda A. Rath and Zoltan L. Fulop, Wagner College, Staten Island, NY.**

In our previous light and electron microscopic studies analyzing similar cultures, we have shown that the adult zebrafish brain has the ability and capacity to survive in organotypic culture conditions for up to 14 days. An *in vitro* time course of the optic tectal explants was run and pieces were collected at 2, 6, 12, 24, 48, 96 hours and 7 days. After 12 hours of cultivation, the majority of cells have died. In the following time points from 24 hours on, many of the cells are able to survive, dedifferentiate, proliferate, and migrate while undergoing a reorganization process. In order to detect proliferating cells as well as immunologically active cell types within the surviving tissue, various antibody markers were explored. Immunohistochemistry to label proliferating and surviving immunologically active cells was carried out for confocal microscopy. To complement a previous study that analyzed the cytoarchitecture and identified different cell types in the normal adult zebrafish brain, we now visited and looked at these similar cell types in our organotypic culture model. The cytoarchitecture and presence of cells in the tectal explants was identified here. Embryoid bodies were labeled with TOTO-3 (cell nuclear stain), while the presence of mast cells was identified as well. Antibodies such as GFAP (glial fibrillary acidic protein) to detect astroglial cells, PCNA (proliferating cell nuclear antigen) to detect proliferating cells, and NSE (neuron specific enolase) to detect neurons were used. Confocal Z-stack fluorescent imaging allowed for the 3-dimensional analysis of the whole optic tectal pieces. Through this analysis, we will obtain further knowledge of the cell types present and proliferating in the surviving brain.

**Synergist Antimicrobial Effects of Modified Lipophilic Green Tea Polyphenols on Antibiotics against Bacteria. Umme Habiba, Doleeben Merai, Kent Ozcan, Bobak Haghjoo and Lee H. Lee, Montclair State University, NJ.**

In a society where antibiotic resistance is rapidly rising, there are great safety concerns for humans. Strains of bacteria that are multi-drug resistant quickly kill their host when untreated. Natural remedies found in nature have been the main focus for the last decade, particularly the plant *Camellia sinensis*. Polyphenols contained in green tea are classified as catechins. Recent experimental studies have shown that LTP are potent antioxidants that have anti-apoptotic, anti-inflammatory, and anti-microbial activities. Lipophilic tea polyphenols (LTP) were prepared by esterification of green tea polyphenols (GTP). 1% LTP in conjunction with the twelve selected antibiotics; Ampicillin (AM10), Bacitracin (B10), Cephalothin (CF30), Chloramphenicol (C30), Doxycycline (D30), Erythromycin (E15), Gentamicin (GM10), Penicillin (P10), Polymyxin (PB300), Rifampin (RA5), Streptomycin (S10), and Tetracycline (TE30) were treated on groups of bacteria. The gram-positive species consisted of *Staphylococcus epidermidis*, and *Bacillus megaterium*. The gram-negative species consisted of *Enterobacter aerogenes*, *serratia marcescens* and *Escherichia coli*. The acid-fast organism tested was *Mycobacterium smegmatis*. The antimicrobial activity was studied with three repetitions by using the disk diffusion method to measure the Zone of Inhibition. The minimum inhibitory concentration (MIC) was also determined. In the presence of LTP, *S. epidermidis* revealed the greatest increase (24 to 122%) in antimicrobial activity with all antibiotics except PB300 (8% decrease). *E. coli* showed similar increase (22 to 188%) in activity with the exception of CF30 (-27%), AM10 (-33%) and RA5 (0%). LTP in *M. smegmatis*, *E. aerogenes*, *B. megaterium*, and *S. marcescens* showed some synergistic and antagonistic effect on different antibiotics. LTP increased 100% efficacy of P10 on *M. smegmatis*; increased 122% efficacy of E15 and 117% efficacy of TE30 on *E. aerogenes*; increased 50% efficacy of C30 in *B. megaterium*; increased 300% efficacy of B10 and 233% of RA5 in *S. marcescens*. LTP promises great potential, and can be used as a synergistic agent for future antibiotic therapy.

**The Effect of Green Tea Polyphenols in Antibiotic-Resistant *Escherichia coli*. Bobak Haghjoo, Konrad Starczak and Lee H. Lee, Montclair State University, NJ.**

*Escherichia coli* is an emerging bacterium that can cause severe illness in susceptible individuals. Some of the bacteria undergo transformation through plasmid exchange and can cause greater illness by developing resistance to antibiotic intervention. The utilization of natural derivatives such as those found in Green Tea have the potential ability in reversing antibiotic resistance by unknown mechanisms. In this study, *Escherichia coli* containing the ampicillin-resistant plasmid and wild-type ampicillin-sensitive *E. coli* were used in the presence of 1% GTP. The Time-Kill study was carried out and the cells were grown in the presence of ampicillin with or without GTP. The inoculated cultures were grown at 37°C and constant shaking at 200rpm. The samples were collected at 0, 1, and 2-hour time intervals. Serial dilutions were performed and 100ml of the sample from 10<sup>-3</sup> and 10<sup>-4</sup> dilution were plated onto LB+amp plates (Luria Broth Plates) respectively. The plates were incubated at 37°C for 24 hours. The results indicate that from utilizing of the CFU Time-Kill method, we were able to determine after 1 hour of treatment, there remained only 18 colonies on the plate (effectiveness of 99%). After 2 hours of treatment, there were no visible colonies observed at all (100%). The ampicillin-containing plates at 2 hours showed that there was confluent growth in opposition to the ampicillin plates containing GTP supplement. This study suggested that GTP have the ability to reverse the resistance of *E. coli* on ampicillin.

**Water Treatment at Municipal Wastewater Treatment Plants. Jean Rony Hilaire<sup>1</sup>, Delisha Bella<sup>1</sup> Dereck Skeete<sup>1</sup>, Elvis Phillips<sup>2</sup> and Vishnu Singh<sup>2</sup>, <sup>1</sup>Medgar Evers College and <sup>2</sup>New York City Department of Environmental Protection.**

The purpose of the research was to test the quality of water as it entered and exited municipal wastewater treatment plant. At the plant water goes through different stages of treatment in order to obtain a suitable finish product, one which will not pollute the waterways. The water tended to come in as a black, murky looking substance. It first

went through the influent stage. This is an important stage in which large objects are removed from the water. This stage also removes small stones and pebbles from the water. A sample of water was taken at this stage and tested in the lab. We found different types of bacteria, protozoa, fungi, viruses, ammonia, organic matter, and nutrients for microorganisms such as nitrogen and phosphorous. After this preliminary stage the water went through the primary treatment. During this stage the water flowed through sedimentary tanks. These are large tanks that are used to settle the sludge. Upon the sludge settling, oils and grease rise to the surface and are skimmed off. During the secondary treatment the biological content of the water is degraded. The water goes to aeration tanks. In the aeration tanks oxygen and bacteria are used to remove small particles from the water. After this stage the water goes to chlorination. Chlorine is added to the water before being released into the ocean. Just before the water was released into the ocean, another water sample was taken. Because of the use of chlorine, there was an absence of bacteria, viruses and amoeba. Further studies have shown that chlorination is the best disinfectant for water treatment. The water that was sent off in the end was of higher and better quality than what came in.

**Impact of Plasma Membrane Unsaturated Fatty Acid Levels on Copper Surface Mediated Cell Death in *E. coli*. Bo Zhi (Robert) Hong, Tae Y. Kang, Nidhi Gadura, Queensborough Community College, Bayside, NY.**

The broad goal of our study is to understand the mechanism(s) by which copper alloy surfaces kill microorganisms. Our results indicate that copper surface mediated cell death of *Escherichia coli* correlates with increased levels of lipid peroxidation at the plasma membrane. We also determined the relationship between membrane lipid peroxidation levels and cell death in *E. coli* on both copper and steel surfaces. Quantitative dilutions series were performed to test for bacterial cell death. Our results indicate a biphasic killing curve when *E. coli* is exposed to copper chips however this was not seen on steel chips. TBARS assay was used to measure the lipid peroxidation levels. Genetically altered bacterial strains show that when exposed to copper surfaces, increased levels of unsaturated fatty acids in the plasma membrane results in faster cell death rates in *E. coli*. Genomic DNA analysis show a necrotic cell death pattern. This project was funded by PSC-CUNY and Copper Development Association grant to Dr. Gadura. Robert Hong is partially funded by QCC NSF-STEP and NSF-REU grant.

**The Presence of Octopamine in Ganglia and Tissues of Different Classes of Bivalve Molluscs. Ibukun Ikotun<sup>1</sup>, Christopher Welsh<sup>2</sup>, Edward J. Catapane<sup>2</sup> and Margaret A. Carroll<sup>2</sup>, <sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College, Brooklyn, NY.**

Octopamine is a biogenic amine first identified in the octopus. It has been well studied in arthropods and a few gastropods where it serves as a neurotransmitter and hormone. The presence of octopamine has rarely been reported in bivalves. Our recent work showed it is present in ganglia and tissues of the oyster, *Crassostrea virginica*, a member of the order Osteoidea, where it is a cardio-excitatory agent. It may be working as a neurotransmitter or neurohormone. The present study sought to examine if octopamine also is present in other species of bivalves. We tested tissues of *Mytilus edulis* and *Mercenaria mercenaria* utilizing HPLC to identify and measure octopamine in cerebral ganglia, visceral ganglia, pedal ganglia, gill, palps, heart and foot. HPLC was performed with an isocratic, ion-pairing Phenomenex Gemini 5F C18 column with a Beckman HPLC system with a Jasco FP 2020 Spectrofluorometer. The mobile phase was 50 mM acetate buffer (pH 4.7) with 1 mM EDTA, 1.1 mM SOS and methanol (85%/15%, v/v). The results show that octopamine is present in ng amounts in gill, palps, cerebral ganglia, visceral ganglia, pedal ganglia, heart and foot along with serotonin, dopamine and norepinephrine. The study now identifies octopamine in the nervous system and innervated organs of bivalves in two additional orders, the order Mytilorida (*M. edulis*) and Veneroidea (*M. mercenaria*). This work was supported by grants 2R25GM0600309 of the Bridge Program of NIGMS, 0516041071 of NYSDOE and 0622197 of the DUE Program of NSF.

**Myelin Basic Protein Stimulates CCL2 Chemokine Secretion in Human Astrocytes: Importance in the Pathogenesis Multiple Sclerosis. Ivelisse Izaguirre, Courtney Peloso, Joe Matarlo and Teresa G. D'Aversa, Iona College, New Rochelle, NY.**

Multiple sclerosis (MS) is an autoimmune disease of the central nervous system distinguished by demyelination. Destruction of the protective myelin sheath causes exposure of axons and interruption of impulse propagation, leading to MS disease pathology. Myelin basic protein (MBP) is an integral component of the myelin sheath, which is released upon its degradation. Previous studies have shown that MBP increases the permeability of the blood-brain barrier (BBB), and induces endothelial cells to secrete CCL2. Based on these data, we examined the expression of CCL2 chemokine production in cultured astrocytes after treatment with MBP. We found that CCL2 protein was induced in a time and dose dependent manner. CCL2 protein expression gradually increased from 4 hours post treatment to a peak at 24 hours post treatment. We also demonstrate that CCL2 protein expression is partially dependent on the phosphatidylinositol-3-kinase (PI3K) pathway, as a specific inhibitor to this pathway decreased CCL2 protein expression by 40%. These results demonstrate that degradation of the myelin sheath and the release of MBP may aid in the progression of MS by inducing the secretion of a pro-inflammatory chemokine from astrocytes. This chemokine can then recruit inflammatory cells, thereby enhancing the immune response and inflammation, which may result in the continuation of demyelination. We thank Dr. Joan W. Berman at the Albert Einstein College of Medicine for human astrocytes.

**Horseshoe Crabs Save Lives, But Who Will Save Them?: Censusing *Limulus polyphemus* Juveniles on Plum Beach, New York. Kristina Jeriomenkaite, Mohibur Rahan, Shakuntala Gopal and Christina Colon, Kingsborough Community College, Brooklyn, NY and Fordham University, NY, NY.**

The Atlantic horseshoe crab (*Limulus polyphemus*) is a benthic arthropod found from Maine to the Gulf of Mexico. Plum Beach is New York State's largest horseshoe crab spawning site. The present study intended to quantify egg, hatchling and juvenile distribution, density, survival, and habitat preference. A secondary objective was to develop protocols for censusing juvenile densities, distribution and growth rates. Given the magnitude of *L. polyphemus*'s eggs importance as critical food for migrating shorebirds and their vital role as a biomedical indicator of contamination, it is surprising that research on juveniles remains scarce. Research on Asian species provide comparative data on juveniles such as prosomal width, diet, densities and distributions (Morton et al.). On Plum Beach, monitoring took place from July 13 to September 2, 2011, during low tide when juveniles emerge on the mudflats to forage. Timed visual surveys yielded more data on 2 to 3 year old juveniles (20 – 30 mm) that were foraging, whereas quadrat sampling was more effective for locating young of the year (4-7 mm) and non-foraging individuals burrowed in the sediment. A combination of methods therefore is recommended for accurate quantitative censusing. Overall density decreased from 58 to zero, while mean size increased, suggesting high mortality and a growth rate of 0.23 mm/day. Juvenile distribution appeared clumped, yet microenvironment characteristics that correlated with density have not yet been identified. Ongoing monitoring with focus on distribution patterns are recommended, particularly in light of potential negative impact from nearby highway maintenance. Another goal is to use this data to raise public awareness to protect this crucial nursery beach. This project was made possible through grant 2R25GM06003-05 of the Bridges to the Baccalaureate Program of NIGMS and grant 0537101091 of the CSTEP Program of the NYS Dept. of Education. We thank Drs. Botton and Rowden for their assistance.

**A Relationship of Optical Density Readings and *Escherichia Coli* Cell Count. Gabriel Jimenez, Meiyin Wu and Lee Lee, Montclair State University, Montclair, NJ.**

The optical density reading (O.D.) is often used to estimate the cell count of bacteria. However, viability of cells can vary due to bacterial strain, environmental conditions, growth media, etc. This study aims to examine the relationship between the O.D. reading and

the viable bacterial cell count of *Escherichia coli*. Samples of *E. coli* were collected at various points during the growth cycle in order to gather population samples representing incremental O.D. readings ranging from 0.10 to 1.00. Fifty  $\mu$ l of diluted samples were plated on nutrient agar media, and incubated at 37°C for 24 hours. The results of this study suggest that the growth of *E. coli* was limited, signifying the growth during lag phase, when the O.D. reading was less than 0.40. When the O.D. reading was greater than 0.40 and less than 0.80, the bacterial growth began exhibiting linear growth rates indicating growth during the exponential phase. The results suggest that during exponential phase, bacterial cell count of *E. coli* can be estimated with the O.D. reading,  $y = 974124x - 398200$  ( $R^2 = 0.9997$ ).

**Interaction of Chromium with Nickel in the Induction of Sister Chromatid Exchanges, in CHO Cells. D. Jin, J.A. Otinofski; S.L. Mallory and S.P. Katsifis, University of Bridgeport, Bridgeport, CT.**

Humans are always exposed to low levels of complex mixtures containing metals. Epidemiological studies report that populations exposed to such mixtures show increased incidence rates of cancer. Therefore, chemical interaction is of major concern in the assessment of risk by regulatory agencies. In this study, treatment of Chinese Hamster Ovary (CHO) cells with nickel chloride (1.0 and 5.0  $\mu$ M), or sodium chromate (0.5, 1.0, and 2.5  $\mu$ M) induced sister chromatid exchanges (SCE) in a dose dependent fashion. Statistical analysis of the interaction factor, show that the combined treatments of nickel (1.0 and 0.5  $\mu$ M) with chromium (0.5, 1.0 and 2.5  $\mu$ M) interacted antagonistically for the induction of SCE. Previously, we reported that nickel with chromium, or with UV light or with X-rays interacted antagonistically for the induction of SCEs and MN (micronuclei) in human peripheral lymphocytes. These observations indicate that heavy metals, such as nickel and chromium, present in complex mixtures, may reduce the response, even in the presence of strong SCE or MN inducers, and may lead, therefore, to an underestimate of chemical exposure as assessed by these assays. Therefore, further studies are a necessity.

**The Slipper Shell (*Crepidula fornicata*) Does Not Appear to Serve as a Vector for Dermo (*Perkinsus marinus*) in Jamaica Bay, NY. Orlando Bogran, Kezia Keizer, Craig Hinkley and Gary Sarinsky. Kingsborough Community College, Brooklyn, NY.**

In the 1920's, the oyster beds in Jamaica Bay, N.Y began to decline and today, none are known to exist. The parasitic protozoan dermo (*Perkinsus marinus*) is one of the primary factors responsible for the decline. Infected oysters suffer from emaciation, gaping, retraction of the mantle away from the edge of the shell, and stunted growth. Recent research performed with oysters grown from spats in Taylor Floats in Jamaica Bay showed that some of the oysters were infected with dermo. Since dermo is known to be transmitted from oyster to oyster and oysters are apparently not present, the question that arises is how did they become infected? Some literature suggests that mollusks and scavengers may act as vectors for the transmission of dermo. This research seeks to determine if the Common Slipper Shell (*Crepidula fornicata*), a mollusk commonly found in Jamaica Bay, is a vector for dermo. It is our hypothesis that *C. fornicata* does transmit dermo to the oyster. DNA was isolated from *C. fornicata* tissues and was subjected to PCR amplification using the mitochondrial cytochrome c oxidase 1 (CO1) gene and dermo specific primer sets respectively. To verify that DNA was obtained from *C. fornicata*, the CO1 amplified products were subjected to agarose gel electrophoresis and was found to be present in all six samples. The CO1 amplified products were sequenced by Elim Biopharmaceuticals and they were subjected to NCBI blast searches which further verified that the DNA was the CO1 gene from *C. fornicata*. The dermo amplified products were subjected to agarose gel electrophoresis. No dermo DNA was amplified from the slipper shells tested but we demonstrated that we could amplify dermo under the conditions used with a positive control for dermo. The results of these experiments showed that the slipper shells tested were not vectors for dermo.

**Mud Snails (*Ilyanassa obsoleta*) from Plum Beach, Jamaica Bay and Great Kills Park, Staten Island Do Not Represent Separate Subpopulations. Mandy Kuang, Sherry Perreira Gary Sarinsky and Craig Hinkley. Kingsborough Community College, Brooklyn, NY.**

The presence of genetic variation is important from an evolutionary standpoint. Mud snails are abundant on many beaches making them good candidates for examining genetic variation. We examined nucleotide diversity in mud snails from Plum Beach and Staten Island to determine if they represent two subpopulations. Our hypothesis was that mud snails at Plum Beach are a separate subpopulation from mud snails at Staten Island. To test this hypothesis, we extracted DNA from mud snails and then amplified a region of the cytochrome oxidase I gene using the polymerase chain reaction (PCR). The correct sizes of the PCR products were verified by agarose gel electrophoresis and then the PCR products were sequenced by Elim Biopharmaceuticals. Estimates of average evolutionary divergence within groups (d) were calculated using the Jukes-Cantor model. The average divergence for mud snails from Plum Beach was  $d = 0.01190$  (S.D. = 0.00279) and from Staten Island  $d = 0.00988$  (S.D. = 0.00246). Using a two-tailed t-test with  $\alpha = 0.05$ , we were unable to reject the null hypothesis that average diversity between the two groups was the same,  $p\text{-value} = 0.2134$ . Phylogenetic tree analysis using the Neighbor-Joining method with the Jukes-Cantor model showed that the DNA sequences from Plum Beach and Staten Island were not grouped into separate clades. Taken together, these data suggest that the snails from Plum Beach and Staten Island represent one population and we therefore reject our hypothesis that there are two subpopulations. Despite this, minimum spanning network analysis showed there is a high degree of distance between sequences from both groups. In conclusion, although our data suggests there is one population of mud snails there is a large amount genetic variation within this population. This work was supported by grant 0537101091 of the CSTEP Program of the NYS Department of Education.

**Survey of Fruit Flies in the NYC Metropolitan Area. Chuen Yan Lau<sup>1</sup>, Valerie Schawaroch<sup>1,2</sup>, <sup>1</sup>Baruch College, New York, NY and <sup>2</sup>American Museum of Natural History, New York, NY.**

The goal of this investigation is to determine the fruit fly (drosophilid) species within the NYC metropolitan area. The first series of experiments were to determine an optimal method of trapping live drosophilids. A second experiment was conducted to determine if there is a food source preference among the following choices: banana, apple, watermelon, fig, mango, orange, and tomato. A third series of experiments would measure the period of activity of the flies over the course of a day. For each experiment fruit flies are identified and counted to determine species richness and abundance, respectively. After removal of adults some traps were sealed and kept in order to determine if any species breed and offspring could be successfully reared to adult fly. Besides identification and quantification of local drosophilid fauna it might be possible to determine the presence of invading species.

**Assessment of Bloom-forming Cyanobacteria and Algae in New Jersey Lakes. Stephanie C. Lear, Meiyin Wu and Lee H. Lee, Montclair State University, Montclair, NJ.**

Harmful algal blooms, an accumulation of algae, affect water quality. Timely intervention against the algal blooms depends on the early detection of bloom-forming algae and cyanobacteria. Results were determined regarding distinction and identification of algae and cyanobacteria based on morphology. The objective was to apply the procedure of utilizing a PCR based assay for rapid detection of freshwater algal blooms to lake environment samples. Water samples were collected from 15 lakes in northern New Jersey and processed through both coarse (3.0 $\mu$ m) and fine (0.45 $\mu$ m) filters. Both filters were dried and then frozen at -20 $^{\circ}$ C.

Segments of filters were selected; organisms on the filter segments were re-suspended in water for microscopic identification. Two genes of interest, cyanobacterial phycocyanin and 16S rDNA genes, were selected for polymerase chain reaction (PCR) analysis using three different primers. The primer pairs used in this study included: CPC1F/CPC1R, specifically for cyanobacterial phycocyanin gene; 27FB/785R, for 16S rDNA in bacteria and phytoplankton; and 27FB/PSr, for 16S rDNA phytoplankton. A DNA extraction protocol (using 5% chelex-100) was performed for laboratory cultures and freshwater samples, followed by a PCR based assay. Cyanobacteria and algae were detected through microscope observations and PCR based assay. Results suggested three primers enable detection of cyanobacteria and/or algae in water samples.

**The Effect of Various Compounds on the Prevention and Degradation of *Staphylococcus Aureus* Biofilms. Mengjia Lin<sup>1</sup>, May Myat Moe<sup>1</sup>, Engred Vanegas<sup>1</sup>, Kristen LaMagna<sup>2</sup> and Daniel Moloney<sup>2</sup>, <sup>1</sup>Queensborough Community College and <sup>2</sup>Stony Brook University, Stony Brook, NY.**

Methicillin-Resistant *Staphylococcus aureus* (MRSA) is responsible for a serious, and sometimes deadly, skin infection. In the United States, 19,000 people die from MRSA each year. MRSA is a strain of *Staphylococcus aureus*, a bacterium which produces a biofilm that is necessary for its survival and proliferation. There is a demand for alternatives to antibiotics that can successfully destroy MRSA. Studies have shown that the serine protease ESP from *S. epidermidis* can destroy the formation of biofilm from *S. aureus*. This study examines the effectiveness of various compounds on both the prevention and destruction of biofilm produced by *S. aureus*. We hypothesized that different varieties of compounds, such as supernatant from *S. epidermidis* and Biotene mouth wash, can degrade biofilm from *S. aureus*. *S. aureus* was cultured and treated with Biotene PBF, Biokleen, Propolis and serine protease from *S. epidermidis* compounds. Our results indicate that Propolis did not show any impact on the biofilms. Results from *S. epidermidis* serine protease treatment were not conclusive. However, the Biotene PBF mouthwash treatment was the most effective in the destruction of biofilm whereas Biokleen treatment had the most impact against preventing the formation of biofilm.

**Chemokine Production in Inflammatory Bowel Diseases. Rick Loh and Andrew Nguyen, Queensborough Community College, Bayside, NY.**

Inflammatory bowel diseases (IBD) are a series of circumstance which lead to the inflammation of the colon and small intestine. The major kinds of IBD are Crohn's disease (any part of the GI tract) and ulcerative colitis (colon and rectum). Inflammatory bowel diseases begin when the body initiates an abnormal immune response to some of the trillion flora bacteria that come into contact with the colon of the human body. In many cases of IBD, a link has established that chemokines as one of the key factors regulating IBD pathogenesis. Chemokines are a family of small cytokines which are small heparin binding proteins that facilitate the migration of circulating leukocytes (monocytes, neutrophil and other effector cells) throughout the body to the sites of inflammation. There are over 50 chemokines but they are distinguished into 4 families based on cysteine residues (CXC, CC, C, CX3C). Within chronic inflammatory diseases, there is an excessive recruitment of inflammatory cells into the injured tissue due to excessive chemokine production. There are specific interests in interleukin-8 (IL-8), epithelial neutrophil activating protein 78 (C-X-C motif chemokine 5), macrophage protein 1 $\alpha$  (MIP1 $\alpha$ ), monocyte chemoattractant protein 1 and 3 (MCP1, CCL2), interferon inducible protein 10 (CXCL10) and RANTES (CCL5). These chemokines are all expressed in larger quantities during the active phase of the disease or in areas that are more severely inflamed than others. We have evaluated these chemokine productions using real time PCR in mouse model of inflammatory bowel diseases.

**Effect of Copper Surfaces on Endospore-Forming Bacteria *B. subtilis*. Janet Long and Nidhi Gadura, Queensborough Community College, Bayside, NY.**

The long-term aim of this project is to determine the relationship between exposure to copper alloy surfaces, lipid peroxidation, and cell death in different bacterial strains. For this particular aspect of the project, we wanted to study the impact of copper surface exposure on an endospore-forming, gram-positive strain of bacteria, *B. subtilis*. Different time course trials were performed to determine the correlation between time of exposure to copper surfaces, amount of lipid peroxidation that occurs, and the rate of bacterial cell death. A quantitative dilutions series was used to determine bacterial cell death. The TBARS Assay was used to measure the amount of lipid peroxidation that occurs during exposure to copper ions. Also, genomic DNA was extracted to study the mode of death, whether it's apoptotic or necrotic. Fluorescent microscopy was done using a Live Dead Assay kit; furthermore, Acridine Orange was also used to quantitate spore formation. Our results indicate that most of the cells die within five to ten minutes of copper exposure, except for the endospores. The increase in lipid peroxidation correlates with majority cell death as well as genomic DNA degradation.

**Study of the Effects of Octopamine on Bivalve Heart Rate. Addy Jean Louis<sup>1</sup>, Ruma Hoque<sup>2\*</sup> Edward J. Catapano<sup>2</sup> and Margaret A. Carroll<sup>2</sup>, <sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College, Brooklyn, NY.**

Octopamine is a biogenic amine first identified in octopus. It is well studied in arthropods and gastropods, serving as a neurotransmitter and hormone. The presence and functions of octopamine have rarely been reported in bivalves. Previously, we identified octopamine in cerebral ganglia, visceral ganglia, gill, palps and hemolymph of the oyster *Crassostrea virginica*. We also found octopamine was a cardio-acceleratory agent and postulated it may have a neuro or endocrine role in *C. virginica*. Here we examined effects of octopamine on hearts of the clam *Mercenaria mercenaria* and the mussel *Mytilus edulis*. Clam and mussel heart preparations were prepared *in situ* by removing right shells and connecting ventricles to isotonic transducers with small hooks and thread. Heart rate was monitored with a Physiograph. Data were collected and analyzed with a DATAQ DI-700 Data Acquisition System. Mussel basal heart rate averaged 12 beats/min. Superfusion of octopamine ( $10^{-6}$  -  $10^{-3}$  M) increased heart rate to 22 beats/minutes, an 83% increase. Clam basal heart rate averaged 8 beats/min. Superfusion of octopamine ( $10^{-6}$  -  $10^{-3}$  M) slowed heart rate to 4 beats/minutes, a decrease of 50%. The actions of octopamine were prevented by the octopamine antagonist phentolamine. The study shows octopamine affects heart rate of species in 3 different orders of bivalves, Osteoida the oyster, Mytilorida the mussel and Veneroida the clam. The different result on clam with respect to oyster and mussel appears at first to be confusing, but Veneroida hearts are well known to respond differently to drugs and nervous stimulations compared to the other orders of bivalves. Our lab has found octopamine to be present in the nervous system and innervated organs of bivalves and this present study provides further evidence that octopamine has a neuro or endocrine role as a cardio-regulatory agent in bivalves.

**Nitric Oxide Releasing Nanoparticles for Treatment of *Candida albicans* Burn Infections. Chitrakha Macherla<sup>1</sup>, Mohammed Ahmadi<sup>2</sup>, David Sanchez<sup>3</sup>, Adam J. Friedman<sup>3</sup>, Joshua D. Nosanchuk<sup>3</sup> and Luis R. Martinez<sup>1,3</sup>, <sup>1</sup>Long Island University, C. W. Post Campus, Brookville, NY; <sup>2</sup>Adelphi University, Garden City, NY, Albert Einstein College of Medicine, Bronx, NY.**

*Candida albicans* is a leading fungal cause of both prosthetic-devices and burn infections in hospital settings, frequently resulting in chronic refractory disease. Sepsis is one of the leading causes of death after severe burn. The prevalence of candidemia in burn cases varies widely, but could account for 3-23% of severe infection with a mortality rate ranging from 14% to 70%. Studies performed in intensive care units found that mortality due to candidemia may be as high as 43%. Therefore, it is imperative that innovative therapeutics to which the microbes are unlikely to evolve resistance be developed to curtail associated morbidity and mortality and ultimately improve our capacity to treat these infections. An inexpensive and stable nitric oxide (NO)-releasing nanoparticle (NO-np) platform using nanotechnology based on a silane hydrogel has been recently developed. Notably, NO modulates immune responses and is a significant regulator of wound healing. In fact, the simplicity and the stability of NO-np make them a very attractive treatment modality in many conditions, including burn injuries, especially since they have proven high efficacy against other multi-drug resistant bacteria that are challenging the success of antibiotic use. In this study, we hypothesized that NO-np are effective therapeutics against *C. albicans* burn infection. The results show that the NO-np exerts antimicrobial activity against the fungus in a murine burn model. Acceleration of infected burn injury healing in NO-np-treated groups was clinically shown compared with controls. The histology of wounds revealed that NO-np treatment modifies leukocyte infiltration, minimal fungal burden, and less collagen degradation, providing potential mechanisms for biological activity. Together, these data suggest that these NO-releasing nanoparticles have the potential to serve as a novel class of topically applied antimicrobials for the treatment of cutaneous infections and wounds. This work was supported by C.W. Post-Faculty Research Monetary grant.

**Cadherin Regulation in Fibroblast and Fibrosarcoma Cells: Influence of Culture Density and MAPK Activity. Vincent Marchese, Diti Emporelli and Dorothy Lobo, Monmouth University, West Long Branch, NJ.**

Cadherins are integral proteins that play an important role in cellular adhesion. If E-cadherin is cleaved, releasing an 80 kDa fragment, it is no longer active. Interestingly, this 80 kDa product has been found to be increased in several types of cancers. In this work, the presence of an 80 kDa protein reactive with E-cadherin antibody, consistent with the inactive cleavage product of E-cadherin, has been detected in normal fibroblasts (BJ cells) and fibrosarcoma cells (HT-1080), and is expressed at a slightly higher level in subconfluent cells than confluent cells. Similarly, matrix metalloproteinase-9 (MMP-9), which is capable of cleaving cadherins, is also expressed more in subconfluent cells. Levels of MMP-2 were found not to be altered with increased culture density. Therefore, obtaining a confluent state is correlated with decreased MMP-9 expression, and loss of the 80 kDa fragment. ERK is upregulated in proliferating cells, and may also upregulate expression of E-cadherin. To investigate the potential role in the regulation of the 80 kDa fragment, dexamethasone treatment was used. Dexamethasone treatment resulted in lower expression of the 80 kDa fragment, as well as decreased expression of phosphorylated ERK. These results suggest a relationship between increased culture density, ERK activity, and regulation of cadherins.

**Changes in Expression of AMPA Receptors in Response to Chronic Alcohol and Tianeptine. Bryan Martin, Carlos Rivera, Victoria Schroeter and Dennis Rhoads, Monmouth University W. Long Branch NJ.**

Recent molecular pharmacological studies have demonstrated that ethanol inhibits neuroactivity via Ionotropic Glutamate Receptors (IGR). Adaptive changes during chronic alcohol consumption may result in overexpression of these excitatory receptors leading to symptoms of alcohol withdrawal including excitotoxicity, tremors and seizures. A novel anti-depressant Tianeptine appears to regulate the expression of the AMPA form of IGR and has been reported to be effective in attenuating alcohol withdrawal symptoms in adult rats. We have shown that adolescent rats are especially prone to seizures during alcohol withdrawal and the purpose of this study was to assess variations in relative AMPA receptor densities in membrane fractions from adolescent brain. As adolescents, rats consumed liquid diets containing alcohol, Tianeptine, or neither additive (as a control). Following diet administration for a period of 2-3 weeks, brain microsomal and synaptosomal fractions were obtained. The tissues were subjected to SDS-PAGE and transferred to a PVDF membrane for chemiluminescent immunodetection. Densitometry was used to assess the relative amount of AMPA IGR. The results indicate that chronic exposure to ethanol increased AMPA receptor densities in both the synaptosomal and microsomal fractions. The overexpression of AMPA IGR due to chronic alcohol consumption can promote excitotoxicity and may account for seizures observed during alcohol withdrawal. In contrast, chronic exposure to Tianeptine decreased AMPA receptor densities in both subcellular fractions and thus could be an effective treatment to reduce adolescent alcohol withdrawal symptoms. Initial trials were conducted to co-administer tianeptine and alcohol to adolescent rats. Tianeptine coadministration had only modest effects on anxiety-like behavior and no effect on the high frequency of seizures seen during withdrawal. Based on these observations, we conclude that chronic alcohol upregulates AMPA IGR in adolescent brain and that tianeptine may be an effective treatment in adults, but not adolescents.

**Inhibitory Effects of GABA on Serotonergic Innervation in the Bivalve Mollusc *Crassostrea virginica*. Sadchla Mattieu, Cherryle Brown, Edward J. Catapane and Margaret A. Carroll, Medgar Evers College, Brooklyn, NY.**

In most bivalves, superfusing gill epithelia with the neurotransmitters serotonin or dopamine alters beating of lateral cilia indicating the lateral cilia are regulated by a neuro or endocrine mechanism. In several bivalves, including *Crassostrea virginica* and *Mytilus edulis*, the beating rate of gill lateral cilia is controlled by a reciprocal serotonergic-dopaminergic innervation from their ganglia. GABA (gamma-aminobutyric acid) is a major inhibitory neurotransmitter in molluscs and other animals, but it has not been well studied in bivalves. We examined effects of GABA on beating rates of gill lateral cilia in *C. virginica* and *M. edulis*. Beating was measured in whole animal preparations with the cerebral and visceral ganglia innervation to the gills intact. In both animals GABA had no direct effect on lateral ciliary activity whether superfused to the cerebral ganglia or applied directly to gill. However in *C. virginica*, when GABA and serotonin were both applied to the cerebral ganglia, the presence of GABA, whether applied prior to or after serotonin, blocked the normal excitatory response of serotonin on the beating of the cilia. Furthermore, the GABA antagonist bicuculline methchloride blocked the inhibitory effects of GABA on the serotonergic system in the cerebral ganglia of *C. virginica*. Similar experiments in *M. edulis* could not demonstrate that GABA had a serotonin blocking effect at the cerebral ganglia. The study demonstrates GABA is working centrally as an inhibitory ganglionic neurotransmitter in *C. virginica* to inhibit serotonin neurons that innervate the gill and speed up beating of the lateral gill cilia. The bivalve mollusc gill is a useful model to study regulatory mechanisms of ciliary activity as well as pharmacology of drugs affecting biogenic amines in nervous systems. This work was supported by grants 2R25GM0600309 of the Bridge Program of NIGMS, 0516041071 of NYSDOE and 0622197 of the DUE Program of NSF.

**Mapping Ubiquitination Sites on the Transcriptional Repressor ICER Using Site-directed Mutagenesis. Alex McClain, Ethan Sebasco and Carlos A. Molina, Montclair State University, Montclair, NJ.**

ICER, inducible cAMP Early Repressor a dominant negative transcriptional repressor is our protein of interest. ICER is expressed in every cell and is inducible in endocrine and neuroendocrine cells. ICER also expresses tumor suppressor activity, and is abnormally expressed in prostate cancer cells. ICER when reintroduced into cancer cells inhibits the transformed phenotype of prostate cancer cells. ICER in cancer cells becomes modified by ubiquitination. Consequentially ICER is degraded or re-localized from the nucleus to the cytosol where it is non-functional. The overall goal of this project is identify the ubiquitination sites on ICER protein. Eleven mutants forms of ICER were constructed using site directed mutagenesis techniques. All lysines residues were substituted to arginine to create an ICER molecule without lysines. This construct was termed ICERK0. Another 10 independent mutants were generated where all but one specific lysine was substituted by arginine. All clones were subcloned in a mammalian expression vector and sequenced to confirm the mutations. These altered forms of ICER will be used to map the specific ubiquitination sites on ICER, because if we locate the site, we can stop and block degradation. This holds a promising insight to the advancement of understanding and treating of prostate cancer.

**Measuring Distribution and Permeability of an HIV Microbicide Gel Vehicle Using MRI, SPECT/CT and a Radiolabeled Small Molecule. Maleeha A. Memon, Edward J. Fuchs, Rahul P. Bakshi and Craig W. Hendrix, Johns Hopkins University, Baltimore, MD.**

Products that protect against sexually transmitted infections (STIs) including Human Immunodeficiency Virus (HIV) are needed for women. Vaginal gels offer the advantages of dosing controlled by the female partner, and the potential for less systemic toxicity due to drug exposure. A gel vehicle has been designed to provide coverage of the entire vaginal surface. This study is designed to determine the gel's distribution and effect on mucosal permeability using non-invasive imaging techniques. We piloted a study measuring the gel distribution, clearance, and mucosal permeability of the spreading gel. The results were compared to a positive control, (Nonoxonyl-9). Data was obtained blood and urine by measuring gamma activity. MRI and Single Photon Emission Computed Tomography (SPECT/CT) was conducted to view the intensity of the gel and its location. Data included findings of geometric mean ratio of the individual N-9: spreading gel permeability measures with 95% confidence intervals shown for area under the curve (AUC), peak concentration (Cmax), time to Cmax (Tmax). Mucosal permeability to <sup>99m</sup>Tc following N-9 is significantly greater than spreading gel based on AUC and Cmax. There is no significant difference in Tmax between gels. We then concluded that the gel formulation distributed quickly, though variably, throughout the vaginal canal and persisted for 24 hours. The greatest concentration of signal was seen in the anterior vaginal fornix at 1 and 4 hrs. The gel formulation provides coverage to the lower genital tract throughout the 24 hours. Based on the plasma PK curves there was a 50-fold difference in vaginal permeability between the gel formulation and N-9. N-9 is a compound known to increase the risk of HIV transmission. In contrast, less mucosal permeability following the spreading gel may indicate less systemic drug access (toxicity) and reduction in HIV transmission. This work was completed at The Johns Hopkins University during a Summer Internship Program that was funded by the Wagner College.

**Development of a Bioinformatics Tool for Prediction of Evolutionarily Conserved Regulatory Motifs in Human mRNAs. Camille Menendez, Scott Frees and Paramjeet S. Bagga. Ramapo College of New Jersey, Mahwah, NJ.**

Guanine rich nucleic acid molecules can form three-dimensional G-quadruplexes, also known as G-quartets. Naturally occurring G-quadruplex sequence motifs have been reported in mammalian, including human, genomes. The quadruplex structures have received significant attention recently because of growing evidence for their role in important biological processes, human disease, and as therapeutic targets. In order to understand the global role of G-quadruplexes in the regulation of gene expression and human disease there is a need to develop methods for reliable detection and analysis of G-quadruplexes in entire genomes. The goal of the current project has been to use a computational/bioinformatics approach to map phylogenetically conserved G-quadruplexes in all known human genes. The computational tool that we have developed performs semi-global alignments of appropriate mRNA sequence orthologs and then identifies evolutionarily conserved G-quadruplexes between the two mRNAs. The associated computations rate the degree and type of similarity between the homologous G-quadruplexes. Our program is capable of searching NCBI based databases for direct retrieval of available orthologs of the user-identified mRNAs and mapping conserved G-quadruplexes. We have successfully applied our program to analyze several human genes involved in neurological disorders. We have been able to confirm that it accurately predicts conserved G-quadruplexes among mRNA orthologs. For example, we have identified phylogenetically conserved G-quadruplexes in the SNCA gene, which codes for alpha-synuclein and is primarily expressed in the brain. Mutations in the SNCA gene have been linked to Parkinson's disease as well as dementia. Our bioinformatics tool can be very useful for studying the distribution of G-quadruplexes and their role in gene regulation, including those involved in disease.

**Potential Usage of EGCG as A Synergistic Agent for Antibiotic Therapy. Doleeban Merai, Kent Ozcan, Umme Habiba, Bobak Haghjoo and Lee H. Lee, Molecular Biology, Montclair State University, NJ.**

Green Tea is made from the leaves of the herbal plant *Camellia sinensis*. These leaves contain antioxidant ingredient catechins also known as polyphenols. Green tea contains six primary catechin compounds: catechin, gallacocatechin, epicatechin, epigallocatechin, epicatechin gallate, and epigallocatechin-3-gallate (EGCG). Out of these six catechin compounds, EGCG has a powerful anti-tumor, anti-viral, and anti-bacterial activity. In this study, 1% EGCG was used in synergism with the most commonly used antibiotics to study the effects on different species of bacteria. Six different bacteria (*Staphylococcus epidermidis*, *Bacillus megaterium*, *Escherichia coli*, *Enterobacter aerogenes*, *Mycobacterium smegmatis* and *Serratia marcescens*), and twelve different commonly used antibiotics (Ampicillin (AM10), Bacitracin (B10), Cephalothin (CF30), Chloramphenicol (C30), Doxycycline (D30) Erythromycin (E15), Gentamicin (GM10), Penicillin (P10), Polymyxin (PB300), Rifampin (RA5), Streptomycin (S10) and Tetracycline (TE30)) were used for this study. The Kirby-Bauer disk diffusion Method was used for this study with twelve antibiotics. The zone of inhibition was measured after a 24 hour incubation period, and the bacteria were categorized as being resistant (R), intermediate (I), or susceptible (S) toward different antibiotics both with and without 1% EGCG. The results suggested that synergistic effect of 1% EGCG varied depending upon microorganisms and antibiotics used against particular microorganism. In the presence of 1% EGCG, *E. aerogenes* revealed the greatest increase (19-150%) in antimicrobial activities with all antibiotics. *S. epidermidis* and *E. coli* showed similar increases (30-133% and 18-181% respectively) in activity, with an exception of PB300 on *S. epidermidis* (-46%) and CF30 on *E. coli* (-17%). EGCG in *M. smegmatis* and *B. megaterium* showed some synergistic and antagonistic effect on different antibiotics. EGCG increased efficacy of B10, CF30, and P10 on *M. smegmatis* (86%-150%). There is no synergistic effect on *S. marcescens*. EGCG can be utilized synergistically for most common antibiotics.

**Effectiveness of 4-tert-Butylphenol and Monobenzyl Ether of Hydroquinone Against M153 Melanoma Cells. Linda Miranda<sup>1,2</sup>, Nikkia Lewis<sup>1</sup> and Sarah Salm<sup>1</sup>. <sup>1</sup>Borough of Manhattan Community College, NY, NY and <sup>2</sup>Hunter College, NY, NY.**

Melanoma is the most aggressive form of skin cancer and has the highest rate of metastasis among skin cancers. The disease is caused by uncontrolled proliferation of melanocytes, the cells that produce skin pigment. Metastatic melanoma has a poor prognosis; the 5 and 10-year patient survival rates are 7-19% and 2-16% respectively. Early melanoma can be successfully treated with excision surgery. However, treatment options for metastatic melanoma are limited and there has been little recent improvement in increasing patient survival rates, indicating that new methods of treatment are needed. Phenolics such as 4-tertiary butyl phenol (4-TBP) and monobenzyl ether of hydroquinone (MBEH) have been found successful in treating people with vitiligo, a condition in which melanocytes die for unknown reasons. One treatment for vitiligo involves using chemicals such as MBEH and 4-TBP, that are used to lighten the skin around the affected area by killing the melanocytes, making the vitiligo patches less obvious. In this study, we determined whether these chemicals also affect the growth of melanoma cells. Melanoma cells (M153) were grown in the presence and absence of MBEH or 4-TBP at different concentrations, and cell growth was assessed using a crystal violet assay. We determined that both MBEH and 4-TBP cause significant death of M153 melanoma cells. In future work we will use SDS-PAGE and Western blot analysis to examine the possible mechanisms of action of MBEH and 4-TBP on melanoma cells. We thank Dr. Prashiela Manga, NYU Langone Medical Center, Department of Dermatology, for supplying the melanoma cell lines.

**L-Carnitine Induces MDA-MB 231 Cell Death. Jasmin Molina, Maria Cotrina, Jennifer Adjodha-Evans and Regina Sullivan, Queensborough Community College, Bayside, N.Y.**

Many cancer cells rely on glycolysis for ATP production even in the presence of oxygen, a phenomenon known as the "Warburg Effect". A number of studies have suggested that ATP production via aerobic glycolysis may alter the production of reactive oxygen species leading to evasion of apoptotic pathways. In our studies we investigated the ability of L-Carnitine to induce cell death in MDA-MB 231 cells, a metastatic human breast cancer cell line. L-Carnitine is a quaternary amine with important mitochondrial functions including the transport of lipids into mitochondria for oxidation and the export of toxic compounds from the mitochondria. Preliminary results show MDA-MB 231 cell death is increased at L-Carnitine concentrations of 100um. Further studies will determine if this metabolic pathway could be a target for cancer drug development.

**Performing Fluorescent Spectrometric Analyses to Distinguish the Excitation Wavelengths of Common Polycyclic Aromatic Hydrocarbons from Vitamins E and A in Fish Oil. Angelo Montero, Edwin Pena, Megan Dunham and Carolyn Bentivegna. Seton Hall University, South Orange, NJ.**

After the BP oil spill, concern rose in regards to the toxicological effects on the many species of fish that inhabit the region of the Gulf of Mexico. One of these effects is the possibility that PAH's dissolved into the oil of these fish. In order to prove this hypothesis, a particularly oily fish, the Menhaden, was chosen as a sample organism from which to analyze fish oil. Before investigating the oil from these fish, however, a method of analysis was first developed using commercially available fish oil. The oil was tested for PAH's, mostly naphthol and hydroxyperene, by dissolving it in 75 % ethanol and by analyzing the solution using a fluorescent spectrometer. The spectrometric protocol called for holding the emission wavelength constant and scanning for excitation. Through this method, it was possible to detect the aforementioned PAH's through the appearance of peaks at the wavelength values they normally excite in. It was also discovered that vitamins A and E, which are found in fish oil, appeared to fluoresce at values similar to those of naphthol and hydroxyperene. Nevertheless, a method for distinguishing the PAH's from the vitamins was developed by using various emission wavelengths and identifying where these compounds excite at those emission values. As an example, it was possible to distinguish naphthol from vitamin A by observing that at an emission of 450 nm, naphthol excites at 360 nm and vitamin A at 340 nm. This work was supported by the New Jersey Department of Environmental Protection and the Louisiana Fish and Wildlife Service.

**Determination of Fus3p MAP Kinase Phosphorylation Sites in the Formin Bni1p During the Mating Response of *Saccharomyces cerevisiae*.** Eric Muller<sup>1</sup>, Marcia Correa<sup>1</sup>, Garner Soltes<sup>2</sup>, Mark Rose<sup>2</sup>, <sup>1</sup>Iona College, New Rochelle, NY and <sup>2</sup>Princeton University, Princeton, NJ.

During the mating of the yeast *Saccharomyces cerevisiae*, two haploid cells of opposite mating type ( $\alpha$  or  $a$ ) sense each other via small peptide pheromones, initiate a signal transduction cascade, and eventually fuse to form a diploid zygote. Mating requires successful cell cycle arrest in G1, transcriptional changes, and morphogenesis which forms a cytoplasmic projection called a shmoo. Fusion ultimately occurs at the tips of the shmoo projection. All of these events, in part, require Fus3p, the final MAP kinase of the mating signal transduction cascade. Previously, it was determined that Fus3p phosphorylates Bni1p, a member of a conserved group of proteins called formins which nucleate unbranched filamentous actin. This actin nucleation, stimulated by Bni1p during the mating response, is essential for shmoo formation. Thus it seems likely that Fus3p phosphorylation of Bni1p plays a direct role in regulation of morphogenesis. Therefore, in order to map specific phosphorylation sites on Bni1p which may impact shmoo formation we have performed a truncation analysis of the Bni1p protein, followed by site directed mutagenesis of specific candidate residues. Several of these candidate sites are currently being assayed phenotypically and for phosphorylation status in an *in vitro* kinase assay. This study will elucidate the relationship between Fus3p and Bni1p, as well as differentiate this interaction from all the other roles of Bni1p. These findings will provide more information about how cells interpret external stimuli about how and where to polarize and fuse.

**Determination of the Total Antioxidants' Concentration in Juices and Tea Beverages via the Folin Ciocalteu Method.** May Myat Moe<sup>1</sup>, Paris Svoronos<sup>1</sup> and Soraya Svoronos<sup>1</sup>, Queensborough Community College, CUNY, Bayside, NY.

Many commercially available beverages contain large quantities of antioxidants. Antioxidants are mostly polyphenols, which are groups of organic compounds that quench the oxidative cell damage that is created by the formation of free radicals in the human body. There is an increasing interest for alternatives to most commercial beverages and various types of teas that can gradually neutralize the damaging effect of free radicals. Various studies have shown that five servings of antioxidants per day will maintain a healthy life. The purpose of this research project is to use UV-Visible Spectrophotometry to quantitatively measure the total amount of antioxidants in beverages using the Folin Ciocalteu Method, previously employed in similar studies in oenology. The method was successfully applied with different kinds of tea samples, juices, and other beverages using Gallic acid as the standard. Similar studies on the effect of air oxidation on the quantities of antioxidants in these same beverages after a week indicated a marked decomposition that ranged from 20-80%.

**The Distribution and Development of Horseshoe Crab Eggs (*Limulus polyphemus*) on Plumb Beach, Jamaica Bay, New York, and Negative Impact of Human Activity on Hatching Rate.** Syed Nawaz, Ron Tillman and Christina Colon, Kingsborough Community College, Brooklyn, NY.

Horseshoe crabs are estimated to be at least 500 million years old. There are only four species of horseshoe crabs worldwide, and the Atlantic horseshoe crab (*Limulus polyphemus*) is by far the most numerous. *L. polyphemus* can be found along the East Coast of North and Central America, but their survival is threatened by habitat destruction, as well as over harvesting for the biomedical and bait industries. While breeding adults are regularly surveyed, no information exists on egg or hatchling densities, or rate of emergence and survival at this location. This study compares the number and density of eggs and hatchlings on three different locations along Plumb Beach, Jamaica Bay, which is New York State's most important breeding beach for this species. Five surveys were conducted between June 01 and August 11. A total of 31,513 eggs and 5,801 hatchlings were counted, indicating an average

hatching rate of 18.4%. Egg counts declined steadily from June 1 and reached zero by August 11<sup>th</sup>. Hatchling numbers peaked on July 13<sup>th</sup> and declined to zero by August 11<sup>th</sup>. While the number of eggs were almost same on all three locations, the number of hatchlings was higher in areas where the human activity was lowest (36.5% vs 16% vs 3.5%) indicating that the human activity appears to negatively impact survival rates. These baseline values will be used for comparison to future studies as part of an ongoing monitoring effort to help protect this declining yet economically and environmentally critical species. This project was made possible through grant 2R25GM06003-05 of the Bridges to the Baccalaureate Program of NIGMS and grant 0537101091 of the CSTEP Program of the NYS Dept. of Education. We thank Dr. Mark Botton from Fordham University and Dr. John Rowden from The New York City Audubon for their assistance and input.

**Effects of Resveratrol Analogs on Cell Proliferation and Migration of Mouse Melanoma Cells.** Fathima B. Nazumdeen<sup>1</sup>, Valery Morris<sup>1</sup>, Carmela Spatafora<sup>2</sup>, Corrado Tringali<sup>2</sup> and Susan A. Rotenberg<sup>3</sup>, <sup>1</sup>Queensborough Community College, <sup>2</sup>Universita di Catania and <sup>3</sup>Queens College.

Resveratrol (3, 5, 4'-trihydroxy-*trans*-stilbene) is found in red wine in addition to other foods. It occurs naturally as both *trans* and *cis* isomers. It has been shown to have both anti-oxidant and anti-cancer properties. There has been recent interest in the beneficial effects of resveratrol against cancer cells and in the synthesis of resveratrol analogues with more potent anti-cancer properties. The focus of this research is to examine the inhibitory effect of resveratrol and its analogues on proliferation and motility of metastatic mouse melanoma B16 F10 cells. Resveratrol and several related analogues were tested for effects on the proliferation of B16 F10 cells by an assay using Alamar Blue. The effect of these compounds on cell migration, an aspect of cellular metastasis, is analyzed by using a cell sedimentation assay. The results showed that proliferation is inhibited substantially by 50  $\mu$ M of the parent *trans*-trihydroxy compound (*trans*-resveratrol). In contrast, inhibition by the *cis*-trimethoxy analogue at 50  $\mu$ M is almost as strong as the parent compound and more potent than the *trans*-trimethoxy compound. Motility is also substantially decreased by 50  $\mu$ M of the *cis*-trimethoxy compound. However, *trans*-resveratrol at 50  $\mu$ M has no effect on cell movement. The results indicate that while none of the analogues are more potent than the parent compound as inhibitors of proliferation, the *cis*-trimethoxy analogue shows novel and potent activity as an inhibitor of cell movement and therefore has potential as an anti-metastatic agent.

**Development of Nek2 Substrates Based on C-Nap1 Using Fmoc-based Solid Phase Peptide Synthesis.** Daniel Andre Novoa<sup>1</sup>, Rafael Duran<sup>1</sup> and Sanjai Kumar<sup>2</sup>. <sup>1</sup>Queensborough Community College, Bayside, NY and <sup>2</sup>Queens College, Flushing, NY.

Nek2 is a Serine/Threonine kinase localized in the centrosome of the cell. It is essential for proper cell division during mitosis, and recent data suggests it is greatly over-expressed in many forms of cancer. C-Nap1 is a known *in vivo* protein substrate of Nek2. Mass spectrometry data has revealed the phosphorylation sites on C-Nap1. Despite this knowledge, many of the biological functions of Nek2 remain unknown. This is primarily due to the lack of appropriate tools, namely, small molecule substrates for assaying the *in vitro* activity of Nek2. The goal of this project is to synthesize small peptide substrates of Nek2 based on the consensus sequence of C-Nap1 that will display desirable Michaelis-Menten parameters (high  $k_{cat}$  and low  $K_m$  values). Fmoc-based solid phase peptide synthesis was employed to generate peptide substrates for Nek2. Subsequently, two crude peptides named NAP\_3 and NAP\_4 were purified using Reverse Phase-HPLC, and characterized by ElectroSpray Ionization Mass Spectrometry. The next phase of this study will be to assay the enzyme kinetics of the two peptides to determine the most effective small molecule substrate for Nek2. The knowledge gained from such studies could be utilized in the development of Nek2 biosensors and small molecule inhibitors. Daniel Novoa and Rafael Duran are participants in the NIH Bridges to the Baccalaureate Program at Queensborough Community College.

**Adenylyl Cyclase Inhibitors Reverse the Neurotoxic Effects of Manganese on Post-Synaptic Dopamine D2 Receptors.** Christiana Ojo<sup>1</sup>, Michael Nelson<sup>2</sup>, Trevon Adams<sup>2</sup>, Edward J. Catapane<sup>2</sup>, and Margaret A. Carroll<sup>2</sup>, <sup>1</sup>Kingsborough Community College and <sup>2</sup>Medgar Evers College, Brooklyn, NY.

Manganese (Mn) is a neurotoxin causing Manganism, a Parkinsons-like disease. Mn neurotoxicity involves disruption of dopaminergic neurotransmission. The mechanism by which Mn produces dopaminergic dysfunction is not fully resolved. Lack of effective treatment for Manganism is a major obstacle. Lateral cilia of gill of *Crassostrea virginica* are controlled by serotonergic-dopaminergic innervations from their ganglia. Dopamine is the neurotransmitter causing cilio-inhibition, serotonin cilio-excitation. Our lab showed post-synaptic dopamine receptors present in gill lateral cells are D2 type, which are G protein-coupled metabotropic receptors. G $\alpha$  inhibits adenylyl cyclase, while G $\beta\gamma$  increases K<sup>+</sup> channel conductance and closes Ca<sup>2+</sup> channels. We further showed Mn blocks the cilio-inhibitory effects of dopamine and Mn exerts its effects by blocking dopamine post-synaptic receptors. Here we observed membrane potentials of lateral ciliated cells of *C. virginica* gill with a voltage sensitive fluorescent dye while measuring cilia beating rates. Applying serotonin to gill caused prolonged membrane depolarization and increased beating. Applying dopamine to gill after exciting cilia repolarized the cell membrane and decreased beating. Applying Mn prevented the cilio-inhibitory response and corresponding repolarization. Adding ATP (10<sup>-4</sup>M) or forskolin (10<sup>-6</sup>-10<sup>-5</sup>M), an adenylyl cyclase activator, to control or Mn treated gill increased beating without changing the membrane potential. Applying MDL or SQ, adenylyl cyclase inhibitors, to controls or Mn treated gill, decreased beating without affecting membrane potential. The study shows the correlation between membrane potential of lateral ciliated cells and cilia beating rates. It shows the actions initiated by activation of D2 post-synaptic receptors can be differentiated to effects on adenylyl cyclase and on membrane channel conductance and the neurotoxic effects of Mn can be overcome by application of adenylyl cyclase inhibitors. It helps elucidate the neurotoxic mechanism of action of Mn. This information is helpful to understand causes and potential therapeutic treatments of Manganism.

**Decreased Neutrophil Infiltration Into Neonatal Lungs Following Lipopolysaccharide Stimulation.** Brenna M O'Keefe, Jerin M Karingattil and Heping Zhou, Seton Hall University, South Orange, NJ.

The innate immune inflammatory response in the lung is essential for host defense against infection. Studies have shown that neutrophil recruitment into the respiratory tract in response to *Moraxella catarrhalis* exposure is greatly delayed and diminished in newborn rats than adult animals. Neonatal mice also exhibit impaired clearance of nasopharyngeal colonization with *S. pneumonia* compared to adult animals. Our studies aimed to examine the infiltration of neutrophils into the lungs following a systemic infection during postnatal development. We treated animals with lipopolysaccharide (LPS) at postnatal day 1 (P 1), P 21, and P70 via intraperitoneal injection, and measured the enzymatic activity of myeloperoxidase (MPO) in the lungs of these animals. We found that LPS treatment significantly increased the MPO activity in the lungs of P 21 and P 70 animals, but did not have significant effects on the MPO activity in P 1 lungs. Our studies suggest that the infiltration of neutrophils into the lungs of neonates was impaired, which may contribute to increased neonatal pulmonary susceptibility to microbial infections.

**Inhibition of Herpes Simplex Virus Type 1 with the Modified Green Tea Polyphenol Palmitoyl-Epigallocatechin Gallate.** Aline de Oliveira<sup>1</sup>, Lee H. Lee<sup>2</sup>, Sandra D. Adams<sup>2</sup>, Sean R. Murray<sup>3</sup> and Tin-Chun Chu<sup>1</sup>, <sup>1</sup>Seton Hall University, South Orange NJ, <sup>2</sup>Montclair State University, Montclair NJ and <sup>3</sup>California State University Northridge, Northridge, CA.

Herpes Simplex virus 1 (HSV-1) is among the most common infectious diseases in humans. HSV-1 DNA with the green fluorescent protein (GFP) introduced into the UL46 gene was used to investigate the effects of green tea polyphenols on the virus. Two different green tea extracts have been isolated and modified, epigallocatechin gallate (EGCG) and palmitoyl-EGCG (p-EGCG). Modification of EGCG with palmitate increases the effectiveness of EGCG as an antiviral agent. EGCGs are of interest since they can be topically applied to skin, one of the primary tissues infected by Herpes Simplex Virus. The results demonstrate that p-EGCG is a more potent inhibitor of HSV-1 than EGCG and that p-EGCG is not toxic to Vero cells in culture. Viral titers, PCR, real-time quantitative PCR, and fluorescence microscopy were used to demonstrate that p-EGCG concentrations of 50mM and higher completely block the production of HSV-1 particles. Quantitative study using RT-PCR indicated that p-EGCG at 75mM inhibited 99.46% of infection when compared to the control. Thus, p-EGCG may provide a novel treatment for HSV-1 infections. Use of p-EGCG could have significant public health benefits, and warrants further study in appropriate models.

**Robo2 and Pax2 Play Distinct Roles in the Pathogenesis of Congenital Anomalies of the Kidney and Urinary Tract in Mice.** Rachael Opoku<sup>1</sup>, Hila Milo Rasouly<sup>2</sup> and Weining Lu<sup>2</sup>, <sup>1</sup>Medgar Evers College, Brooklyn, NY and <sup>2</sup>Boston University Boston, MA.

Congenital anomalies of the kidney and urinary tract (CAKUT) are a complex birth defect that includes dysplastic kidney and vesicoureteral reflux (VUR). Despite the high incidence of CAKUT, its genetic basis remains unclear. *Robo2* and *Pax2* are two genes playing critical roles in embryonic development of the kidney and urinary tract. Previous studies showed mutations in either *Robo2* or *Pax2* are associated with CAKUT-VUR phenotype in human and mouse. Both *Robo2* and *Pax2* regulate expression of *gdnf*, which is a key factor for early kidney induction. To determine if there is a genetic interaction between *Robo2* and *Pax2*, i.e., to test if compound mutations of *Robo2* and *Pax2* in the same mice would modify CAKUT phenotype compared with mice with a *Robo2* single mutation; we analyzed kidney and urinary tract phenotype in mice harboring either or both *Robo2* and *Pax2* mutations. *Robo2* and *Pax2* double heterozygous mice were crossed to produce *Robo2* homozygous mouse offspring with or without a *Pax2* mutation. Progeny were sacrificed between 6 to 21 days of age and phenotype was analyzed by surgical dissection. DNAs were extracted from mouse tails and used for PCR genotyping to identify *Robo2* mutations and *Pax2* mutations. Thirteen *Robo2* homozygous mice with *Pax2* mutation (*Robo2*<sup>-/-</sup>; *Pax2*<sup>+/-</sup>) and 12 *Robo2* homozygous mice without *Pax2* mutation (*Robo2*<sup>-/-</sup>; *Pax2*<sup>+/+</sup>) were identified. Among those, 8 (61.5%) *Robo2*<sup>-/-</sup>; *Pax2*<sup>+/-</sup> and 8 (67%) *Robo2*<sup>-/-</sup>; *Pax2*<sup>+/+</sup> mice developed CAKUT phenotypes such as dysplastic kidney and hydronephrosis. There is no statistically significant difference in the frequency of the CAKUT phenotype between *Robo2* homozygous mice with *Pax2* mutation and *Robo2* homozygous mice without *Pax2* mutation. There appears to be no genetic interaction between *Robo2* and *Pax2*. We conclude *Robo2* and *Pax2* gene play distinct roles in the pathogenesis of congenital anomalies of the kidney and urinary tract in mice.

**Adolescent Long-Evans Rats Are Resistant to the Induction of Repetitive Behavior by Buspirone. Krystal Orlando, Madelyn Mauterer, Janine Mallari and Dennis Rhoads, Monmouth University West Long Branch, NJ.**

Spontaneous alternation behavior (SAB) is the natural tendency of rats to alternate in their choice of arms of a T-maze when both arms are baited equally with an attractant. Disruption of SAB by drugs altering brain serotonin (5-HT) is of interest because the resulting repetitive behaviors serve as models for aspects of human Obsessive-Compulsive Disorder (OCD). Might rat strain differences in responses to disruption of SAB provide insight toward understanding individual differences in people, including differences between adolescents and adults? Repetition in choices of arms of a T-maze was measured along with increased apparent decision time due to induction of vicarious trial and error (VTE) behavior. Responses of male adolescent Long-Evans (LE) rats were compared to those of adolescent Sprague Dawley (SD) and adult LE rats. The 5-HT<sub>1A</sub> agonist 8-hydroxy-dipropylaminotetraline (8-OH-DPAT; 2-3 mg/kg, i.p.) induced repetitive choices of arms in the maze in all three test groups. Buspirone (1-4 mg/kg, i.p.), a 5-HT<sub>1A</sub> partial agonist/dopamine D2 receptor antagonist, had no significant effect on arm choice but induced VTE behavior and increased the apparent decision time in the adolescent SD and adult LE rats, but not the adolescent LE rats. Thus, insensitivity to buspirone is characteristic of the adolescent stage in the LE strain. Western blotting of brain 5-HT<sub>1A</sub> receptors showed that adolescent LE brain had a similar density of receptors to that seen in adolescent SD and adult LE. A 5-HT<sub>1A</sub> antagonist WAY 100365 failed to block the effect of buspirone on VTE behavior. We conclude that the adolescent LE brain has normal levels of 5-HT<sub>1A</sub> receptor and that the effect of buspirone on VTE behavior is not mediated by the 5-HT<sub>1A</sub> receptor. Dopamine may share roles with serotonin in inducing repetitive behaviors and the LE strain provides a useful model for exploring differential responses of the adolescent brain.

**Direct Loss of Rotavirus Infectivity in Suspension by Flavonoids Using a Viral Capsid Antigen Detection Cell-Free Assay System. F.S. Ozen<sup>1,2</sup>, G.L. Sullivan<sup>1</sup>, R.S. Gordon<sup>3</sup>, L. Karthekeyan<sup>4</sup> and S.M. Lipson<sup>1</sup>. <sup>1</sup>St. Francis College, Brooklyn, NY, <sup>2</sup>Selcuk Univ., Konya, Turkey, <sup>3</sup>Mt. Sinai Med. Ctr., <sup>4</sup>NYC Col. Tech./CUNY.**

Secondary plant metabolites (e.g., flavonoids) display antiviral activity upon infectivity titration testing in susceptible host cell monolayers. However, no studies have reported the direct loss of virus infectivity/virus structural integrity by flavonoids in the cell-free assay system. Accordingly, experiments were performed to determine the extent of antiviral activity by different flavonoids present in cranberry and grape juices, citrus fruits, and green tea [viz., proanthocyanidins (PACs), catechin types, epicatechin (EC), hesperidin, naringin, and diosmin]. A cranberry PAC concentrate, HI-PAC 4.0, was evaluated as well. A quantitative antigen capture [viral capsid protein 6 (VP6)] enzyme immunoassay assay was used to measure loss of viral infectivity. The simian rotavirus strain SA-11 (RTV), was used as a representative enteric viral system. RTV stock titers were determined the TCID<sub>50</sub> technique in monkey kidney (MA-104) cell cultures. Two hundred and 100 ug/ml PACs affected an infectivity loss of 92 and 56%, respectively. An HI-PAC 4 concentration of 25,000 ug/ml was necessary to reduce RTV infectivity by one order of magnitude. One-hundred sixty and 80 ug/ml epigallocatechin gallate affected a loss of RTV infectivity >99 and 45%, respectively. PAC component flavan-3-ol monomers consisting of catechin and EC, mandated increased concentrations (ca., 5,000 to 10,000 ug/ml) to affect a RTV loss of infectivity approaching 50% of control. Synergistic studies failed to enhance these monomers' antiviral effect. Catechin (1000 ug/ml) but not EC, displayed a hemagglutination inhibitory effect, suggesting a blockage of RBC sialic acid receptor sites. Utilizing gold-labeled immunoelectron microscopy, RTV particles were found to be entrapped within PAC aggregates. Our findings

denote the importance of flavonoid structure as a potential anti-RTV agent. Our work furthermore, points out the need for a more directed or canalized approach in the use of specific plant secondary metabolites as antiviral moieties.

**Bacterial Counts and Avian Populations at Kingsborough Community College Beach and Sheepshead Bay, Brooklyn, New York. Michelle P. Pamas, Mary T. Ortiz and Navneet K. Parmar, Kingsborough Community College, Brooklyn, NY.**

A problem beaches face is feces-borne pathogenic contamination. Birds (eg. Gulls) wander beaches, defecating in shore areas, increasing aquatic fecal coliforms. One seashore water contaminant is *Escherichia coli*, ubiquitous bacteria that are beneficial (some strains are part of the normal human flora in the large intestine, producing vitamin K and inhibiting pathogenic microorganisms) or harmful, causing symptoms such as hemorrhagic diarrhea and kidney failure. During 8 weeks in the summer of 2011, we monitored the amount and types of birds on the beach and in the bay area, and bacterial counts in the water at Kingsborough Community College Beach (KB) and Sheepshead Bay (SB), Brooklyn, NY. We hypothesized a direct relationship between bacterial counts and the number and species of birds at KB and SB. Both sites were visited once per week. Wild bird species were catalogued. Sea water samples were collected and incubated. Samples were also collected and tested for salinity and pH. For the 8 week period at KB and SB, the pH values were consistent at 6.5. The salinity value range was 1.2-1.7‰. Of the bird populations observed, 95% were Gulls. *E. coli* count ranges were 0-4/mL at KB and 0-21/mL at SB. Bacterial colony count ranges were 11-74/mL at KB and 9-81/mL at SB. There was no relationship between bird abundance and bacterial counts. Our hypothesis unsupported. We observed that bacterial counts were highest during the week of the July 2011 heat wave and following the sewage treatment plant spill on the Hudson River. This is a complex ecological problem. More data and parameters (such as detailed weather conditions) need to be examined in future studies. This work was supported by Grant 5R25GM62003-9 of the Bridges to the Baccalaureate Program of NIGMS and Grant 0516051091 of the CSTEP Program of the NYS Department of Education.

**Inflammation and Cancer. Joey Pang and Andrew Nguyen, Queensborough Community College, Bayside, NY.**

A relationship between cancer and inflammation due to chronic inflammation has been long recognized. One of the key players in inflammation is the transcriptional factor NF-κB in immune cells. NF-κB is activated in immune cells as a response to an infectious agent and by the pro-inflammatory cytokines via the IκB kinase (IKK) complex. Colitis associated cancer (CAC) is the inflammation of the colon which contributes to cancer. It is one of the most serious complications of inflammatory bowel disease (IBD). Interleukin 6 (IL-6) is a multifunctional NF-κB-regulated cytokine that acts on epithelial and immune cells. Recent data suggest that IL-6 is a critical tumor promoter during early stages of CAC tumor genesis. The proliferative and survival effects of IL-6 are largely mediated by the transcriptional factor, signal transducers and activators of transcription (Stat3). We have developed a mouse model of inflammation associated colorectal cancer by conditionally deleting Stat3 in immune cells. Greater than 80% of these mice developed hyperplasia and dysplasia. Since chemokines have been known to recruit immune cells to the infectious sites, we hypothesize that epithelial Stat3 could regulate the chemokine production, thereby, affecting inflammatory response and tumor progression. We are evaluating the degree of inflammation and chemokine production using real time PCR and immunohistochemistry from the colons of mice depleted of Stat3 in immune and epithelial cells.

**Effects of Lipopolysaccharide-induced Inflammation on Hypoxia-inducible Factor-1 Expression in the Rat Testis. Dharm Patel, Genevieve Fasano and Michael A. Palladino, Monmouth University, West Long Branch, NJ.**

Bacterial and viral infections of the human male reproductive tract are known to reduce fertility through decreased sperm mobility, blockage of the tract itself, and/or decreased androgen output. Identifying molecular changes following inflammation within tissues is a topic of intense research. Hypoxia-Inducible Factor-1 (HIF-1) is a transcription factor that is considered the master regulator of hypoxia. We hypothesize that HIF-1, in the rat testis is upregulated following lipopolysaccharide(LPS)-induced inflammation through an activation pathway involving NF- $\kappa$ B, a key transcriptional regulator of inflammation, that stimulates HIF-1 $\alpha$  transcription. Induction of inflammation in rats was accomplished via intraperitoneal administration of LPS from *E. coli* and *P. aeruginosa* for 1, 3 and 6 hours (n = 3-5 animals/time point) at a dosage of 5 mg/kg body weight. Western Blot analysis of testicular cytoplasmic and nuclear protein extracts demonstrated an increase in HIF-1 $\alpha$  protein levels and no change in NF- $\kappa$ B and I $\kappa$ B protein levels following LPS treatment. Electromobility shift assays (EMSA), performed to determine NF- $\kappa$ B binding activity to HIF-1 $\alpha$  promoter, suggest a decrease in NF- $\kappa$ B binding activity following LPS treatment. Further experiments will be performed to determine if the mechanism affecting levels of HIF-1 $\alpha$  is via transcriptional regulation. In addition, Western Blot analysis will be performed to examine effects of inflammation on downstream target genes of HIF-1, such as *Mcl-1*. This work will shed light on the crosstalk between NF- $\kappa$ B and HIF-1, two major transcriptional regulators of inflammation and hypoxia, respectively. This relationship may be useful in studying disease states in which hypoxia and inflammation are a feature of the microenvironment.

**Characterization of Human ICER Promoter and Comparative Studies of its Activity in Different Human Cancer Cells. Dipika B. Patel and Carlos A. Molina, Montclair State University, Montclair, NJ.**

The Inducible cAMP Early Repressor (ICER) is a dominant transcriptional repressor that binds to cAMP response promoter elements (CRE) to repress cAMP-mediated gene transcription. ICER belongs to CREB/ATF family and it is transcribed from an internal promoter, P2, of cAMP responsive element modulator (CREM) gene. The promoter of ICER contains four regulatory CRE sequences, termed cAMP autoregulatory response elements (CAREs) that are highly inducible by cAMP signaling. In a cell, cAMP pathway induces the expression of ICER, however, when ICER protein level increases, it can regulate its own production by binding to the CAREs located in its promoter region to inhibit ICER gene transcription. Thus, ICER with this autoregulatory feedback mechanism is also a great interest in this research. ICER is normally present in neuroendocrine cells, however, it is not present in tumor cells. In addition, the growths of these tumor cells have been known to be hampered when ICER is artificially reintroduced. Therefore, it is hypothesized that ICER, putative tumor suppressor, manipulation could potentially be used as a new treatment for cancers. Until now, the activity of ICER promoter has been studied in organisms such as rat and mouse; however, human form of ICER promoter has not been characterized yet. Furthermore, in silico analysis shows that the CAREs of human ICER promoter regions are highly conserved which emphasizes the importance of these CARE sites in gene regulation. Thus, the goal of this research is to characterize the human ICER promoter and study the transcriptional regulation of putative tumor suppressor gene, ICER. In order to achieve our goal, the human ICER promoter containing the putative CAREs has been analyzed in vivo as well as in vitro. Electromobility shift assay revealed ICER binding to three CAREs, namely CARE-1, CARE-3 and CARE-4. Furthermore, luciferase reporter assay was also conducted to characterize ICER promoter and to do comparative studies of its activity in different human cancer cells. Results show that human ICER promoter is inducible by cAMP mediated signaling in LNCaP cells but in HeLa cells. Furthermore, ICER can repress its own production by binding cooperatively to three CAREs located in its promoter region. Results also show that ICER binds to CAREs in cooperative manner to represses the activity of its own promoter confirming the negative autoregulatory loop.

**Fluorescence Analysis of PAHs Extracted from Fish Oils Obtained from Various Locations Pre- and Post-Deep Water Horizon Mississippi Canyon 252 Oil Spill using Spectramax®. Edwin A. Pena Angelo Montero, Megan E. Dunham and Carolyn S. Bentivegna, Seton Hall University, South Orange NJ.**

The BP oil spill contaminated a large area in the Gulf of Mexico in summer 2010. It is likely that many aquatic species in the Gulf were affected by the spill. Crude oil contains polycyclic aromatic hydrocarbon (PAHs). Some PAHs are carcinogenic to fish and humans. The purpose of this project was to determine the levels of PAHs in wild menhaden collected from several locations including Delaware Bay, NJ, James River, VA, Grand Isle, LA- which was heavily soaked by BP oil and Vermillion Bay, LA- which was not oiled by the 2010 spill. Menhaden are a filtering feeding fish and very important to aquatic ecosystems as the principle prey species for higher trophic level organisms, such as bluefish and tuna. They are also important to the bait and reduction industries, including the production of omega-3-fatty acid. Menhaden are oily fish, and being that "like dissolves like", it was hypothesized that their body oil would accumulate crude oil contaminants such as PAHs. Fish oil was obtained by separating fish muscle and skin from internal organs. Muscle and skin were crushed then centrifuged for 6 hours at 10,000rpm. The resulting fish oil layer was separated from the aqueous layer and fish meal. PAHs were extracted from 50  $\mu$ l of fish oil into 75% ETOH. They were detected using scanning fluorescence spectroscopy. The spectra for fish oils were compared to PAH standards and PAHs spiked into fish oil. Results showed that fluorescence was a sensitive detection tool: PAH-like substances were quantified at the  $\mu$ g/L level (ppb). Major fish oil peaks were at Em350/Ex280 and Em450/Ex350. Menhaden from Grande Isle had higher PAH-like substances than fish from Vermillion Bay and lower levels than some samples from NJ and VA. Menhaden fish oil could be useful for monitoring oil spill contaminants.

**Effect of High Ammonia on Neonatal Neuroglial Cells. Stephanie Perdomo<sup>1</sup> and Maria Luisa Cotrina<sup>2</sup>. <sup>1</sup>Queensborough Community College, Bayside, NY and <sup>2</sup>Columbia University/University of Rochester, NY.**

Hyperammonemia is the accumulation of ammonia in the blood and brain. Vomiting, lethargy, poor feeding, failure to thrive and coma may occur in neonatal patients with hyperammonemia. Infants that survive the hyperammonemic state often show neurodevelopmental delay and seizures indicating significant neural cell damage. Hypomyelination, (lower levels of myelin in brain) has also been observed. Culture studies have shown that high ammonia selectively affects growth of neuronal fibers, and promotes death of oligodendrocytes, the myelin producing cells. In addition, most of glial cell maturation occurs close to birth and newborns are very sensitive to high ammonia. Based on these findings, we hypothesized that high ammonia causes hypomyelination by affecting the early developmental decisions of the oligodendrocyte precursor cells at the time of birth. In this study, mixed neuronal-glial cultures derived from 1-day old mouse brains were treated with 5 mM ammonia and then labeled with antibodies specific for immature (positive for the antigen olig2) and mature (positive for the antigen O4) oligodendrocytes. Our data show that exposure to high ammonia for a short period of time (with no apparent cell death) does not change the amount of olig2+ oligodendrocytes precursors (27 $\pm$ 1 in control vs 30 $\pm$ 3) but significantly increases the number of mature, differentiated O4+ oligodendrocytes. (6.7 $\pm$ 0.5 in control vs 11.1 $\pm$ 0.4), indicating that high ammonia may affect the differentiation of developing oligodendrocytes in the neonatal period even in the absence of cell death. These results suggest that the hypomyelination observed in children affected with hyperammonemia could be caused by a differential effect of ammonia on developing cells depending on the time of exposure. Stephanie Perdomo is a participant in the NIH Bridges to the Baccalaureate Program at Queensborough Community College.

**Searching for *Polygalacturonase* in the Genome of Two *Primula* Species.** Delrol Peters and Farshad Tamari, Kingsborough Community College, Brooklyn, NY.

*Primula polyantha* and *P. acaulis* are members of the Primulaceae family of plants and exhibit a floral dimorphism known as distyly and self-incompatibility. Distyly is the occurrence of two floral morphologies in a given species whereby short-styled plants have short pistils and long stamens, and long-styled plants have long pistils and short stamens. Self-incompatibility refers to the inability of a hermaphroditic seed plant to produce seeds after self- and intra-morph pollinations. The focus of this research is to address whether the gene *polygalacturonase* is present in the genome of *P. polyantha* and *P. acaulis*. We focused on this gene because it has been implicated in distyly and self-incompatibility in another distylous genus (Turnera, Turneraceae). We hypothesized that the gene *polygalacturonase* is present in both *P. polyantha* and *P. acaulis*. To test our hypothesis we extracted DNA from ten short- and long-styled plants of *P. acaulis*, and eight short- and long-styled plants of *P. polyantha*. The extracted DNA were used with primer designed against Turnera-specific *polygalacturonase* to PCR amplify the gene. This was followed by sequencing. Preliminary results show that *polygalacturonase* is present in both species however, these results need to be confirmed. This finding provides further evidence for the involvement of *polygalacturonase* in distyly and self-incompatibility. It also hints at potential similarities between *Primula* and *Turnera* in the mechanism of distyly and self-incompatibility. This work was supported by grant 0537101091 of the CSTEP Program of the NYS Department of Education and a President's Faculty Innovation Award to F.T.

**A Voltaic Cell Derived from a Combination of  $^{151}\text{Eu}$  Mossbauer and  $\text{Eu}/\text{Eu}^{3+}/\text{Eu}^{2+}$  Electrovoltaic Measurements.** Travis. Pinnock<sup>1</sup> and Clive I. Wynter<sup>2</sup>, <sup>1</sup>Medgar Evers College, Brooklyn, NY and <sup>2</sup>SUNY at Old Westbury, Old Westbury, NY.

Mossbauer Spectroscopy is a widely used technique that is used to provide information in many areas of science. It helps give precise information about the chemical, structural and time dependent properties of a material. In my research Mossbauer Spectroscopy was used to measure the potential utility of Europium ( $^{151}\text{Eu}$ ) for electro-voltaic cell applications. Utilizing the 21.6 Kev gamma ray from Samarium oxide  $^{151}\text{Sm}_2\text{O}_3$  three relatively stable  $^{151}\text{Eu}$  charged states, namely  $\text{Eu}^0$ ,  $\text{Eu}^{3+}$  and  $\text{Eu}^{2+}$  have been identified. The presence of three or more charge states of a given nuclide is suggestive of a disproportionation reaction in which a species in an intermediate charge state such as  $\text{Eu}^0$  can be oxidized to a higher charge state such as ( $\text{Eu}^{3+}$ ) and simultaneously reduced to a lower charge state as  $\text{Eu}^0$ . The differential chemical shift  $d$  in mm/s relative to  $\text{EuF}_3$  at room temperature between these different charge states exhibits a difference of some 12 to 13 mm/s. This difference in the isomeric shift is directly related to the relative error of the Eu-151 nuclide ( $dR/R$ ), and the difference between the s-electron density at the nuclide and the absorber probes at room temperature and 77k. In a search to expand the usefulness of Mossbauer Spectroscopy, we studied the Mossbauer Spectrum of the three charged states of  $^{151}\text{Eu}$ . Baseline experiments were run using oxygenated and deoxygenated standard bland solutions followed by oxygenated and deoxygenated 1M  $\text{EuCl}$  solutions. These experiments were repeated several times to ensure the reproducibility of the results. At our 1M concentration of  $\text{EuCl}$  we were able to observe relatively large energy measurements. These preliminary results indicate that  $^{151}\text{Eu}$  may be useful in electro-voltaic cell applications.

***In Vitro* Toxicity of Hoechst 33342 and Ultraviolet Illumination in *Drosophila pseudoobscura* spermatogenic Cysts.** Crystal Pristell and Angela V. Klaus, Seton Hall University, South Orange, NJ.

Previous work in our laboratory was aimed at the development of an in vitro system for culturing *Drosophila* spermatogenic cysts. The current work is aimed at analyzing the effects of nuclear dye and ultraviolet light on the viability of spermatogenic cysts in our in vitro culture system. The goal is to develop a method for visualizing nuclear migration and nuclear transformation in living cells and in real-time. Recent work indicates that Hoechst 33342 is non-toxic in time-lapse live-cell imaging when dye concentration and light exposure is limited (Purschke et al., 2010, Phototoxicity of Hoechst 33342 in time-lapse fluorescence microscopy, Photochem Photobiol Sci 9:1634-9). We tested the effects of Hoechst 33342, a DNA-specific dye, and UV illumination on cyst viability. Cysts were exposed to one minute of UV light at 30 minute intervals over two 5-hour periods using the 4X objective lens on a wide-field fluorescence microscope. UV illumination took place over the course of two days in culture. Cysts were then analyzed for viability on the third day using calcein-AM staining. Four conditions were tested: (1) no dye, no UV (control), (2) dye, no UV, (3) dye, UV, and (4) no dye, UV. The dye concentration used was 0.02  $\mu\text{M}$  and nuclear signals were still visible after 3 days incubation. For all conditions tested, there was no significant difference in the percentage of viable cysts remaining in culture by the third day as compared to controls. Illumination at 4X represents a relatively low dose of UV light. We are continuing this work using a similar illumination scheme with the 20X objective lens where UV exposure will be more intense. We gratefully acknowledge the Benjamin-Cummings/MACUB Student Research Grant Program for funding this work.

**Understanding the Mechanisms of Copper Induced, Lipid Peroxidation Mediated Cell Death in *Saccharomyces cerevisiae*.** Jasodra Ramlall, Janet Long, Nidhi Gadara, Queensborough Community College, Bayside, NY.

The long-term goal of this proposal is to understand the mechanisms of copper induced cell death by using *Saccharomyces cerevisiae*, a powerful eukaryotic model system. Our working hypothesis, based on our preliminary results is that upon exposure to copper, toxicity is triggered by the increased lipid peroxidation of unsaturated fatty acids in the plasma membrane. In order to determine the relationship between exposure to copper alloy surfaces, lipid peroxidation, and cell death in *Saccharomyces cerevisiae* quantitative dilutions series were performed to test for *S. cerevisiae* cell death levels. Our results indicate a biphasic killing curve when *S. cerevisiae* is exposed to copper chips however this was not seen on steel chips. TBARS assay was used to measure the lipid peroxidation levels. In addition to looking at how copper affects the membrane we characterized the impact of exposure to copper alloy surface by using FM4-64, an amphiphilic styryl dye followed by fluorescence microscopy to study the structural integrity of the plasma membrane. Genomic DNA was analyzed in order to establish whether the cell death is triggered by the apoptotic or necrotic pathway.

**Diverse Responses of MAPK Subfamily Members in DFO Treated Neuronal Cells. Lawrence W Rasmussen, George Coricor and Jane L Ko, Seton Hall University, South Orange, NJ.**

Hypoxia is the state of low oxygen availability to a cell or organism. Oxygen serves many vital roles, including being the final electron acceptor in the electron transport chain that allows the generation of energy. Low oxygen therefore can influence cell viability. Our lab previously used the hypoxic mimic compound, DFO, to generate the simulated hypoxic condition with a neuronal cell model system (Biochem. Biophys. Res. Commun., 2010). We found that the drug treatment decreased cell viability in a dose- and time-dependent manner. However, there were still surviving cells, and the increase of cellular glutathione levels was detected in these surviving cells. Confocal analysis using annexin-V-fluorescein and propidium iodide staining revealed that surviving/attached cells were morphologically similar to control (vehicle-treated) cells. The adaptive responses occurred in these cells were then investigated. RT-PCR analysis demonstrated that the hypoxia inducible factor-1 $\alpha$  mRNA level was augmented in these surviving cells. The treatment of 8 h or longer resulted in the down-regulation of the hMOR message. Functional analysis using luciferase reporter assay showed that the CT-rich region of the hMOR 5'-regulatory region mediated at least the partial response. Although certain adaptive responses are identified in this cell model, how cells convey the message of drug treatment into the cells is still unknown. To achieve this goal, we therefore examined the potential signal transduction pathways. Kinases such as the family of MAP kinase are known to initiate the signaling cascades that mediate gene expressions for cell survival in low oxygen conditions. Several pathways, such as MAP, ERK2 and JNK, were then examined. Western blot analysis showed that ERK2 activity was barely detectable, whereas MAP and JNK displayed the decrease of their activities under the challenge, suggesting that the adjustment of MAP and JNK signal transduction pathways occurred in this model system.

**Engineering Artificial Proteins Derived from Histone Acetyltransferase for Cancer Treatment. Kareem Rayn<sup>1</sup>, Kinjal R. Mehta<sup>1</sup> and Jin K. Montclare<sup>1,2</sup>, <sup>1</sup>Polytechnic Institute of NYU, Brooklyn, NY and <sup>2</sup>SUNY Downstate Medical Center, Brooklyn, NY.**

The histone code refers to patterns of post translational modifications of histones, which play a critical role in gene regulation. Histone acetyltransferases (HATs) catalyze the acetylation of histones on specific lysine residues. p300/CBP associated factor (PCAF) is a HAT that acetylates the histone substrate H3 as well as the tumor suppressor p53. Recently, our lab has found the incorporation of *para*-fluorophenylalanine (pFF) in PCAF (pFF-PCAF) leads to enhanced activity for p53, indicating the effectiveness of fluorinated residues in modulating substrate specificity of HATs for therapeutic applications. Here we combine mutagenesis with unnatural amino acid (UAA) incorporation to synthesize a mutant of pFF-PCAF that can acetylate and activate the tumor suppressor p53 for therapeutic applications. Three variants of PCAF, V572A, C574L and Y612F, have been created based on homology alignment and biochemical data. The effects of residue-specific incorporation of pFF on the substrate specificity and structure of the mutants are assessed, with wild type PCAF being utilized as a control. The secondary structure and melting temperature of the variants are determined via circular dichroism (CD), all mutants demonstrate  $\alpha/\beta$  secondary structures with Y612F demonstrating the greatest

structure, followed by C574L and V572A. Characterization of C574L and V572A reveal no change in thermodynamic stability, while Y612F demonstrates a 1°C increase in melting temperature.

**Nuclear Migration in Cultured Round Spermatid Cysts in *Drosophila pseudoobscura*. Benjamin Reimer and Angela V. Klaus, Seton Hall University, South Orange, NJ.**

*Drosophila* is a model genus that can be used to enhance our knowledge of mammalian spermatogenesis as there are many similarities between mammalian spermatogenesis and fruit fly spermatogenesis. During spermatogenesis in the species *D. pseudoobscura*, 128 round spermatids arise by five mitotic and two meiotic divisions within an encapsulating cyst. The round spermatids then transform into mature, elongate sperm during a post-meiotic process called spermiogenesis. Before spermiogenesis occurs however, the nuclei of the round spermatids migrate to one side of the cyst and become highly organized. The mechanism for the migration of the sperm nuclei is unclear. However, it has been shown that a characteristic 'individualization complex' made primarily of actin is a key structure involved in the individualization process of *Drosophila* spermatozoa. Based on this information, we hypothesized that an actin-based structure is facilitating the nuclear migration event. The current goal is to visualize actin by confocal microscopy in the stages leading up to the formation of the 128 round spermatid stage, as well as before and after the nuclear migration event has occurred. Eventually, we hope to visualize the migration event via live cell imaging and be able to establish a mechanism for nuclear migration. We thank the Seton Hall Department of Biological Sciences for funding this work.

**Detection and Identification of Bacteria, Cyanobacteria, and Phytoplankton: A Biodiversity Study of Freshwater Lakes in Essex County, New Jersey. Matthew J. Rienzo and Tin-Chun Chu. Seton Hall University, South Orange, NJ.**

Urbanized freshwater lakes receive nitrogen and phosphorous among other harmful elements in excess due to manmade chemicals such as fertilizers and pesticides. These elements are involved in a process called eutrophication, which is characterized by excessive phytoplankton growth in these lakes. Eutrophication of lakes located in urbanized areas can disrupt aquatic life and vegetation in several ways, including hypoxia and the possible release of harmful toxins as a byproduct of cyanobacterial growth. In the present study, water samples from five freshwater lakes in Essex County, New Jersey were collected. The samples were filtered through a coarse filter with a pore size of 2.7  $\mu$ m to collect large bacteria and debris, and through a fine filter with a pore size of 0.45  $\mu$ m to collect smaller bacteria as well as cyanobacteria of interest. The samples underwent DNA extraction using 5% Chelex-100 and the specific regions of DNA were amplified by polymerase chain reaction (PCR) using developed primers. The primer sets used in this study were CPC1f/CPC1r, AN3801f/AN3801r, 27Fb/785r, PSf/PSr, as well as Uf/Ur. Gel electrophoresis was carried out to detect the presence of bacteria, phytoplankton and cyanobacteria in the water samples. Both filters for each site were dried and preserved for microscopic observation.

**The Effects of Exogenous Carbohydrates on Notch Binding to Its Ligand Delta. Stacy-Ann Robinson, Alimra Mohammed and Dan Moloney Queensborough Community College, Bayside, NY.**

Notch signaling is vital to many cell processes including cell-cell communication and cell fate decisions. Notch malfunction has been implicated in such diseases such as Leukemia, Alagille syndrome and CADASIL. Glycosylation of Notch receptor impacts signaling. The carbohydrates on the exterior domain of Notch are an integral part of Notch's functionality as changes to the O-linked carbohydrates have been shown to affect Notch signaling. The enzyme Fringe is a glycosyltransferase that modifies O-linked fucose on the extracellular domain of Notch and alters receptor signaling. In this experiment we tested the impact of exogenously added sugars including fucose on Notch binding to its ligand Delta using cell based ligand binding assays. In the ligand binding assay, Delta tagged with heavy chain (Fc) from human immunoglobulin was applied to cells expressing Notch, and binding was measured using an anti-human secondary antibody conjugated with Horseradish peroxidase. The results of our assay showed that addition of exogenous fucose reduced Delta binding to Notch, whereas addition of exogenous para-Nitrophenyl fucose surprisingly increased Delta binding to Notch. Discovering compounds that impact ligand binding to Notch will help researchers to manipulate cell differentiation pathways and better understand Notch signaling.

**ACTH Promotes Osteogenesis of Rat Mesenchymal Stem Cells through the Melanocortin-2 Receptor. Sylvana Rodriguez<sup>1,2</sup>, Jodi Evans<sup>1,2</sup> and Louis Ragolia<sup>2</sup>. <sup>1</sup>Molloy College, Rockville Centre, NY and <sup>2</sup>Winthrop University Hospital, Mineola, NY.**

Adrenocorticotropic Hormone (ACTH) is an endocrine hormone that is secreted by the pituitary and stimulates the secretion of cortisol from the adrenal cortex. It is among the several melanocortin peptide hormones that are derived from proopiomelanocortin (POMC) such as  $\alpha$ -melanocyte stimulating hormone ( $\alpha$ -MSH),  $\gamma$ -MSH and the endorphins. ACTH is also produced by cells outside the central nervous system and has been found to play a role in osteogenesis. Using mesenchymal stem cells (MSC) obtained from bone marrow of the Wistar Kyoto (WKY) rat, we confirmed that ACTH increases osteogenesis in a dose-dependent manner. Immunoblot of crude membrane fractions was used to determine that rat MSC express three melanocortin receptors (MC-R); the MC2-R, MC3-R and MC5-R. To determine which of these receptors mediate ACTH-induced osteogenesis we used MC-R specific peptides and antagonists. Neither  $\alpha$ -MSH, a strong agonist of the MC5-R nor  $\gamma$ -MSH, a strong agonist of the MC3-R, increases osteogenesis in rat MSC. Additionally the MC3-R specific antagonist did not suppress ACTH-induced increases in osteogenesis. In addition, calcium flux was examined as a mechanism for ACTH action at the MC2-R. Consistent with MC2-R expression patterns in the MSC cultures, ACTH-induced transient increases in intracellular calcium were increased with dexamethasone treatment. Therefore the osteogenic effects of ACTH in rat MSC cultures are consistent with an MC2-R signaling mechanism. This pathway represents a new therapeutic target in the prevention and treatment of bone loss.

**Haplosporidium nelsoni (MSX) Small Subunit rRNA Gene is Detected in the Eastern Oyster (*Crassostrea virginica*) in Jamaica Bay, NY. Keisha Rogers, Craig Hinkley, Gary Sarinsky. Kingsborough Community College, Brooklyn, NY.**

*Haplosporidium nelsoni* (MSX) is a parasitic protozoan which is responsible for extensive mortality in the Eastern Oyster (*Crassostrea virginica*) populations along the eastern coast of North America. The origin of MSX to these waters is unknown. However, it is speculated that it was introduced when the Pacific Oyster (*Crassostrea gigas*) was attempted to be used as a replacement for

the declining native oyster stocks in the Delaware and Chesapeake Bays during the late 1950's. As of now, the intermediate host or hosts that transmit MSX to oysters are unknown. There has been no known oyster populations observed in Jamaica Bay since the 1920's. Oysters used in this experiment were grown from spats in Taylor Floats in the Bay. It is hypothesized that the unknown host or hosts would be present in Jamaica Bay and there will be oysters found infected with MSX. DNA was isolated from gill and mantle tissues. PCR amplifications were carried out using the MSX small subunit rRNA and the mitochondrial cytochrome c oxidase 1 (CO1) gene primer sets respectively. The MSX amplified products and a positive control for MSX were then subjected to agarose gel electrophoresis to determine correct size (564-bp). One of the six oyster's gill and mantle tissue and the control were positive for MSX. To verify that DNA was obtained from all of the oysters, the CO1 amplified products were subjected to agarose gel electrophoresis to determine correct size (702 bp) and was found to be present in all six samples. The MSX amplified and CO1 amplified products were sequenced and were subjected to NCBI blast searches which further verified that the small subunit rRNA gene was from *Haplosporidium nelsoni* and the CO1 gene from *Crassostrea virginica*. The results of these experiments demonstrate that MSX is present in *Crassostrea virginica* in Jamaica Bay.

**Polyketide Synthase is Found in Lichen Species in Metropolitan New York and Sub-Sahara Africa Areas. Mojisola Rotibi and Ivan Shun Ho. Kingsborough Community College, Brooklyn, NY.**

Lichens are symbiotic organisms of fungi, algae, and cyanobacteria. There are approximately 13500 Lichen species worldwide and more than 1200 can be found in South Africa. Lichens can synthesize numerous secondary metabolites, known as the "lichen acids". To date over 1000 lichen secondary metabolites have been identified. Just like the amount of lichen species, these metabolites have diverse functions: antiviral, antibiotic, antitumor, etc. Some of them even allow lichens to thrive in locales that are deemed uninhabitable. An essential step in the production of secondary metabolites is conducted by an enzyme called polyketide synthase (PKS). We investigate whether the conserved ketosynthase (KS) domain of PKS is present in lichens from areas of New York and South Africa. We hypothesize that samples from New York will possess PKS for the poor air quality of lower Manhattan. In addition, we hypothesize that the more populated Cape Town has considerable air pollution and therefore lichens of that region will have PKS, whereas lichens found in the coastal, less populated Mozambique Archipelago will not. Lichen DNA was isolated using a protocol involving Edward's Buffer. The KS domain of PKS was targeted and amplified by polymerase chain reaction (PCR) using degenerate primers. A region of tubulin was also amplified as a control. The PCR products were separated by agarose gel electrophoresis to verify the correct size. Our preliminary data show that the lichen species collected in Cape Town does have the KS domain of the PKS in their genome while species from Mozambique do not. Interestingly, our data also show that samples from Battery Park City possess the KS domain while those from Brooklyn Heights do not. This work was supported by Grant 2R25GM06003-05 of the Bridges to the Baccalaureate Program of NIGMS and Grant 0537101091 of the CSTEP Program of the New York State Department of Education.

**Water Quality Assessment at the Newtown Creek Nature Walk: A Potential Site for Bioremediation of Water Quality. Muhammad Sadiq, Renata Bermudez, Yue Ru Li, Keishan Ragoo, John Landers and Sarah Durand. LaGuardia Community College, Long Island City, New York.**

Newtown Creek Estuary is a 3.5 mile waterway between Brooklyn and Queens. The Creek can be defined as an extension of the East River because the sole source of water flow into the Creek is tidal, with the exception of combined sewage outflow at 23 locations. The loss of freshwater tributaries and tidal wetland due to landfill and bulkhead construction currently renders the Creek largely devoid of habitat suitable for wetland restoration. Chemical contamination from oil, heavy metals and organic solvents has resulted in the Creek's designation as a "Superfund" site. This study was undertaken to address the feasibility of water quality remediation by construction of artificial wetland communities, wherein contaminants can be filtered, sequestered and degraded. Two sets of data were acquired: 1) measurements of specific physical and biological variables of water quality (dissolved oxygen, salinity, pH, turbidity and *Enterococcus* contamination) for comparison with East River data and 2) identifications of invertebrate organisms (planktonic and benthic) that could serve as recruitment pools for a proposed constructed wetland habitat. Although Creek water exhibited a significantly greater range of variation for most variables tested, average values were comparable to East River samples. All major groups of invertebrate phyla were represented in both planktonic and benthic populations, indicating the existence of both recruitment pools and a high probability of successful substrate colonization. This work was supported by grant 5R25GM048989 of the NIH Bridges to the Baccalaureate and by the 0537121062 of the CSTEP Program of the NYSED. We thank Riverkeeper for supplying water quality data for the East River and Dr. Greg O'Mullan of Queens College, CUNY, for guidance in standard measurement and sampling techniques.

**A Study of Environmental Factors Affecting Embryonic Stem Cells. Maciej Sadowski, Michelle Connor, Raymond Morales and Tetyana Delaney, St. Joseph's College, Brooklyn NY.**

The embryonic cells have much potential in today's world of biology and medicine; they can be affected by many factors in the body and from the outside environment. This study will focus on the outside factors in everyday life affecting the cells. We will use cell lines that are established by using an 8-day-old chick embryo and extracting cells from them. They will be placed in petri dishes with cell medium for propagation into cell lines for further examination. They will be put under different environmental factors such as milk or coffee sweeteners that were proven to affect the cells disrupting their genomic characteristics.

**The Common Periwinkle (*Littorina littorea*) Does Not Appear to Serve as a Vector for Dermo (*Perkinsus marinus*) in Jamaica Bay, NY. Ilianna Serrano, Craig Hinkley and Gary Sarinsky, Kingsborough Community College, Brooklyn, NY.**

The Eastern Oyster (*Crassostrea virginica*) began to diminish in the 1920's in Jamaica Bay N.Y. and now, none are known to exist. Water pollution and dermo (*Perkinsus marinus*) are believed to be responsible for their decline. Dermo is a parasitic protozoan which is responsible for massive mortality in oyster populations. Previous research performed on oysters grown from spats in Taylor floats in Jamaica Bay show that some of the oysters have become infected with dermo. Since it was thought that dermo was passed from oyster to oyster, the question that these results raise is how did they become infected? There is some literature that suggests that bivalves and scavengers can serve as a vector for dermo. Since there are no known oysters in the bay, it is hypothesized that the Common Periwinkle (*Littorina littorea*) serves as a vector for dermo. Muscle tissue was excised from periwinkles collected in Jamaica Bay. DNA was isolated from these tissues using a DNeasy Blood and

Tissue kit. PCR amplifications were carried out using a dermo specific primer set and Folmer's Primer to detect the presence of the cytochrome oxidase1 gene (CO1). To determine if dermo DNA was extracted and amplified from the periwinkles, the samples and a control positive for dermo were subjected to gel electrophoresis. No dermo was shown to be present but we demonstrated that we could amplify dermo under the conditions used with the positive control. To demonstrate that DNA was in fact successfully extracted from the tissues, the amplified CO1 samples were subjected to gel electrophoresis and all were positive. The CO1 samples were sequenced and the results were subjected to a NCBI blast search which confirmed that the DNA was the CO1 gene from *Littorina littorea*. This experiment shows that the periwinkles may not be vectors for Dermo.

**Mercury in New Jersey's Diamondback Terrapins (*Malaclemys terrapin*). Natalie Sherwood and Meiyin Wu, Montclair State University, Montclair, NJ.**

Diamondback terrapins (*Malaclemys terrapin*) are legally harvested throughout the state of New Jersey. Turtles are usually sold for human consumption at both local and global markets. Since turtles are long-lived omnivores, they can bioaccumulate high concentrations of pollutants in their tissues, such as mercury. High levels of mercury have been reported in turtle eggs, fat, organs, blood, shell, and muscle. This study aims to assess human consumption safety of diamondback terrapins. Twelve female and eight male turtles were collected from the Cape May area, New Jersey. Samples were collected from turtle carapace (n=24), blood (n=17), and front leg muscle (n=22). Mercury concentrations of collected samples were measured using Bacharach Coleman Cold Vapor AA Hg Analyzer (Model 50D). The results indicated the highest average mercury concentration was found in turtle carapace (1.099ppm), the concentration in blood the second highest (0.194ppm). The lowest concentration was found in turtle muscle at 0.178ppm, which was lower than the U.S. EPA fish mercury threshold of 0.3ppm. Three of the 22 muscle samples, 13.64%, were found to be over the threshold with the highest concentration of mercury recorded at 0.5ppm. The result of this study suggests that on average, diamondback terrapins do not pose as a threat to human consumption safety.

**Engineering Smart Proteins for Drug Delivery. Navjot Singh<sup>1</sup>, Min Dai<sup>1</sup> and Jin K. Montclare<sup>1,2</sup> <sup>1</sup>Polytechnic Institute of NYU, Brooklyn, NY and <sup>2</sup>SUNY Downstate Medical Center, Brooklyn, NY.**

Naturally existing proteins can be modified or mimicked in order to produce "smart proteins" that exhibit chemical and physical properties desirable for applications in medicine. Elastin-like polypeptides (E) and the coiled-coil domain of Cartilage Oligomeric Matrix Protein (C) are two promising proteins useful for drug delivery due to their properties. E exhibits stimuli-responsive aggregation upon change in surrounding conditions such as change in pH, ion concentration or temperature. C, on the other hand, assembles into pentamers bearing a pore that can bind to numerous molecules such as curcumin, all-trans retinol, vitamin D and other hydrophobic compounds. Recently, we demonstrated that the fusion of E and C domain into a single polymer chain, EC and CE, results in particles capable of not only binding small therapeutic chemical compounds but also of aggregating upon increase in temperature. We also discovered that the orientation of the fusion impacts the binding of a chemical as well as the thermoresponsive aggregation. To expand the temperature sensitivity for applications in hyperthermia triggered aggregation, we generated libraries of E<sub>n</sub>C and CE<sub>n</sub> in which the E domain was systematically shortened. Here, we describe the biosynthesis and physicochemical characterization of these "smart proteins" for potential use in targeted drug delivery.

**Analysis of the Transcriptional Regulation of RET Isoforms. Joan Soon, Binta Jalloh and Quinn Vega, Montclair State University, Montclair, NJ.**

The-ret proto-oncogene, RET, codes for a receptor tyrosine kinase which is required in kidney formation and development of the enteric nervous system. RET is activated by the members of the glial cell line-derived neurotrophic factor family of ligands. These ligands do not directly bind to RET; instead they bind to RET through a family of receptors named GFRA 1-4. The three common isoforms of RET are RET51, RET9, and RET43 although RET9 and RET51 are the most well studied. The purpose of this study is to investigate the transcriptional regulation of these RET isoforms. Each isoform has a distinct C-terminus with varying binding to downstream adapter molecules, which suggests different signaling functions. Understanding the regulation of RET isoform expression is the focus of this study. Reverse transcription and quantitative PCR (qPCR) allow for the analysis of RET9 and RET51 expression levels.

**Nickel Chloride on the Growth and Exopolysaccharides Production in Cyanobacteria *Synechococcus sp.* IU 625. Jiayu Tan<sup>1</sup>, Tin-Chun Chu<sup>2</sup> and Lee H. Lee<sup>1</sup>, <sup>1</sup>Montclair State University, NJ and <sup>2</sup>Seton Hall University, South Orange, NJ.**

*Synechococcus sp.* IU 625 is a unicellular freshwater photoautotrophic cyanobacterium. This organism has been used in many studies as an indicator to assess the effects of heavy metal toxicity in polluted environment. In this study, cultures of *Synechococcus sp.* IU 625 (SIU 625) were grown in the presence of various concentrations of nickel chloride (0, 10, 20 and 30 mg/L) for 23 days. The growth was monitored by turbidity study and direct count. The quantitative measurement of exopolysaccharide production was performed by using the Phenol-Sulfuric Acid Colorimetric Assay. Morphological changes under heavy metal stressed conditions were observed with microscopes. DAPI stain was used to study the DNA changes in different concentration of NiCl<sub>2</sub>. The results indicated that the growth of SIU625 in the presence of 10 mg/L of NiCl<sub>2</sub> was very similar to the control. A long lag phase of approximately 15 days was observed in the cultures with 20 and 30 mg/L of NiCl<sub>2</sub>. The exponential growth was observed after a long lag phase, although the growth did not reach the level in the control. The results suggested that resistant mechanisms in SIU 625 may be established after metal exposure. The cell morphology was smaller and shorter in the cultures treated with NiCl<sub>2</sub>. The color of the treated cells were pale green in comparison with the control cells which were dark green. Exopolysaccharide quantitatively increased in the presence of NiCl<sub>2</sub>. The higher concentration the cells exposed to, the higher exopolysaccharide was induced. The production of exopolysaccharides may be a defensive mechanism utilized by cyanobacteria that survives toxic conditions and stressful environments.

**Manipulating the c-Src Enzyme in Osteoblasts: Functional Consequences. Joseph Tarr, Dana Branch and Thomas Owen. Ramapo College of New Jersey, Mahwah, NJ.**

Bone is constantly formed and broken down through the activities of osteoblasts and osteoclasts, respectively. When the activities of these two cell types become unbalanced, bone density is affected resulting in diseases such as osteoporosis, the loss of bone mineral density. C-src is an enzyme which phosphorylates other proteins to regulate their activity and also serves as a docking site to bring proteins into close proximity. When this gene is knocked out, the only consequences of its loss are a decrease in osteoclast activity and an increase in bone formation by osteoblasts. Studies have shown that c-src

affects bone mineralization by regulating osteoblast function in order to retain optimal bone density. The goal of our research is to further explore the effects of c-src kinase on bone formation using two different approaches in ROS 17/2.8 osteosarcoma cells. Our first approach is to treat ROS cells with the c-src kinase inhibitor PP2 and measure the activity of alkaline phosphatase, an enzyme needed by osteoblasts to properly mineralize. PP3 treated cells yielded higher alkaline phosphatase levels than PP2 treated cells. Our second approach is to transfect ROS cells with plasmids which allow the over expression of either normal c-src; kinase enzyme dead c-src; dominant negative c-src lacking kinase function but retaining docking function; or a negative c-src in which both kinase and docking functions have been mutated. Stably transfected ROS cell lines were established and alkaline phosphatase activity will be determined. This work was supported in part by a grant from the Ramapo College Foundation.

**Comparison of Copper Mediated Toxicity in Both *Staphylococcus aureus* and *Escherichia coli*. Phyto Thu, Janet Long and Nidhi Gadura, Queensborough Community College, Bayside, NY.**

The mechanism(s) by which copper alloy surfaces kill microorganisms is still largely unclear. The aim of our project is to determine the relationship between exposure to copper alloy surfaces or copper ions, lipid peroxidation, and killing of *Staphylococcus aureus* and *Escherichia coli*. Quantitative dilutions series were performed to test for bacterial cell death. Our results indicate a bisaphic killing curve when Gram positive and Gram negative bacteria are exposed to copper chips. TBARS assay was used to measure the lipid peroxidation levels. The bacterial killing rate upon exposure to copper surface also correlates with increased lipid peroxidation levels. There are some differences in the rate of cell death that correlates with the levels of lipid peroxidation between the two bacterial strains. Live/Dead assay with fluorescent microscopy was done and Genomic DNA was extracted to study the mode of cell death, apoptotic vs. necrotic. Results will be discussed.

**Inhibition of HSV-1 by Black Tea Polyphenols in Cultured A549 and Vero Cells. Daniel J. Traum, Anthony Cantatore and Dr. Sandra D. Adams, Montclair State University, Montclair, NJ.**

Herpes viruses, belonging to the family *Herpesviridae*, are a diverse class of DNA viruses. There exists the ability to establish latency in neurons. Therefore, there is difficulty to eradicate HSV-1 (herpes simplex virus type 1) from an infected individual. Black tea polyphenols are powerful antioxidants that also have antiviral properties that may act on a variety of viruses, including HSV-1. The purpose of this investigation is to determine if black tea polyphenols (theaflavins) can inhibit infection of cultured cells by HSV-1. This could be significant in treatment of HSV-1 infection if an antiviral agent is developed. Both combinations and pure extracts were used, consisting of theaflavin (TF-1), theaflavin-3'-monogallate (TF-2), and theaflavin-3,3'-digallate (TF-3). Cytotoxicity studies determined non-lethal concentrations of theaflavin extracts. After establishing maximum non-toxic concentrations, cell lines and virus were treated, respectively. A549 and Vero cells were infected with HSV-1 with a green fluorescent protein (GFP) insert at the UL46 gene. Results show a decrease in infectivity with increasing theaflavin concentrations as measured by quantitative plaque assay and fluorescent microscopy. Research partially funded by Merck and Roche through the Science Honors Innovation Program.

**Antibacterial Activity of Spices and Their Potential Synergistic Effect with Antibiotics.** Jeffrey Tsai and Tin-Chun Chu, Seton Hall University, South Orange, NJ.

Some spices have been known to have antibacterial activity. In this study, three spices including garlic, turmeric, and red chili pepper were used to investigate the antibacterial activity and potential synergistic effects with antibiotics and antiseptics. Two gram negative bacteria, *Escherichia coli* and *Enterobacter aerogenes*, and two gram positive bacteria, *Bacillus subtilis* and *Staphylococcus epidermidis* were used in this study. Turbidity studies were carried out to monitor the bacterial growth. Growth curves with and without the spices were established to evaluate the antibacterial activity of garlic, turmeric, and red chili pepper. Garlic showed the best inhibition among three spices: 97.57% inhibition for *E. coli*, 98.90% inhibition for *E. aerogenes*, 99.84% inhibition for *B. subtilis*, and complete inhibition (100%) for *S. epidermidis*. As for turmeric, it resulted in 91.03% inhibition for *E. coli*, 99.47% inhibition for *E. aerogenes*, 80.90% inhibition for *B. subtilis* and 75.48% inhibition for *S. epidermidis*. Red chili pepper only showed inhibition on *E. coli* (55.00%). The synergistic effects of spices with various antiseptics and antibiotics were carried out by using disc diffusion method. 10% Turmeric showed synergistic effects with antibiotics including gentamycin, tetracycline, chloramphenicol, neomycin, novobiocin, erythromycin and kanamycin. Garlic also showed synergistic effects with antiseptics against all four bacteria. Turmeric had synergistic effects with antiseptics against gram negative bacteria. However, red chili pepper didn't show significant synergistic effects with antiseptics tested.

**How Does the Presence of Tyrosol Effect *Candida albicans* Tau-containing Cells?** Kathleen Van Manen, Alejandra Alonso and Elena C. McCoy, College of Staten Island, Staten Island, NY.

*Candida albicans* is a dimorphic, opportunistic human fungal pathogen. Adhesion and filament formation contribute to its invasiveness and pathogenicity. Two morphological forms of *C. albicans* are observed, the yeast form and a filamentous form. At high cell densities, *C. albicans* is in the yeast form, whereas at lower cell densities it is in a filamentous form (Chen, *et al.*, 2004.) Yeast-to-hyphae transition is dependent on environmental conditions, including, temperature, pH, CO<sub>2</sub> levels, carbon and nitrogen source in the medium, and phosphate addition. *C. albicans* has two types of quorum sensing molecules that are important for the yeast- to- hyphae transition: farnesol and tyrosol. Farnesol, blocks the yeast to hyphae transition at high cell densities, whereas, tyrosol promotes germ tube formation at lower cell densities. In the current study, *C. albicans* was transfected with the plasmid vector, promoter region of the cytomegalovirus (CMV) with and without the presence of Microtubule Associated Protein Tau gene (tau). Tau is a hydrophilic mammalian protein that is important for microtubule assembly, bundling, stabilization and polarized growth. In cells containing tau, medium dependent filamentation observed was presumably due to expression of tau. In this study, we investigated the effects of the addition of tyrosol to growth medium and effects on filamentation in tau-containing cells.

**Co-polymerization of Partially Sulfonated Polyaniline Nanofibers for Electrostatic Interaction with Gold Nanoparticles.** Engred Vanegas and David M. Sarno. Queensborough Community College, CUNY, Bayside, NY.

Nanocomposites of polyaniline nanofibers and gold nanoparticles (NPs) are of interest for catalysis, light-harvesting, organic electronics, and biosensors. In light of their many applications, specific and reliable loading of Au-NPs onto nanofibers is desirable. Towards this, we have explored an electrostatic interaction between these two materials by combining negatively charged sulfonated nanofibers with positively charged Au-NPs. The deposition of positive Au-NPs onto the nanofibers is generally greater than for negative Au-NPs, which appear to be repelled from the negatively charged polymer. However, sulfonation also significantly increases the solubility of the polymer in aqueous solution, which can result in partial to full loss of the nanostructure. To balance the desired electrostatic effect against the unwanted solubility, we have prepared partially sulfonated nanofibers by copolymerizing aniline and 2-aniline sulfonic acid in varying mole ratios, facilitated by an initiator (N-phenyl-1,4-phenylenediamine). Although we do not yet know the actual degree of sulfonation, FTIR confirms the presence of sulfonic acid groups in the polymer and SEM reveals changes in morphology depending on the monomer ratio and amount of initiator. Initial results indicate greater deposition of positive NPs with increasing sulfonation, but also increasingly fused nanofibers above 50% sulfonation. This work was supported by the PSC-CUNY Research Award Program (61362-0039) and NSF-MRI Program (DMR 0722607). Dr. Mathew Maye of Syracuse University is thanked for providing the gold nanoparticles.

**Antibacterial Activity of Polymethoxylated Flavones (PMFs) and Their Synergistic Effects with Antibiotics and Antiseptics.** Evan Venino, Franzie Edquigal and Tin-Chun Chu. Seton Hall University, South Orange, NJ.

Polymethoxylated flavones (PMFs) are compounds extracted from citrus fruits such as oranges and tangerines. Previous publications have reported the potential anticancer effects, antioxidant effects, and cholesterol lowering effects of PMFs. This study focuses on the possibility of PMFs having antibacterial activity as well as synergistic effects with antibiotics and antiseptics. The three specific PMFs that were studied were tangeretin and nobiletin, two of the main PMFs found in citrus fruits, along with an isomer of tangeretin, 5-demethyltangeretin. Two gram negative bacteria, *Escherichia coli* and *Enterobacter aerogenes*, and two gram positive bacteria, *Bacillus subtilis* and *Staphylococcus epidermidis* were used in this study. Turbidity studies were carried out and growth curves were established to evaluate the antibacterial activity of the PMFs. These growth curves of control were compared to the growth curves of samples treated with PMFs in order to measure the antibacterial effect of the PMFs. Nobiletin resulted in the greatest inhibition for *B. subtilis* (95.41%) when compared to the other three species of bacteria. 5-demethyltangeretin was also effective on *B. subtilis* (85.53%) but to a lesser degree. Tangeretin showed the best inhibition (88.49%) against *E. aerogenes* among all the bacteria tested. Overall, however, each PMF proved to have an inhibitory effect upon bacteria growth with the 200 µM PMFs being most effective. In addition, the synergistic effects of PMFs with both antiseptics (*Listerine*, *Purell*, *Germ X*, *ACT*) and antibiotics were also studied by using disc diffusion method. In this study, PMFs proved to have effective synergistic effects with the antiseptics and Tangeretin had good antibiotic synergistic effects against gram negative bacteria specifically with Tetracycline, Rifampin, and Erythromycin.

**The Role of Putative Virulence Protein Lav in Auto-Aggregation of Nontypeable *Haemophilus influenzae*. Jennel Vincent<sup>1</sup>, Jessica Boateng<sup>2</sup> and Miriam Golomb<sup>2</sup>, <sup>1</sup>Medgar Evers College, Brooklyn, NY and <sup>2</sup>University of Missouri-Columbia, Columbia, MO.**

Nontypeable *Haemophilus influenzae* (NTHI) are gram-negative bacteria responsible for multiple respiratory illnesses, including ear infections of children, conjunctivitis, sinusitis, bronchitis, and complications of Chronic Obstructive Pulmonary Disorder. Rarely, they cause invasive diseases such as meningitis or septicemia. Early steps in bacterial host colonization and pathogenesis include specific adhesion, microcolony formation, and dispersal to surrounding host tissue. Our lab has been studying a phase-variable outer membrane protein termed Lav, which belongs to the family of virulence-associated autotransporters. The *lav* gene is found in many disease-associated NTHI but not in commensal NTHI from healthy individuals. Knocking out *lav* makes NTHI bacteria auto-aggregate and settle rapidly out of suspension, and become less adherent to lung cells. Based on the auto-aggregation phenotype, we hypothesize that Lav may play a role in initial colonization and dispersal. Before investigating mechanisms by which Lav may affect auto-aggregation, it is necessary to prove that the rapid aggregation phenotype is caused by loss of Lav expression rather than being an artifact of constructing the knockout. If so, restoring Lav function on a plasmid should rescue the rapid aggregation phenotype. We have constructed a new complementing plasmid (pLav) to restore Lav expression to knockout strains. Starting with a *H. influenzae*-adapted plasmid that grows in *E. coli*, we inserted *lav* (phase-locked ON) and its presumed promoter. Over-expression of Lav is fairly toxic for *E. coli* and most clones had acquired inactivating mutations. We tested clones by restriction analysis, sequencing, and Western blot, and we found one that expressed wild-type Lav in *E. coli*. This successful pLav plasmid will be explored further by being electroporated into NTHI carrying a chromosomal *lav* deletion to see if the non-aggregating phenotype is restored.

**The Effects of Glucocorticoids on Microglia Cell Function. Kari Wiedinger, Seton Hall University, South Orange, NJ.**

Glucocorticoids (GCs) are released from the hypothalamic-pituitary-adrenal-axis in response to physiological and psychological stressors. GCs initiate their signaling pathway by binding to Type I mineralocorticoid receptor (MR) or Type II GC receptor (GR) which are members of a large family of nuclear receptors, and have traditionally been credited with anti-inflammatory and immunosuppressive actions in the periphery making them a pharmacological tool to treat a variety of autoimmune diseases. Recent evidence has suggested that the actions for GCs may be more complicated in the central nervous system (CNS). Microglia cells, the resident macrophage in the brain, act as a primary response component of CNS inflammatory action. To gain insight into the microglia response to GCs, time- and dose-dependent effects of dexamethasone, a synthetic corticosteroid, on microglial morphology and mRNA expression of GR, MR, toll-like receptor 4 (TLR4), cluster differentiation 14 (CD14), and myeloid differentiation factor (MyD88) were examined. The type I mineralocorticoid receptor (MR) was found to be downregulated at 100 nM dose of dexamethasone after 3 days of treatment. The 10 nM and 1  $\mu$ M concentration of dexamethasone did not elicit the same repressive effects on MR as the 100 nM treatments. The type II receptor GR and inflammatory mediators TLR4, CD14, and MyD88 did not show significant changes in mRNA expression following dexamethasone treatment. Additionally, the percentage of

amoeboid cells seemed to increase after exposure to 100 nM dexamethasone for two and three days. These data suggest that chronic exposure to dexamethasone may have significant effects on microglial activation and the MR mRNA expression without significantly affecting the mRNA expression of upstream mediators of LPS signaling pathway in microglial cells.

**Is Chelation the Mechanism of Action of p-Aminosalicylic Acid (PAS) in the Treatment of Manganism? Sheena Wiggins, Kareem Mattis, Naomi Morrison, Dwane Fraser, Karl Ruddock and Dereck Skeete, Medgar Evers College, Brooklyn, NY.**

Manganese is a naturally occurring element, essential in trace amounts for living organisms, but is potentially toxic in high concentrations. Certain occupations including mining, welding and steel manufacturing can expose workers to chronically high levels of manganese, leading to a clinical condition known as Manganism, which has Parkinson like symptoms. The mechanism of manganese toxicity is not fully understood, and effective treatments for this condition are still being developed. A number of studies have shown that the metal chelator, ethylenediaminetetraacetic acid (EDTA), has proven effective in alleviating some symptoms of Manganism. More recently, the drug, p-aminosalicylic acid (PAS) is showing promise in the treatment of Manganism but the mechanism of action is still unclear. It is debateable whether the positive effects of PAS are due to its anti-inflammatory or metal chelation properties. In this study we used a spectrophotometric assay to determine the manganese chelating properties of PAS. A 1.78 millimolar of Manganese ion ( $Mn^{+2}$ ) solution was exposed to varying concentrations of PAS. Free  $Mn^{+2}$  ions were then oxidized to permanganate ion ( $MnO_4^-$ ). The levels of  $MnO_4^-$  present were then measured spectrophotometrically and compared to controls. Our results indicate that PAS does show promise as a chelator of the  $Mn^{+2}$  ion as at certain concentrations of PAS some amount of the manganese is bound to the PAS molecule. These results should help to verify the action of PAS as a chelating agent and promote the use of PAS to alleviate the symptoms of Manganism. This work was supported by grant 0516041071 of NYSDOE, 0622197 of the DUE Program of NSF and P382A080040 of the USDE.

**Mutagenesis of Fluorinated Histone Acetyltransferases: Investigating Substrate Selectivity. Liming Yin<sup>1</sup>, Kinjal Rajesh Mehta<sup>1</sup> and Jin Kim Montclare<sup>1,2</sup>. <sup>1</sup>Polytechnic Institute of New York University, Brooklyn, NY and <sup>2</sup>SUNY-Downstate Medical Center, Brooklyn NY.**

Histone acetyltransferases (HATs) are widely studied due to its ability to acetylate histone and non-histone substrates, promoting transcription and gene regulation. *Tetrahymena* general control non-derepressor (tGCN5) is an alpha-beta protein composed of 5  $\alpha$ -helices and 6  $\beta$ -strands and this structure is conserved among GCN5-related N-acetyltransferase (GNAT) superfamily. Our lab has studied single mutants of tGCN5 in the past and three positions -- F90, F112 and R140 -- were found to be critical to the function. To further study the effects of these residues on tGCN5 structure and function, we probe these positions with a broad range of amino acids via mutagenesis. We intend to carry out this study in the presence of non-natural amino acids *para*-fluorophenylalanine (pFF) as incorporation of pFF into tGCN5 exhibited activity for the non-histone p53 in addition to the target histone H3. p53 as a tumor suppressor is a transcriptional activator of apoptosis gene responding to DNA damage and acetylation; however, because of its crucial role in the relation with cell death, the activity of p53 is tightly regulated. To discover a pFF-tGCN5 mutant able to activate p53, we are characterizing the structure and activity of variants of the three positions.

**Synthesis of Protein Scaffolds for Cartilage Tissue Engineering. Jinhui Zhao<sup>1</sup>, Susheel K. Gunasekar<sup>1</sup>, and Jin K. Montclare<sup>1,2</sup>, <sup>1</sup>Polytechnic Institute of NYU, Brooklyn, NY and <sup>2</sup>SUNY Downstate Medical Center, Brooklyn, NY.**

Cartilage tissue regeneration requires scaffolds that can specifically bind to and interact with the extracellular matrix (ECM) proteins on the surface of chondrocytes. Our goal is to generate scaffolds and to incorporate cell-binding motifs, arginine-glycine-aspartic acid (RGD) repeats, for cell adhesion. We intend to design the scaffolds by using di- and tri- block co-polymers COMPcc-ZR and COMPcc-ZE-COMPcc. COMPcc is the self-assembling coiled-coil domain of cartilage oligomeric matrix protein, while ZR and ZE are a leucine zipper pair that aids in the formation of heterodimers. Upon mixing the block co-polymers highly cross-linked scaffolds may be generated by self-assembly. We have successfully incorporated RGD motifs in the block co-polymers, expressed in *E. coli* bacteria, purified the proteins, and performed secondary structure and stability analysis using circular dichroism (CD). Our future work will be to determine the secondary structure and stability using CD in the presence of small molecules such as vitamin D, all-trans retinol, and curcumin. Once these proteins are successfully synthesized and characterized, they will be subjected to template chondrocyte cell growth and tissue regeneration.

## MACUB 2011 Conference Member Presentations

### **Trends in Asthma Prevalence in School-Aged Children on Long Island. Betty Borowsky<sup>1</sup> and Anne Little<sup>2</sup>, <sup>1</sup>Nassau Community College, Garden City, NY and <sup>2</sup>Asthma Coalition of Long Island, Hauppauge, NY.**

Asthma is the leading chronic illness in children in the United States today; in extreme cases, it can be fatal. Without proper management, asthma reduces the child's quality of life and the family's as well. With proper management, however, all can lead healthy, normal lives. The key to proper management is education. But resources are limited, so it is imperative that education programs be targeted toward communities with the greatest need. Determining where asthma is highest is a problem, however, as national surveys are not sufficiently robust to permit extrapolation to the local level. Accordingly, under the auspices of the Asthma Coalition of Long Island (ACLI), a study to determine the prevalence of asthma in every school in Nassau and Suffolk Counties was conducted in 2004, 2006, 2008, and 2010. A survey was mailed to every school nurse asking two main questions: 1) how many children in your school have asthma? (this information was obtained from annual medical forms); and 2) how many children have permission to carry their inhalers in school? (When asthma is well managed, the patient has a rescue inhaler immediately available at all times to provide quick relief in the event of an acute attack). The results showed that in 2010, 8.7% of all the children on Long Island in grades pre-k through 12 had been diagnosed with asthma by a medical professional. Furthermore, the prevalence increased from 7.6% in 2004. But only 42.7% of asthmatic children had permission to carry their inhalers in school, and that figure had not improved since 2004. This study has allowed the ACLI and other organizations concerned with childhood asthma to focus their efforts in areas with the highest asthma prevalence and where access to inhalers appears to be lowest.

### **Brightness Fluctuation Analysis of Cell Translational and Rotational Motion in Wound Assays. Todd Holden, Sumudu Dehipawala, Eric Cheung, George Tremberger Jr, Regina Sullivan, Patricia Schneider and Tak Cheung. Queensborough Community College, Bayside, NY.**

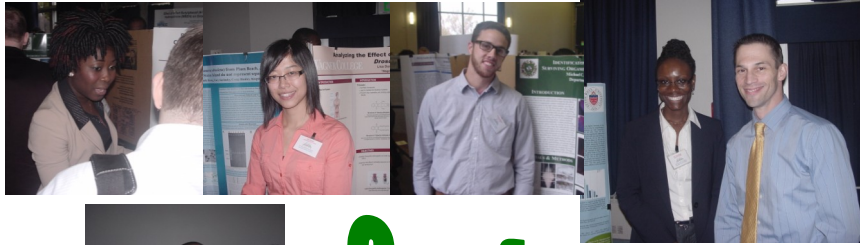
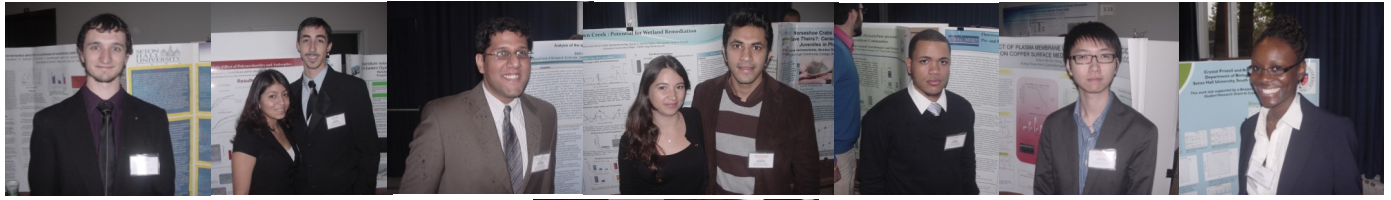
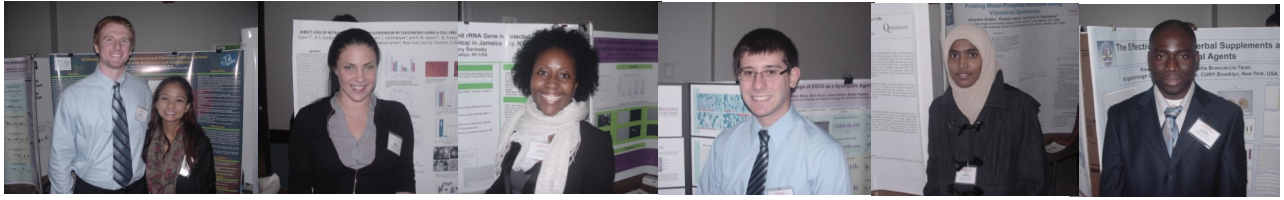
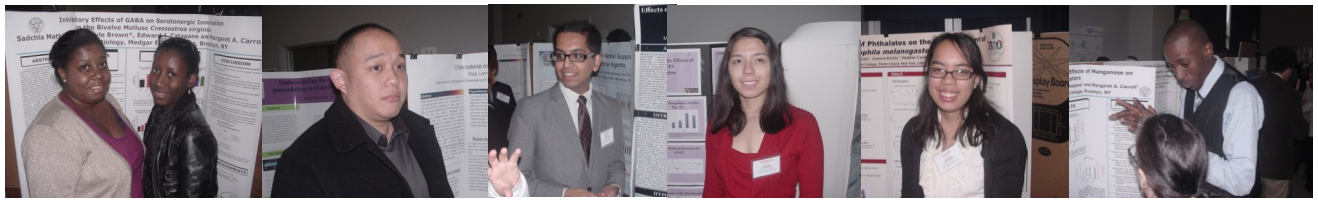
Brightness fluctuation in digital images has been studied in terms of the Higuchi fractal method and the application to a published wound assay cell migration dataset is presented (Murrell M, Kamm R, Matsudaira P, Tension, Free Space, and Cell Damage in a Microfluidic Wound Healing Assay, PLoS ONE 6(9): e24283, Sept 21 2011). The brightness profile data series of a selected area in an image can be computed by imaging software such as ImageJ, a free program from NIH. The Higuchi fractal method was used to compute the fractal dimension of the brightness profile data series as a marker of the brightness fluctuation represented by the series. Time-lapsed video data frames were used to generate a time series dataset with fractal dimension variation as a function of time. Our previous methodology (International Journal of Biological and Life Sciences 6(3): 170–175, 2010) has been extended to the analysis of the correlation between the time series datasets of two adjacent areas in the images examined. The results using Movie-S5 posted by MIT in the above referenced wound assay publication suggest that a negative correlation exists after a duration of three hours between the selected adjacent areas, consistent with the interpretation that for different proteins to be expressed during translational and rotational cellular motions time is required. Computer simulation suggests that the observed negative correlation value exceeds one standard deviation beyond the expected value. Our results suggest that brightness fluctuation between adjacent areas could be used as a tool to characterize cell migration with translational and rotational motion.

**The Collection of Male and Female Specimens of *Tabanus darimonti* Leclercq, 1964, in Northern Morocco (Diptera: Tabanidae). Scott C. Sherman, Queensborough Community College, The City University of New York, Bayside, NY.**

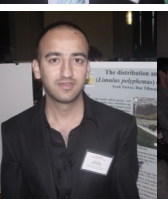
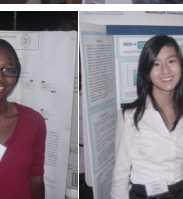
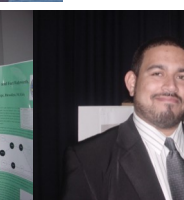
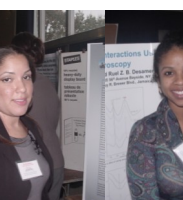
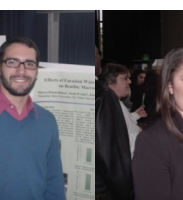
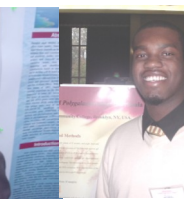
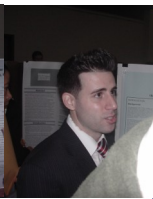
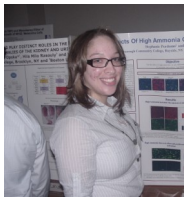
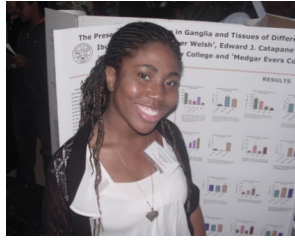
Male and female specimens of *Tabanus darimonti* Leclercq, 1964, were collected in the environs of the village of Zinate ( $\approx 35^{\circ}28'30''\text{N}$ – $35^{\circ}29'30''\text{N}$   $5^{\circ}24'\text{W}$ – $5^{\circ}25'\text{W}$ ) in northern Morocco. All the male specimens were collected as they flew over water holes. The female specimens were collected while they were blood-feeding from the bellies of horses and when they visited water holes to obtain moisture. *T. darimonti* is a poorly known Palaearctic species of the *Tabanus bromius* Linnaeus, 1758, species group. *T. darimonti* was originally described in 1964 by Marcel Leclercq (1924–2008) from one female specimen collected in Portugal. Since 1964 female specimens have been reported from other countries. The species appears to have a partial circum-Mediterranean distribution and is rare throughout its distributional range. Up to this time there have been no published collection records and no published descriptions of male specimens of *T. darimonti*. The egg, larval, and pupal stages of the species are all still unknown.

**Analysis of Direct-current Electrical Field Guided Neuronal Stem/progenitor cell Migration Irregular Pattern. Regina Sullivan, George Tremberger Jr, Anne Rosario, Dalia Noeman, Karim Asqiriba, Hajar Kadissi and Tak Cheung. Queensborough Community College, Bayside, NY.**

It was reported that direct-current electrical fields could promote nerve growth and axon regeneration. Such migration behaviors in explant culture of rat lateral ganglionic eminence have been captured by time-lapse video movies and published in open literature (pubmed-18556511). It was reported that the explants were observed under phase-constant optics for 3 hours. The fractal dimension analysis of the published video frames using ImageJ reveals that the direct-current electrical field guided neuronal stem/progenitor cell migration has similar trend in fractal dimension enhancement as compared to the null case with zero electrical field. However the electrical field guided case does show fractal enhancement non-uniformity in the studied growth period. The fractal dimensionality of the electric field guided migration video frame was found to be suppressed as compared to its counterpart in the absence of electrical field, consistent with the expectation that the irregular pattern in electrical-field guided migration would exhibit enhanced correlation. The timing of these enhanced correlation effects could be incorporated in a practical therapeutic strategy for brain repair by direct-current electrical field guided neuronal stem/progenitor cell migration to replace brain cell loss in an injured area.



# Conference Highlights



# 2012 Benjamin Cummings/MACUB Student Research Grants

## Purpose

To provide investigative research support for undergraduate students working under the supervision of faculty who are current members of MACUB. Awards Applications will be evaluated and awards granted based on the scientific merit and overall quality of the proposed research experience.

4 grants of \$500 each will be awarded annually (provided by BC).

Complimentary registration for the annual fall conference of MACUB and membership in MACUB for student research grant awardees (provided by MACUB).

## Eligibility

Only undergraduate students working under the supervision of a faculty member who is a current member of MACUB may apply.

Undergraduates who are graduating seniors must plan to complete their research prior to graduation.

A student is only eligible to receive one award.

## Requirements

Student research grants may be used to support scientific investigation in any field of biology.

Funding may be used to purchase equipment or supplies required for the proposed project, and/or travel to and from a research location.

Grant winners are required to present the results of research supported by this award at the MACUB annual fall conference following the year of the award.

Institutional support is required. This may include research supplies, travel expenses, in-kind matches, and other forms of support.

All application materials must be submitted on-line at <http://www.macub.org> by February 28, 2012 and all applicants will receive notification of award status by March 15, 2012.

## Application

On-line proposal requires:

Student contact information

Faculty advisor contact information

Faculty reference letter from the research advisor

This letter must include a statement of institutional support for the project

Proposal title

Proposal (maximum of 500 words)

The proposal should provide a brief background on the project with reference, a statement of the proposed question or hypothesis to be tested, and a description of the experimental approach.

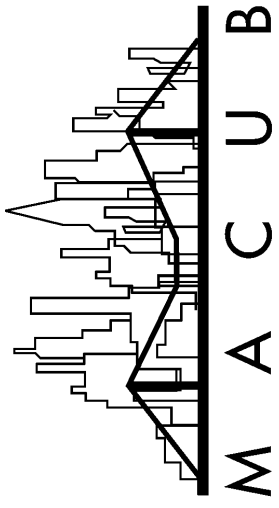
References

Basic budget justification.

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