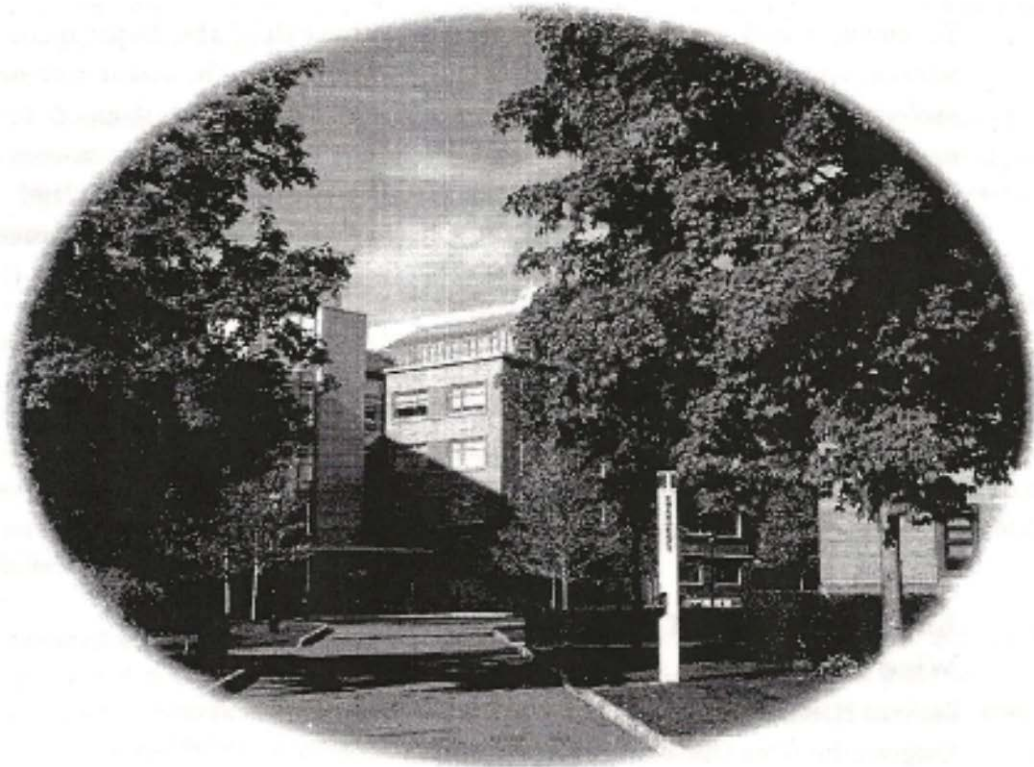


SETON HALL UNIVERSITY

College of Arts & Sciences

Department of Biological Sciences



8th Annual Biological Sciences Symposium

Observe, Explore, Achieve

Abstract Booklet

Spring 2015

The Biological Sciences Symposium is a proud participant in the Annual Petersheim Exhibition

Order of Events

3:30 pm Opening Remarks (McNulty Atrium)

Dr. Jane Ko, Chair of Biological Sciences

Student Travel Awards

To enhance and enrich our SHU student scholarship, the Department of Biological Sciences has established two biology student travel awards. One is the *Dr. Linda Hsu Travel Award*, named in honor of Professor Emeritus Dr. Hsu. The second is the *DaCosta Travel Fund*, made possible through the generous donations of Drs. Theodore and Judy DaCosta, both of whom are alumni of SHU Biology.

3:35 pm Research and Senior Seminar Poster Session

Refreshments available
Judging of posters

5:20 pm Keynote Seminar (McNulty Amphitheater, SC-101)

Michael T. Madigan, Ph.D.
Distinguished Professor Emeritus
Department of Microbiology
Southern Illinois University

Title: "Sulfur-Cycling in the Permanently Ice-Covered Lake Fryxell, McMurdo Dry Valleys, Antarctica"

6:25 pm Closing Remarks

Announcement of poster winners



Michael T. Madigan, Ph.D.

Distinguished Professor Emeritus
Department of Microbiology
Southern Illinois University
Carbondale, IL

Dr. Michael T. Madigan is Distinguished Professor Emeritus at Southern Illinois University Carbondale (USA) where he has conducted research on extremophilic bacteria and taught undergraduate and graduate students for 33 years. He earned his B.S. in biology and education at Wisconsin State University–Stevens Point, and his M.S. and Ph.D. at the University of Wisconsin–Madison Department of Bacteriology. His graduate advisor at Wisconsin was Dr. Thomas D. Brock, the first to isolate hyperthermophilic prokaryotes from hot springs in Yellowstone National Park, which ushered in the era of “extremophilic microbiology”. Dr. Madigan has written several editions of the microbiology textbook **Brock Biology of Microorganisms**, the 14th edition of which appeared in 2014. He received the Carski Award for Outstanding Teaching from the American Society for Microbiology, is an elected member of the American Academy of Microbiology, and received the Antarctic Service Medal for his research in Antarctica. The past 15 years Dr. Madigan has lead field teams in Antarctica and was Chief Editor of Archives of Microbiology from 1994–2004.

The main research theme in my laboratory is the isolation and characterization of new species of anoxygenic phototrophic bacteria from extreme environments. The long-term objective is to better understand the physiochemical limits of photosynthesis. By characterizing new species of anoxygenic phototrophs from hot, cold, acidic, alkaline, and saline habitats, we seek to reveal the diversity of photosynthetic life on Earth and to eventually understand the mechanisms that allow photosynthesis to occur optimally under extreme conditions; work from my lab also contributes towards an understanding of the evolution of photosynthesis. Some of our work involves collaborations with biophysicists, biochemists, and geneticists interested in special features of our new organisms.

ABSTRACTS

GRADUATE RESEARCH

1) ENDOTOXIN TOLERANCE IN MICROGLIA

Victoria Floriani and Heping Zhou

Department of Biological Sciences, Seton Hall University

Lipopolysaccharide (LPS), an endotoxin and the main component of the outer membrane of Gram negative bacteria, is known to elicit a robust immune response via a signaling cascade initiated by toll-like receptor-4 (TLR4). Microglia are the resident innate immune cells of the central nervous system. LPS treatment activates microglia and increases the production of inflammatory mediators including cytokines and chemokines in these cells. Repeated exposure to endotoxin has been reported to lead to diminished inflammatory response, which is termed endotoxin tolerance. Our previous studies have shown that microglia cells pretreated with 1 µg/ml of LPS exhibit decreased cytokine response to subsequent stimulation with 1µg/ml of LPS as compared to control cells pretreated with vehicle. This study showed that the mRNA level of nuclear factor of kappa light chain enhancer in B-Cells 2 (NFKB-2) exhibited a significant decrease in cells pretreated and stimulated with 1µg/ml LPS, when compared to cells pretreated with vehicle and subsequently stimulated with 1µg/ml of LPS treatment. The mRNA level of suppressor of cytokines 1 (SOCS1), a negative regulator of the TLR4 pathway, showed a significant decrease in cells pretreated and stimulated with 1µg/ml LPS, when compared to cells pretreated with vehicle and then stimulated with 1µg/ml of LPS treatment. The mRNA level of dual specific phosphatase 1(Dusp1), a negative regulator of MAPKs, showed a significant increase in cells pretreated and stimulated with 1µg/ml LPS, when compared to cells pretreated with vehicle and stimulated with 1µg/ml of LPS treatment. These data suggest that endotoxin tolerance in microglia could be associated with decreased mRNA expression of NFKB2, SOCS1, and increase expression of Dusp1 in cells pretreated and stimulated with 1µg/ml of LPS. Our studies will help to shed light on the mechanism of endotoxin tolerance in microglial cells.

2) INHIBITION OF HOST INTERFERON ACTIVATION BY MOLLUSCUM CONTAGIOSUM VIRAL PROTEIN MC160

Michael W. Beaury and Daniel Brian Nichols

Department of Biology, Seton Hall University

Molluscum Contagiosum Virus (MCV) is a common poxvirus that produces benign skin neoplasms. MCV lesions are characterized by lack of inflammation, which has been attributed to interference of host immune signaling pathways by viral immune evasion proteins. Unfortunately, the pathogenicity of the virus is poorly understood. Current, therapies can result in scarring and emotional distress in patients, especially children. Therefore, understanding the molecular mechanisms specific to MCV immune evasion are vital for the development improved anti-MCV therapies. Two MCV early genes, MC159 and MC160, contain death effector domains (DEDs) and antagonize natural cellular defenses for viral infection. DEDs are present in many host proteins such as FADD and procaspase-8 and mediate a diverse array of innate immune responses including activation of apoptosis and interferon (IFN) production. The MC159 protein antagonizes apoptotic pathways presumably by binding to the DEDs of FADD and procaspase-8. MC159 also inhibits the activation of IFN most likely by associating with upstream host signaling proteins such as IKKε, TBK1 and NEMO. On the other hand, MC160 binds to FADD and procaspase-8 as well; however it is not directly correlated with the inhibition of apoptosis. Therefore, the functionality of the MC160-FADD/procaspase-8 association is not entirely understood. Interestingly, MC160 can antagonize the activation of host inflammatory responses such as NF-κB and IFN activation. Of note, both FADD and procaspase-8 have been shown to play a role in these signaling events as well. Therefore I hypothesize that MC160 binding to FADD and procaspase-8 prevents the activation of host IFN responses. The goal of this study is to determine the functionality of the MC160/FADD/procaspase-8 association and determine the molecular mechanism by which MC160 exerts its effects in host cells

3) CHARACTERIZATION OF MC163: A PUTATIVE SOD HOST INTERACTING PROTEIN

Jesse Coutu

Department of Biological Sciences, Seton Hall University

Molluscum Contagiosum Virus (MCV) is an obligate human, tumorigenic poxvirus which causes benign skin neoplasm's leading to disfigurement and scarring. Reduced inflammation during an MCV infection has been attributed to production of MCV immune evasion molecules (IEM's). IEM's antagonize host immune responses allowing MCV to evade the host immune system and re-program the host cell for viral growth. MCV IEMs alter apoptosis (MC159, MC160), deregulate the cell cycle targeting retinoblastoma (MC007), and produce a chemokine homolog (MC148). Bioinformatics analysis identified, MC163, as another potential host-interacting protein. MC163 encodes a $\text{Cu}^{2+}/\text{Zn}^{2+}$ binding domain with putative superoxide dismutase (SOD) activity and a transmembrane domain. Reactive oxygen species (ROS) levels are tightly controlled in the cell by cellular SOD proteins. Disruption of ROS homeostasis can lead to deregulation of the cell cycle and either pro- or anti-apoptotic signals. Several poxviruses code nonfunctional SODs which function to disrupt host ROS control. SOD metal-binding domain similarity is seen between MC163 and two leporipoxvirus SODs, yet the functional domain of MC163 are "broken up" by long streams of amino acids. Interestingly, MC163 predicted protein structure indicates these SOD-like regions may fold into each other to form functional $\text{Cu}^{2+}/\text{Zn}^{2+}$ binding domains. Using bioinformatics analysis, I further identified a mitochondrial localization sequence. Viral proteins that localize to the mitochondria typically modulate cellular apoptotic responses. I hypothesize MCV MC163 protein expression antagonizes apoptotic responses and upregulates cell proliferation pathways through disruption of cellular reactive oxygen species (ROS) homeostasis. Difficulties arise when studying MCV since no cell culture model exists, thus functional characterization of MC163 will be executed utilizing over-expression and co-expression assays for apoptotic and cell proliferation pathways in human cells. Characterization will identify the cellular localization, role in cellular ROS/SOD function using mutational deletions to determine critical amino acids or domains crucial for function and identification of cellular pathways involved with MC163 function.

4) FUNCTIONAL ANALYSIS OF *MOLLUSCUM CONTAGIOSUM* VIRUS MC160 RXDL MOTIF

Sarah Weber

Department of Biological Sciences, Seton Hall University

The *Molluscum contagiosum* virus (MCV) is a member of the *poxviridae* family that causes benign skin lesions that persist for months. MCV lesions persist on average for 8-12 months in otherwise healthy individuals and are characterized as having reduced inflammation. The persistence and reduction of inflammation at the site of MCV infections have been attributed to MCV immune evasion genes. The MCV encodes two death effector domain (DED) containing proteins, MC159 and MC160. DEDs are found in cellular proteins such as FADD and procaspase-8 and are involved in several innate immune responses including apoptosis and activation of interferon (IFN) responses. Ectopic expression of MC159 blocks apoptosis and IFN activation, while MC160 expression antagonizes IFN activation. Presumably, MC159 and MC160 binds host DED containing proteins as a means to prevent the formation of innate immune signaling complexes. In the current study, I tested the functionality of the RxDL motif in the MC160 protein employing site-directed mutagenesis. The RxDL motif is conserved among several host and viral DED containing proteins and has been previously shown to be required for the function of DED-containing proteins. MCV mutants with mutated RxDL motifs were assessed for the ability to inhibit the activation of interferon- β by the overexpression of the host adapter molecule MAVS and the activation of NF- κB by the host signaling kinase RIP-1. Surprisingly, and unlike other DED containing proteins, the RxDL motif of MC160 appears to be dispensable for its function. Interestingly, I found that neither MC160 wild-type nor the MC160 mutants could antagonize NF- κB activation induced by the expression of procaspase-8. Therefore, my results support the model that the MC160 protein interacts with procaspase-8 as a means to inhibit activation of host IFN responses.

5) *DE NOVO* ASSEMBLY AND ANALYSIS OF THE TESTES TRANSCRIPTOME FROM THE MENHADEN, *BERVORTIA TYRANNUS*

Frank J. Zadlock IV, Satshil B. Rana, and Carolyn S. Bentivegna
Department of Biological Sciences, Seton Hall University

The menhaden, *Bervortia tyrannus*, is one of the most important fish within the oceanic ecosystem along with being a crucial species for various fishing industries. Despite being an ecological and economical important species, little is known about *B. tyrannus* from a genetic aspect. The objective of this project is to apply high throughput sequencing to the testes transcriptome of *B. tyrannus* to enhance the available genetic information for this species and to provide the genetic tools required to further study their population dynamics. To accomplish this, we applied Illumina NextSeq 500 technology to two different testes and performed *de novo* assemblies on the generated raw reads using Velvet/Oases. BLASTx was utilized to annotate the assembled contigs against the Genbank non-redundant protein database. To validate the accuracy of the assemblies *in silico*, the contigs were aligned independently to two phylogenetically related genomes belonging to zebrafish and cavefish using BLASTx. To experimentally verify the assembly results, primers were designed based on the assembled transcriptome and PCR was performed. The presence of a unique PCR product of appropriate size was verified by agarose gel electrophoresis and Sanger sequencing. To enhance the functional categorization of the annotated contigs, they were further classified using Gene Ontology (GO), Kyoto Encyclopedia of Genes and Genomes (KEGG), and Clusters of Orthologous Groups (COG) databases. We also identified miRNAs and microsatellites that had sufficient flanking sequences on both sides for primer design. To date, this research is the first report of an annotated overview for the testes transcriptome in *B. tyrannus*, resulting in the most comprehensive genetic resource available for the species. This work can provide a repository for future gene expression analysis, functional studies, and reproductive investigations in *B. tyrannus*. This will enhance the capabilities of population monitoring and can be used as a benchmark in comparative studies in other fish models. Overall, this research will open new opportunities and bring new insights for researchers using *B. tyrannus* as a model.

6) THE STIMULATORY EFFECTS OF CHOLERA TOXIN B AS AN ADJUVANT IN AN *F. TULARENSIS* VACCINE PREPARATION ON MURINE DENDRITIC CELLS

Trevor Smith
Department of Biological Sciences, Seton Hall University

Francisella tularensis is an intracellular pathogen with a category "A" bioterrorism agent classification according to the United States Centers for Disease Control and Prevention. To date, there is no approved vaccine to provide protection against tularemia, the disease caused by this pathogen. Previous *in vivo* studies using a mouse model have shown that a mucosally targeted intranasal vaccine preparation of inactivated *F. tularensis* (*iFt*) adjuvanted with Cholera toxin subunit B (CTB) successfully granted full protection against the less virulent vaccine strain of *F. tularensis* (*FT LVS*) and provided partial protection against the more virulent SchuS4 strain. While the mechanisms of protection are not completely understood, previous *in vitro* studies using RAW 264.7 murine macrophages have shown that treatments with *iFt* and CTB generated an increased secretion of the pro-inflammatory cytokines IL-6 and TNF- α , as well as an upregulation in the expression of TLR4 and co-stimulatory molecules CD80 and CD86. In the present study, the mechanisms of protection were investigated using bone marrow derived murine dendritic cells (DC) cultured *in vitro* with the same treatments. It was shown that combined preparations of CTB and *iFt* elicited a greater production of pro-inflammatory cytokines and an enhanced expression of activation cell surface markers on DCs when compared to treatments with CTB or *iFt* alone. These results indicate an increased level of activation that is essential for the generation of protective immune responses *in vivo* against a lethal *F. tularensis* challenge.

7) LONG TERM STUDY OF PHYSIOLOGICAL RESPONSE TO ZINC STRESS IN *SYNECHOCOCCUS* SP. IU 625

Robert Newby, Jr., Ruchit Patel, and Tin-Chun Chu
Department of Biological Sciences, Seton Hall University

Eutrophication of freshwater is leading to the rapid increase of cyanobacterial harmful algal blooms (CHABs). Increasingly, heavy metals such as zinc are being found in freshwater sources from a variety of potential contamination causes. Due to increased industrial activity, freshwater ways are under increasing threats of CHABs. In order to study the mechanisms in which these CHABs can respond to heavy metals work has been undertaken using the unicellular cyanobacterium *Synechococcus* sp. IU 625 (*S. IU 625*). *S. IU 625* has been cultured in medium containing $ZnCl_2$ at levels of 0, 10, 25, and 50 mg/L; *S. IU 625* was cultured over a period of 29 days, and demonstrated survival in $ZnCl_2$ concentrations up to 25 mg/L. Viability was measured using SYTOX® via flow cytometry and confocal light microscopy imaging. Viable populations of cells were found in $ZnCl_2$ in all concentrations up to 50mg/L. Scanning electron microscopy coupled with energy dispersive x-ray spectroscopy imaging (SEM-EDS) was conducted and yielded images showing divisionary deficient cells in the presence of 25 mg/L $ZnCl_2$. qPCR analysis of heavy metal binding protein metallothionein highlighted significant upregulation and expression in cells exposed to $ZnCl_2$ by 4 days. Forward scatter, side scatter, phycoerythrin, allophycocyanin, and chlorophyll a were used in flow cytometry to measure changes in population composition as measured. This analysis will allow for a better understanding into the response CHABs pose in response to long-term exposure to zinc.

8) ANTIBACTERIAL EFFECTS OF *POLYGONUM MULTIFLORUM*

Andy S. Demianicz and Tin-Chun Chu
Department of Biological Sciences, Seton Hall University

Chinese Knotweed (*Polygonum multiflorum*) is a strong antioxidant, antibacterial and antiviral compound that has been used as a natural product in the eastern hemisphere. The compound is of interest due to the novel importance in natural compound. The extract from the roots of the Chinese Knotweed was used to assess its antibacterial properties against a broad spectrum of bacterial species. Five gram positive and five gram negative species were used to assess the antibacterial activity of Chinese Knotweed. *Bacillus cereus*, *Bacillus megaterium*, *Staphylococcus epidermis*, *Streptococcus mutans* and *Streptococcus pyogenes* were the five gram positive species. *Enterobacter aerogenes*, *Escherichia coli*, *Proteus vulgaris* and *Pseudomonas aeruginosa* are the gram negative species. Microtitre plate-based antibacterial assay was carried out to evaluate the antibacterial activity of Chinese Knotweed and to determine the Minimum Inhibitory Concentration (MIC). The Congo red assay, crystal violet assay and confocal microscopic analyses were also carried out to evaluate the anti-biofilm activity of the compound. The results indicated that MIC of Chinese Knotweed is 1% and the LD_{50} is 0.5%. Anti-biofilm assay also showed that 1% Chinese Knotweed was able to inhibit biofilm formation. Thus, Chinese Knotweed may provide a novel treatment against bacterial infections and biofilm formation.

9) SOD ACTIVITY IN *CHIRONOMUS RIPARIUS*

Tanya Thompson and Carolyn S. Bentivegna
Department of Biological Sciences, Seton Hall University

Chironomus riparius is a species of aquatic non-biting midges whose larvae are commonly used in various toxicology studies. They belong to the Order Diptera and the Family Chironimadae, from which the common name for their larvae, chironomid, derives. In previous work, chironomids were exposed to Cadmium (Cd) at different concentrations to investigate possible mechanisms of toxicity. Superoxide dismutase (SOD) is known to be an important antioxidative enzyme that has the ability to respond to Cd. SOD catalyzes the dismutation of the superoxide anion into H_2O_2 . The primary purpose of this project was to measure the SOD activity of three different size chironomid larvae samples and determine the effects of storage temperature (-20°C) on sample SOD activity. The SOD activity is measured using a colorimetric assay (Dojindo Molecular Technologies, Kumamoto, Japan) and is quantified using a spectrometer. The more SOD activity there is in a sample the less color will be seen. It was concluded that there was no significant change throughout several weeks of measuring frozen samples of chironomid larvae.

10) EFFECT OF CHINESE KNOTWEED EXTRACT ON HERPES SIMPLEX VIRUS TYPE-1 INFECTION OF VERO CELLS

Derek Prince and Tin-Chun Chu

Department of Biological Sciences, Seton Hall University

Herpes simplex virus type-1 (HSV-1) is an enveloped and double stranded DNA virus responsible for infecting the majority of the human population. The strategic ability of HSV-1 to alternate between latent and lytic states makes it a difficult infection to treat. Although a few current antivirals are available, adverse effects and genetic resistance make studying alternative methods of critical importance. *Polygonum multiflorum* (Chinese Knotweed) is an herbaceous vine local to the south central regions of China. In this study, purified Chinese Knotweed thubn extracts were used to assess potential anti-HSV-1 properties. Cytotoxicity and cell proliferation assays indicate that the compound had no toxic effect on cultured Vero cells at concentrations up to 1%. Antiviral assays such as, cytopathic effect (CPE) monitoring studies, plaque reduction assays, confocal microscopy, and flow cytometry analysis all provide evidence that Chinese Knotweed concentrations as low as 0.1% strongly inhibit HSV-1 viral infection of Vero cells. Furthermore, molecular analysis from quantitative real-time polymerase chain reaction (qPCR) assays suggest that 0.1% Chinese Knotweed concentrations are able to inhibit > 98% of HSV-1 viral entry when compared to untreated HSV-1 positive controls. Chinese Knotweeds ability to inhibit *in vitro* HSV-1 infection may provide clinicians a potential natural alternative and/or synergistic agent to current HSV-1 therapies.

11) INVESTIGATION OF ADAPTIVE RESPONSES OF HUMAN NEURONAL CELLS UNDER HYPOXIA-MIMIC CONDITION

Ashley Alexandre, Denise S Abdulahad, and Jane L Ko

Department of Biological Sciences, Seton Hall University

Hypoxic injury to the brain can result in neuronal dysfunction and eventual cell death. Neuronal cells are more susceptible to hypoxia due to its great demand for oxygen to maintain membrane potential and limited capacity for glucose storage. Under hypoxic conditions, neuronal cells depolarizes and calcium influx subsequently resulting in cell death. However, some cells can still survive the insult by developing adaptation mechanisms. Our lab recently reported that one of adaptive responses is to alter the expression of opioid receptors (MOR, DOR and KOR), which are known to mediate analgesic effects, using DFO-induced hypoxic mimic neuronal cell model system. In this study, we further investigated the expression of the opioid receptors, mu (MOR) and delta (DOR) using human neuronal cells under nickel induced hypoxic mimic condition. In addition, the influence on cell viability and cell cycle were also tested and determined. Our preliminary results suggested that surviving neuronal cells developed various adaptive responses to the hypoxic insult.

12) STUDY OF ADAPTIVE RESPONSES ELICITED BY DESFERRIOXAMINE IN HUMAN NEURONAL CELLS

Jennifer Babcock, Alberto Herrera, and Jane Ko

Department of Biological Sciences, Seton Hall University

Cardiac arrest, stroke and physical trauma are a few events that can elicit a hypoxic condition. Mu-Opioid Receptors are known for their mediation of pain sensation; therefore, the effects of hypoxia on MOR expression were examined using human neuronal cells treated with desferrioxamine (DFO) to create a mimicked hypoxic condition. The transcription regulator, PCBP-1, is known to modulate MOR gene expression. While its interacting protein, RACK-1, identified by the two-hybrid screening system, can negatively regulate MOR gene expression. RT-PCR analysis exposed a decrease of MOR expression under DFO, whereas RACK-1 expression was increased. The results from DFO-induced hypoxia supported the hypothesis of RACK-1 participating in the regulation of MOR expression. Neuronal cells surviving exposure to DFO also displayed an activation of the JAK/STAT pathway via Western blot analysis. The negative regulators of the JAK/STAT pathway, the suppressors of cytokine signaling, were also shown to increase through detection via RT-PCR. Up-regulation of suppressors of cytokine signaling proteins under hypoxia leads to the suggestion that they may play a role in a form of neuroprotection.

13) CD8 T-CELLS PRIMED BY FC RECEPTOR TARGETING ARE VITAL FOR PROTECTION AGAINST THE INTRACELLULAR PATHOGEN, *FRANCISELLA TULARENSIS*

James McCauley and Constantine Bitsaktsis

Department of Biological Sciences, Seton Hall University

Francisella tularensis is a Center for Disease Control and Prevention (CDC) classified Category A intracellular mucosal pathogen with no FDA approved vaccine. It has been previously demonstrated that the targeting of fixed *Francisella tularensis* (iFt) to Fc γ R on antigen presenting cells by mixing iFt with anti-LPS monoclonal antibodies to form immune complexes (mAb-iFt) enhances protection against lethal *F. tularensis* challenge. The mechanism of this enhanced protection is due to increased generation of pathogen specific CD4+ memory T cells, antibodies, and cytokine responses. During infection, activated lymphocytes will eliminate the pathogen and a small portion of these lymphocytes will form memory cells specific to *F. tularensis* epitopes. Of these memory cell subsets, CD8+ memory T cells are of a particular interest in this study due to their involvement in targeting and eliminating intracellular pathogens. In this study, an *in vivo* mouse immunization model was utilized to determine if CD8+ memory T cells are essential for protection by this FcR targeting vaccine strategy. C57BL/6 wild-type mice and CD8 knockout mice were immunized with mAb-iFt and then challenged with a lethal dose of *F. tularensis* live vaccine strain (LVS). Survival studies revealed that FcR targeting did not protect CD8 knockout mice against lethal LVS challenge. This evidence suggests that CD8+ memory T cells following Fc receptor targeting plays a vital role in protection against lethal *F. tularensis* challenge.

EFFECT OF SALINITY LEVEL ON THE HEMOGLOBIN PROTEIN OF CHIRONOMUS RIPARIUS LARVAE FOR TWO GENERATIONS

Zainab H. Alali and Carolyn S. Bentivegna

Department of Biological Sciences, Seton Hall University

Hemoglobin protein (Hb) of Chironomus larvae is a promising molecular biomarker for detecting toxic metals in aquatic ecosystems. However, molecular biomarkers might be affected by natural environmental factors that interfere with interpretation of results. In this study, the effect of salinity on Hb profiles was investigated. Hemolymph of 4th instar *C. riparius* was examined after transferring egg masses from freshwater to increasing levels of salinity water for two generations. The first generation was raised in 1PPT (1g/l) of Instant Ocean Sea Salt, and the second generation was raised in 3PPT (3g/l) of Instant Ocean Sea Salt. The first and second generations of control animals were raised in 0.15PPT (0.15g/l) of Instant Ocean Sea Salt. Effects on Hb profiles were determined by digesting hemolymph with trypsin enzyme for 0, 5, 30 and 60 minutes and detecting Hb products by SDS-PAGE. Samples were also tested for protease activity using Proteasome-Glo Trypsin-Like Assay. Results showed that increased salinity corresponded with increased digestion of Hb. This was indicated on SDS-PAGE gels by a concurrent rise in low molecular weight (MW) bands and loss of high MW bands previously identified as Hb. The increase in low MW Hb proteins might be due to the effort of the animal to struggle against osmotic pressure created by increased salinity. Activation of proteases would increase levels of low MW proteins in hemolymph and thereby prevent water loss. This would allow the species to extend its habitat from freshwater (≤ 0.5 PPT) into oligohaline (3PPT) environments. Findings demonstrate that natural environmental factors must be considered when developing biomarkers for pollutants.

UNDERGRADUATE RESEARCH

14) PROTEIN SIGNAL REDUCTION THROUGH SIZE-EXCLUSION CHROMATOGRAPHY IN POLYCYCLIC AROMATIC HYDROCARBON SOLUTIONS

Gilbert Sharp, Chelsea DeFelice, and Carolyn S. Bentivegna
Department of Biological Sciences, Seton Hall University

Polycyclic aromatic hydrocarbons (PAHs) are a component of crude oil and are attributed to many adverse effects to living organisms, both marine and land-based. PAHs are strongly fluorescent and utilizing them as a biomonitoring technique is desired. However, their signal is blocked in the presence of weakly fluorescent proteins that, when aggregated, have a signal intensity that diminishes PAH signals. Fish that inhabited the vicinity of the Deepwater Horizon Oil Spill in 2011 were directly exposed to crude oil; therefore, they had PAH exposure. By utilizing fluorescent spectrometric techniques, the identification of PAHs in fish tissues is possible. The technique that is utilized for this work is three-dimensional glass-cuvette scanning (3D), which plots excitation, emission, and signal intensity for compounds simultaneously in a contour map data output. Size-exclusion chromatography allows certain molecules of lower molecular weight, like PAHs, to pass through the solid phase (Sephadex LH-20) and elute quicker than heavier molecules, like proteins. This will allow PAHs to have a stronger signal without protein signal interference because the proteins will elute last from the column. The purpose of this work is to utilize 3D spectra for protein standards, PAH standards with protein, and PAH standards without protein, before and after being run through a column to see if protein signals are reduced. Protein signal reduction in these fish samples allows for PAH signals to be seen more clearly and make biomonitoring PAHs in crude oil exposed fish easier.

15) DIFFERENTIATION OF A HUMAN NEUROBLASTOMA CANCER STEM CELL

Marissa Ayasse, Jeanette D. Walton, Allan D. Blake, Ph.D
Department of Biological Sciences, Seton Hall University

Human neuroblastoma is the most common cancer in infants and most frequent solid tumor outside the brain in children. Distinct tumor cell types from multiple neural crest lineages can be identified *in vivo* and propagated with *in vitro* tissue culture. The three cell types currently grown from human neuroblastoma tumors are: (1) Neuroblastic (N-type) cells which express a neuronal phenotype and are tumorigenic. (2) Substrate-adherent (S-type) cells which are contact inhibited and exhibit little, if any tumorigenicity. (3) Intermediate (I-type) cells which express biochemical markers of both N-type and S-type cells, are mildly substrate adherent, are not contact inhibited, but are highly tumorigenic, and possess stem cell characteristics. The I-type cells are referred to as cancer stem cells. In the current study, the cell differentiating reagent, retinoic acid or the cyclic nucleotide activator, forskolin, were used to treat the I-type cancer stem cell, BE(2)-C, to determine whether these agents would promote cancer stem cell differentiation. Our results show that both differentiation reagents promoted N-type cell formation. The medical literature documents that differentiation toward a less tumorigenic phenotype results in a better prognosis for the child. Further study of the I-type cancer stem cells and their differentiation potential is necessary to understand their role in the progression of this deadly childhood cancer.

16) TECHNIQUES FOR THE PREPARATION OF HEPATIC PROGENITOR CELLS FOR SURGICAL TRANSPLANTATION OF PREVIOUSLY NECROTIC HEPATIC TISSUE

Omar Hassenien and James Love

Department of Biological Sciences, Seton Hall University

Considerable research into facilitating the generation of progenitor cell lines for specific tissue construction has been done on cardio myocytes and hepatocytes, alike. This research focuses on coalescing current laboratory techniques to test the potential of procedures to return function to previously necrotized hepatic tissue. By combining isolation methods for human hepatic progenitor cells (hHPCs) by Pei-Pei et al (2013), techniques for cell seeding onto 3D scaffold by Pagliari et al (2014), and grafting cultured cells for mouse liver transplantation procedures, by Smits et al (2009); this experiment tested if liver function will improve in failing and/or necrotized liver tissue post-transplantation onto liver failure induced Severe Compromised Immuno-deficient (SCID) mice. Results were quantified by performing a standard liver panel test on the mouse sample, for bilirubin, ALT and AST, ALP, albumin, and PT levels. Furthermore, biopsies of the sample livers were taken at one week, one month, and three month intervals for Fluorescent in situ Hybridization (FISH) analysis to fluoresce human cells versus mouse cells to ensure the continued proliferation and viability of the differentiated hHPCs. The results of this experiment concluded that hHPCs can be successfully differentiated in vitro. Furthermore, the liver panel analysis showed that the samples' liver function significantly increased and FISH quantification revealed evidence to show continued positive differentiation of the hHPCs.

17) EFFECTS OF CRUDE OIL ON *SYNECHOCOCCUS* SP. IU 625

Jonathan Valsechi-Diaz, Sally Tarabey, Garrett Almeida, and Tin-Chun Chu

Department of Biological Sciences, Seton Hall University

The BP oil spill released a devastating 210 million gallons of crude oil into the Gulf of Mexico in the year 2010. The effects of the oil on wildlife was made apparent immediately, while the effects on microorganisms was not visible without research. In this study, three concentrations of crude oil from the oil spill were used to evaluate their effects on a unicellular cyanobacterium, *Synechococcus* sp. IU 625. The growth was monitored by turbidity study with spectrophotometer and direct count with a hemocytometer. Microscopic analyses were also carried out to evaluate the morphological differences of the cells. The results indicated that the 0.25% crude oil culture received almost no inhibition to cell growth from the oil. Cultures exposed to both 0.5% and 1% crude oil were affected as the concentration increases. Though the 1% crude oil culture was inhibited significantly more than the 0.5% crude oil culture, the cultures reached similar cell counts by day 22.

18) FLOW CYTOMETRIC ANALYSIS OF WATER SAMPLES COLLECTED FROM BARNEGAT BAY, NEW JERSEY

Anaika Singh, Jillian Cortese, and Tin-Chun Chu

Department of Biological Sciences, Seton Hall University

Cyanobacteria are an essential part of any aquatic environment, but the waterbodies become toxic when cyanobacteria overgrow and form cyanobacterial harmful algal blooms (CHABs). Many factors contribute to these CHABs, including industrial wastewater, agriculture runoffs and climate change...etc., which pose a threat to aquatic organisms, animals, and humans. Barnegat Bay, a popular destination along the Jersey shore, has been suffering from CHAB in recent years, resulting in ecological decline. In this study, water samples were obtained from 18 sites throughout Barnegat Bay. Collected water samples were then filtered and then were run through the flow cytometer, along with *Synechococcus* sp. IU 625 and *Oscillatoria* spp. as reference cultures. The percentage of cells containing phycoerythrin, allophycocyanin, and chlorophyll a, were determined for each water sample. Results indicate that all of the water sites contain ~ 63-94% phycoerythrin, 0-4% allophycocyanin, 0-10% of chlorophyll a when compared with *Synechococcus* sp. IU 625 while contain ~39-91% phycoerythrin, ~66-100% allophycocyanin, and ~80-100% chlorophyll a when compared with the *Oscillatoria* species.

19) EVALUATION OF ANTIBACTERIAL ACTIVITY AND GERMINATION INHIBITION OF PATCHOULI OIL AND TURMERIC

Leslie Landy, Nicolle Segarra, and Tin-Chun Chu
Department of Biological Sciences, Seton Hall University

Natural products are used in a variety of ways—ranging from home remedies to ingredients in cosmetic products. Recent studies show that natural products, specifically spices, possess many antimicrobial properties. Patchouli oil helps fight depression, soothes inflammation and boosts energy and immune system. Likewise turmeric helps heal infections and infected wounds. Two gram negative bacteria, *Escherichia coli* and *Pseudomonas aeruginosa*; and two gram positive bacteria, *Bacillus megaterium* and *Staphylococcus epidermidis* were selected to evaluate the synergistic antibacterial activity of turmeric and 8 antibiotics. Kirby-Bauer assay results indicated turmeric showed best synergy with Penicillin (10 µg) and Rifampin (5 µg). *B. megaterium* was used to examine the endospore germination inhibition when coupled with 5% and 2.5% turmeric and Patchouli oil. The results indicated that both 2.5% patchouli oil and 2.5% turmeric were able to inhibit > 99% of the germination process for *B. megaterium*.

20) CHARACTERIZATION OF MOLLUSCUM CONTAGIOSUM IMMUNE EVASION PROTEINS

Cassandra Soto
Department of Biological Sciences, Seton Hall University

Molluscum Contagiosum Virus (MCV) is a poxvirus that exclusively infects human keratinocytes and causes persistent benign skin lesions characterized by reduced inflammation. The most common anti-MCV treatments of curettage and cryotherapy are associated with scarring, anxiety, and emotional stress, especially in young children. Therefore, new antiviral therapies are needed. Unfortunately and despite its prevalence, MCV pathogenesis is poorly understood. Therefore, MCV-host cell interactions require further characterization to develop improved anti-MCV strategies. MCV is predicted to produce several viral proteins to evade host cell immune responses. Two such MCV proteins are the death effector domain (DED) containing proteins MC159 and MC160. Both MC159 and MC160 inhibit viral double stranded (ds)RNA-induced immune responses in host cells. Viral dsRNA is produced during a poxvirus infection and is a strong inducer of several host inflammatory and antiviral responses, such as interferon β (IFN- β). Host proteins FADD and procaspase-8 are required for dsRNA-triggered responses. Interestingly, the MCV MC159 and MC160 proteins associates with FADD and procaspase-8, though the functional relevance of this interaction is not well characterized. The objective of my research is to determine the molecular mechanism by which MC160 counters RNA-induced cellular responses. I hypothesize that the binding of MC160 to host proteins FADD and/or procaspase-8 prevents host cells from establishing an antiviral state. To analyze the importance of the MC160-FADD/procaspase-8 interaction, I employed site-directed mutagenesis. The MC160 gene was mutated at various positions predicted to be required for association with with FADD/procaspase-8. I predict MC160 mutants that can no longer bind FADD/procaspase-8 will be unable to antagonize dsRNA-induced IFN- β activation, which will be determined through the use of IFN- β luciferase assays in cells expressing the MC160 protein or mutated MC160. Characterization of the molecular mechanism through which the MC160 protein counters activation of immune responses will provide viable targets for antiviral strategies.

21) FISH OIL AND ITS HIDDEN COMPONENTS

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Department of Biological Sciences, Seton Hall University

Previous research raised questions about the presence of PAHs in commercial fish oils as well as other fluorescent compounds that are not mentioned on the nutrition facts label. Commercial fish oil was obtained from “over the counter brands” which included two lots of Nature’s Bounty, Nature Made and Sundown Naturals. The presences of fluorescent compounds in fish oils was investigate by testing standards and fish oils using 3D matrix scanning on a Fluorolog 3. Standards included linoleic

acid, retinoic acid, 9-cis retinoic acid, omega-3 fatty acids including DHA and EPA and the PAH, hydroxypyrene. The influence of solvent was evaluated by extracting fish oils and standards into different percentages of EtOH or 100% DMSO.. Results showed no detectable PAHs in the commercial fish oils tested. Fluorescence of linoleic acid, retinoic acid, and 9-cis retinoic acid were not detected using EtOH. Low levels of fluorescence were detected for omega-3 DHA (1 µg/ml) and omega-3 EPA (100 µg/ml). Omega-3 DHA spiked into fish oils enhanced fluorescence of other compounds within the fish oils as well as PAHs spiked into the fish oil. It was noticed that DMSO dissolved the fish oil components better than various concentrations (50%, 75%, 90%) of ETOH and thereby increased their levels of fluorescence. Notable compounds in the fish oil were vitamin E, which peaked at Em350/Ex290, and carotenoid precursors (phytofluene) Em440/Ex340. Detection of omega 3s was inconclusive. Different brands of fish oil appear to have different concentrations of major components: Strongest to weakest peak signals of phytofluene was Nature Made, Sundown naturals and Nature's Bounty. Also, both Sundown Naturals and nature's Bounty showed vitamin E signals. The presence of carotenoids in commercial fish oils has not been previously reported. Vitamin E and carotenoids are likely added during production to reduce fish oil degradation.

SENIOR SEMINAR PRESENTATIONS

22) SMALL PHOTOSYNTHETIC ORGANISMS BASED BIOASSESSMENT IN BARNEGAT BAY

Anaika Singh and Shreyal Shukla

Department of Biological Sciences, Seton Hall University

Once a thriving lagoonal estuary, Barnegat Bay is now in severe ecological decline. Overdevelopment, urbanization, and agriculture water runoff have increased eutrophication over the years and have contributed to harmful algal blooms (HABs). In order to prevent the overgrowth of phytoplankton species in the bay, it is crucial to identify the specific types of cyanobacteria and algae (dinoflagellates, diatoms, etc.) present in that region. Our methodology involved collecting water samples from various sites and processed through a 100, 5, and 0.45 µm filter sequentially. Analysis was performed using high performance liquid chromatography to test for pigments as evidence for eutrophication. Flow cytometry assays were carried out on the samples to differentiate the species based on cell size and pigments. Polymerase chain reaction (PCR) based assays were used to detect the presence of cyanobacteria and other phytoplankton. Subsequently, viral plaque assays were performed to determine if phages were present in the sites and could potentially be used as a natural control agent. We expected the sites to contain phycoerythrin and phycocyanin as well as cyanophages. Further analysis including next generation sequencing and confocal microscopy will be carried out to continue monitoring the main contributors of algal blooms in the Barnegat Bay.

This project is proposed as part of our Senior Biology Seminar capstone course.

23) STABILIZATION OF NISIN AGAINST DIGESTIVE ENZYME BY ALTERING PEPTIDE SEQUENCE

Joseph T Parente and Leslie Landy

Department of Biological Sciences, Seton Hall University

Nisin is an antimicrobial peptide that is widely used for food preservation. Although it has potent activity against a number of food pathogens, suggesting potential therapeutic applications, its potential for clinical use is limited by proteolytic susceptibility and poor oral bioavailability. Derivatization of nisin could overcome these issues; however, many nisin analogues, prepared by modification at the N-terminal and C-terminal have previously been shown to be inactive. Focusing on protecting the nisin peptide degradation by pancreatic digestive enzyme, by taking trypsin-cleavage sites into account hypothesis of replacing both Lys12 and Lys22 with Ile on both position or replacing them individually can lead to three modified nisin peptide which can be studied for the enzyme affect and activity. This can be done through two processes; synthetic peptide synthesis or by mutagenesis. Through mutagenesis, we can focus on using a host vector. Through synthetic peptide synthesis, we can break down the original Nisin molecule and reconstruct it back together. And theoretically it is possible to be more stable against trypsin so that it will be more stable against digestive enzyme without losing its antimicrobial activity. *This project is proposed as part of our Senior Biology Seminar capstone course.*

24) MESENCHYMAL STEM CELL USE AS POTENTIAL THERAPY TO AMELIORATE ATROPHY AND LYMPHOCYTE RESPONSE SEEN IN MULTIPLE SCLEROSIS

Cassandra Soto, Kelly Prince, Carissa Ambis
Department of Biological Sciences, Seton Hall University

Although Multiple Sclerosis (MS) is the most common neurodegenerative disease in western countries, there are few effective treatments, many of which are only effective for early stages of MS and lose efficacy throughout treatment. Mesenchymal Stem Cells have been found to effectively interfere with the detrimental progression of experimental autoimmune encephalomyelitis (EAE), a murine animal model for MS. Successful treatment studies regarding the efficacy and safety of MSC in EAE have led to the current study, in which analogous Mesenchymal Stem Cell were used to reduce inflammation and symptoms of all four variants of MS. The results of this study suggest that MSC are effective in the immunomodulation of auto reactive lymphocytes and can be considered a viable form of therapy for those affected by the various forms of MS.

This project is proposed as part of our Senior Biology Seminar capstone course.

25) EFFECT OF RAPAMYCIN AND THE MTOR PATHWAY ON NEUROPROTECTION AFTER ISCHEMIC STROKE AND NEURODEGENERATION DISORDERS

Amy Gao and Matthew Gay
Department of Biological Sciences, Seton Hall University

Acute and chronic neurodegenerative disorders affect over 30 million people in the world and as the average lifespan of individuals increase, the rise in incidence of this disorder will lead to more death and disability for those afflicted. Current FDA-approved medical therapy for patients with acute ischemic stroke or chronic neurodegeneration disorders such as Alzheimer's and Parkinson's disease are not viable for the majority of patients. Therefore, new therapeutic approaches in neuroprotection is necessary. Rapamycin, an important modulator of the mechanistic target of rapamycin (mTOR) pathway, has become an emerging treatment for a wide variety of neurodegeneration disorders. mTOR is a component of two protein complexes, mTORC1 and mTORC2, and the mTOR pathway functions as an important regulator of protein synthesis, cell survival, and cell senescence. In order to study the effects of rapamycin, cortical neurons were treated with rapamycin at various concentrations. Western blot analysis was performed to determine phosphorylation of mTOR at Ser-2448 and Ser-2481. Immunofluorescence technique was used to analyze neuronal cell morphology and viability after oxygen glucose deprivation (OGD). In this study, we show that rapamycin improves cell survival in cortical neurons after OGD and prevents activation of both mTORC1 and mTORC2. The results of this study can be used to further investigate rapamycin as a therapeutic treatment for ischemic stroke and other neurodegenerative disorders. *This project is proposed as part of our Senior Biology Seminar capstone course.*

26) THE USE OF IGF-1 TO REDUCE THE EFFECTS OF OSTEOPOROSIS IN ADULT MICE

Michael Hernandez and Crystal Calise
Department of Biological Sciences, Seton Hall University

IGF-1 is a hormone involved in calcium absorption in the bone, along with many other tissues. Aging osteoporotic mice make a good model for studying the effects of hormones for bone development. In this experiment, osteoporotic and healthy mice were given three doses of IGF-1 daily over an eight week period with a calcium rich diet. Serum IGF-1 levels and bone mineral density were measured every week. It was predicted that the IGF-1 injections would increase bone development by reducing bone loss and increasing bone formation. The experiment revealed that the IGF-1 injections were useful in reducing further bone loss in healthy and osteoporotic mice but not in the development of new bone formation. *This project is proposed as part of our Senior Biology Seminar capstone course.*

27) A COMPARATIVE STUDY OF THE EFFICACY OF PREGABALIN AND DULOXETINE IN THE TREATMENT OF DIABETIC NEUROPATHY

Kirsten Simmons and Jason John

Department of Biological Sciences, Seton Hall University

Diabetic neuropathy is a painful complication of diabetes that has the potential to cripple the peripheral nervous system. This neuropathy presents in approximately 50% of diabetic patients after 25 years since their initial diagnosis. In the United States alone, it was estimated that nearly 20 million Americans were living with diabetic neuropathy, a number that is increasing due to the prevalence of Diabetes. Although there has not been a cure for diabetic neuropathy, there have been many approaches to mitigate its painful symptoms. In this investigation, we have looked at two pharmacological therapies in treating the symptoms of diabetic neuropathy and the effectiveness of these approaches. We studied the potency of the anticonvulsant Pregabalin and the SSRI Duloxetine in reducing neuropathic pain in patients with Type II Diabetes. We hypothesized that Duloxetine would be more efficacious than Pregabalin by comparing the mechanisms of inhibiting reuptake of serotonin and norepinephrine through Duloxetine to the modulation of neuronal excitement by binding to the alpha2-delta subunit of voltage gated calcium channels achieved by Pregabalin. Studies have also shown the success that Duloxetine has in reducing neuropathic pain when compared to a variety of analgesics specifically targeting diabetic neuropathy. Continual research of neuropathic pain through different pharmacological interventions can create safer and more effective treatment methods, allowing us to possibly take one step further towards alleviating most, if not all bodily pain. *This project is proposed as part of Senior Biology Seminar capstone course.*

28) ASSESSMENT OF TREATMENTS FOR ALOPECIA

Deanna Iovine and Shelby Parrish

Department of Biological Sciences, Seton Hall University

Alopecia areata (AA) is an autoimmune disease caused by inflammation that results in non-scarring hair loss on the scalp and/or other parts of the body. AA affects only 1-2% of humans and has multiple clinical forms including *alopecia areata focalis* in which hair is lost in patches on the scalp and body, *alopecia areata totalis*, in which the hair is completely lost on the scalp (including eyebrows and eyelashes) and *alopecia areata universalis* in which all of body and scalp hair is lost. The significance of this study is to determine the effects of different drugs including the new FDA-approved drug for Rheumatoid Arthritis, XELJANZ® (tofacitinib citrate), versus the injection of corticosteroids on patients with *alopecia areata universalis*. A randomized, double-blind study was conducted. A total of 90 adult patients with *alopecia areata universalis* were recruited and monitored in 4 week intervals for one year. All participants were equally distributed and randomly assigned into one of the three groups: control, XELJANZ®, and corticosteroid group. The amount of hair grown was determined by photographs taken of patients, hair pull test, and dermoscopy. If alopecia areata is caused by an attack of one's own immune system on hair follicles, then XELJANZ® (tofacitinib citrate) will successfully regrow hair on patients with alopecia better than that of corticosteroids, with less adverse effects. *This project is proposed as part of our Senior Biology Seminar capstone course.*

29) DETERMINING THE VIABILITY OF HUMAN GINGIVA FIBROBLASTS ENHANCED WITH EXTENDED TELOMERES FROM HT54 NANOPARTICLES IN THE PRESENCE OF HEAD AND NECK SQUAMOUS CELL CARCINOMA-HNO258

Ariel Snell and Justin Steinbergin

Department of Biological Sciences, Seton Hall University

Increasingly more and more research is being done to discover information about the function, use and regulation of telomeres because many diseases such as cancer and other age-related diseases are affected by varying telomere length. In this experiment, an HT54 nanoparticle in combination with pol β , dideoxyribonucleotides and Taq polymerase, was used to lengthen the telomeres of six cell culture samples of Human Gingiva Fibroblasts (HGF) *in vitro*. Another six samples of HGF cells were prepared without the nanoparticle and accompanying materials to act as controls for the experiment. After preparing these samples, the telomere length of all samples were measured using a Southern Blot. After confirming the length of the telomeres in all twelve samples, Head and Neck Squamous Cell Carcinoma of the oral cavity, HNO258 cells, were added to each sample to observe how the cancer cells effect and interact with the HGF cells with and without lengthened telomeres. The results of the experiment should show that the HGF cells with the extended telomeres from the nanoparticle should multiply and survive even after the addition of HNO258 cancer cells. *This project is proposed as part of our Senior Biology Seminar capstone course.*

30) LONG TERM EFFECTS OF ARTIFICIAL SWEETENERS USED BY DIABETICS

Gabriel Espinosa and Jeff Kwok

Department of Biological Sciences, Seton Hall University

The aim of this study is to examine the long term effects of artificial sweeteners used by diabetics. Individuals with Diabetes Mellitus have a problem with insulin that compromises their ability to utilize glucose normally. This experiment will be performed on a total of 100 participants from various ages and genders diagnosed with Type 1 or 2 diabetes. Each group will be consuming different types of artificial sweetener: sucralose, acesulfame potassium, aspartame, neotame, saccharin, throughout the course of two years in the place of ordinary sugar. Each month, participants will have blood drawn to examine any changes in blood glucose and complete blood count and will have physical examinations to examine any noticeable abnormalities in the participant's daily lifestyle. At the end of the experiment, we would expect our participants to exhibit changes in intestinal bacteria, metabolic imbalance, increase risk of health complications, and weight gain. *This project is proposed as part of our Senior Biology Seminar capstone course.*

31) COMBINED THERAPY FOR BILATERAL LOWER LIMB AMPUTEES

Jessica Adorno and Kristen Kosch

Department of Biological Sciences, Seton Hall University

In more recent studies for phantom limb pain, only unilateral amputees have been able to make strides towards pain relief. Mirror therapy has been found to reduce phantom limb pain in lower limb amputees and direct observational therapy has also been proven to effectively reduce the pain. The purpose of this study was to focus on bilateral lower limb amputees who were experiencing phantom limb pain. The experiment consisted of using a combination treatment technique of mirror therapy and direct visual observation therapy while wearing a prosthesis. The prosthesis served as a residual limb during mirror therapy. The combination therapy was found to significantly reduce the intensity of the phantom limb pain for bilateral amputees. *This project is proposed as part of our Senior Biology Seminar capstone course.*

32) THE PREVENTATIVE EFFECTS OF CRANBERRY PRODUCTS, PLANT STEROLS, AND GREEN TEA EXTRACTS ON EXPERIMENTAL COLITIS INDUCED BY DEXTRAN SULPHATE SODIUM IN MICE

Kenya Cabrera, Jacquelyn Holleran
Department of Biological Sciences, Seton Hall University

The preventative effects of cranberries and other plant-derived products regarding the prevention and symptom management of IBD (inflammatory bowel disease) have been noted extensively in recent years. Unfortunately, inflammatory bowel disease contemporarily effects more than 1.4 million Americans. Since patients who endure inflammatory bowel disease (mainly Crohn's disease and ulcerative colitis) have a significantly higher risk of developing colorectal cancer, the prevention and treatment of IBD are collectively crucial in the prevention of colorectal cancer along with numerous other aggressive diseases. Here within our study, we take a close look at whether diets consisting of phytosterol-enriched foods, green tea, and dried cranberry extract will help reduce the severity of experimental colitis (induced by dextran sulphate) in mice. The potential impact of this study cannot be overstated in the reduction of such crippling disorders. It was found that in mice fed phytosterol-enriched diets, green tea extracts, and dried cranberry extracts, the effects of colitis were clearly mitigated, suggesting a link between consumption of these substances and colitis treatment. *This project is proposed as part of our Senior Biology Seminar capstone course.*

33) HIV-1 GP140 COUPLED WITH HSP70 AS A VACCINE MODEL FOR HIV

Siddhi Patel and Christopher Parronchi
Department of Biological Sciences, Seton Hall University

Human Immunodeficiency Virus 1 (HIV-1) has been a topic of much discussion within the scientific community. The HIV-1 capsid contains many different surface marker proteins to aid in adhesion of the virus to human CD4+ cells - one of these surface markers is gp140. Heat shock protein 70 (Hsp70) among other things, is known to bind to chemokine receptor 5 (CCR5), a primary co-receptor for HIV-1 transmission and subsequently down regulate its expression. It has been found that when administering a vaccine using HIV-1 gp140 coupled with Hsp70, a strong immunological response can be observed. In this trial, tests were administered on a very structured schedule to ten males and ten females between the ages of 18 to 30. For each volunteer, microbiome analysis was performed to determine the effect of resident bacteria on the proliferation of HIV in the human body. The vaccine was introduced intra-rectally to the high risk volunteers. It was given at time points of 0 weeks, 4 weeks, and 12 weeks. Blood tests were conducted following each administration and cells were exposed to the active HIV virus. After incubation for 4 to 6 weeks, these cells were tested for the p24 antigen using ELISA techniques and exposed to confocal microscopy to test for the presence or absence of CCR5 on the cell surface. Following statistically significant results, an HIV vaccine could potentially hit the pharmaceutical market within the next few decades. *This project is proposed as part of our Senior Biology Seminar capstone course.*

34) OPEN WOUND FRACTURE HEALING VIA ELECTRICAL CONDUCTION THERAPY

Marc Wheaton and Christopher Vajtay
Department of Biological Sciences, Seton Hall University

Open wound healing using electricity is still under much study. Applying an Alternating Current (AC) across the wound promotes special factors within the epidermal cells of the skin to aid in the healing process. Over the course of 4 months patients were put into two groups and evaluated. The control was not given an electrical stimulus while the experimental group had the stimulus. Using the length, depth, and width of the wound it can be determined to amount of healing that is taking place. Voltages kept under 1 volt have been proven to help aid the healing process. Applying an electrical stimulus over the skin is seen to aid in the healing of the skin along with the bone. Further study is need to confirm the results. *This project is proposed as part of our Senior Biology Seminar capstone course.*

35) EFFECT OF CURCUMIN ON IN VITRO EARLY POST-IMPLANTATION STAGES OF MOUSE EMBRYO DEVELOPMENT AND THE EFFECT ON P53 LEVELS

Priteshi Patel and Hiral Patel

Department of Biological Sciences, Seton Hall University

In this study, the toxic effects of curcumin on the developmental stages of mice were examined. Curcumin is a common hydrophobic pigment and spice used for culinary, cosmetic as well as medical purposes (Huang et al., 2013). Through different experiments, curcumin has been established as an anti-inflammatory, anti-oxidative and anti-carcinogenic compound due to curcumin's ability to modulate enzyme activities as well as gene expression (Wu et al., 2007). In this study, different concentrations of curcumin will be injected into ICR mice at different embryonic stages in vitro. These stages include the blastocyst stage, implanted blastocyst stage, and early egg cylinder stage. The results are expected to show that as the concentration of curcumin injected increases, the amount of apoptosis will increase resulting in lower levels of blastocyst survival. Injection of higher doses of curcumin is expected to have a more profound effect on embryological development compared to lower doses suggesting that toxicity of curcumin is dose dependent (Huang et al., 2013). The levels of p53 will also be measured, which are expected to increase as the dosage of curcumin injection increases. *This project is proposed as part of our Senior Biology Seminar capstone course.*

TECHNOSTRESS

Anastasia Angelbeck & Susan Nolan

Department of Psychology, Seton Hall University

For the average individual, technology is considered an essential aspect of modern life. Multiple devices are used on a daily basis for a wide variety of activities including work, study, communication, and entertainment. However, it is important to consider whether this increasing use of technology is taking a toll on the health and well-being of students in particular. There is a possible link between excessive technology usage, and stress, sleeping disorders, and depression (Salanova, Llorens & Cifre, 2013). There are other issues such as repetitive stress injuries and information overload. The word for this phenomenon has been coined technostress (Brod, 1982). The proposed study seeks to address the following question: Does excessive technology use lead to increased levels of stress? It is predicted that excessive technology use will lead to increased levels of stress. Data will be recorded on 140 students over a period of 21 days. The students will be randomly assigned into one of the following conditions: 12, 8, 4, or 0 hours per day of technology use. The students will be asked to collect and record salivary cortisol levels five times on a daily basis. Students will be permitted to stay at home and otherwise go about their typical routine. Furthermore, Screen for Anxiety Related Emotional Disorders (SCARED), a questionnaire designed to measure and assess stress levels will be administered to each participant after the completion of the study (Wallenius et al., 2010). [*Senior Psychology Seminar course*]

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Biological Sciences Symposium Committee

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Dr. Daniel B. Nichols
Dr. Sylvia Rabacchi
Dr. Edward Tall