Poster Title: Characterization of an Interacting Protein of Dux4

Your Name: Brandford Kojo Adobaw

Home Institution: Georgia State University

Research Program: Heart, Lung, & Blood

Faculty Mentor: Dr. Michael Kyba

Grad student or post-doc mentor(s): Dr. Si Ho Choi

Department of Faculty Mentor: Lillehei Heart Institute

An abstract of your work limited to 150 words:

Facioscapulohumeral muscular dystrophy (FSHD) is caused by a deletion in the tandem repeats of the D4Z4 macrosatellite repeat on chromosome 4q35. D4Z4 is subject to repeat-induced silencing and copy number reduction leads to the overexpression of a gene encoded within D4Z4. This gene encodes the transcription factor DUX4, which is toxic to myoblasts. Although DUX4 mediated cell toxicity has been widely studied it is unclear how DUX4 can regulates its downstream target genes. Here, we identified DUX4 interacting proteins using immunoprecipitation and followed by mass spectrometry analysis. Furthermore, in order to determine the domain of DUX4 that interacts with its interacting partners, we have subcloned four different fragments of DUX4. We have been performing co-immunoprecipitation to determine which fragment of DUX4 mediates the interaction. This work will lead to a better understanding of activities of Dux4, the mechanism underlying its interactions with its target genes, and could help with drug design and therapeutics.

Poster Title: Engineering of a tagged TCR to aid in detection of dual TCR T-cells

Your Name: Carmen Aguirre

Home Institution: College of Saint Scholastica

Research Program: Heart Lung & Blood

Faculty Mentor: Dr. Bryce Binstadt

Grad student or post-doc mentor(s): Dr. Nathan Schuldt

Department of Faculty Mentor: Pediatrics

An abstract of your work limited to 150-200 words:

One of the tenets of clonal selection states: a lymphocyte must have only one receptor

specificity. However, it is now known that dual TCR expressing T cells actually make up about 10% of all T-cells. Currently, there are insufficient reagents to detect dual TCR cells making it difficult to study their role in immunity. Our goal is to create a dual TCR T cell reporter mouse by inserting different epitope tags into the constant regions of the TCR alpha chain alleles. We selected 5 different candidate locations for tag insertion based on protein structure and known essential amino acids. *In vitro* testing of each construct confirmed insertion into the middle of the c-loop provided the best detection of our tagged TCR without affecting TCR signaling. Currently we are working on optimizing the location of this tag as well as adding multiple myc tags to improve its detection. Eventually this detection method could aid in the study of the role of dual TCR T-cells in auto-immunity.

Poster Title: HBB, A Novel Biguanide, Induces Production of Reactive Oxygen Species in MCF-7 and MBA-MD-231 Breast Cancer Cell Lines

Your Name: Juan A Alvarez

Home Institution: University of Maryland- Baltimore County

Research Program: Heart, Lung, & Blood Pre-MSTP

Faculty Mentor: Dr**.** David Potter

Grad student or post-doc mentor(s): Zhijun Guo, PhD

Department of Faculty Mentor: H.O.T. Department of Medicine

An abstract of your work limited to 150 words: Biguanide drugs are of considerable interest for breast cancer therapeutics, but the well-known biguanide metformin lacks potency, potentially related to its poor induction of reactive oxygen species. Combinatorial chemistry has led to the synthesis and identification of more potent biguanides. The Potter lab hypothesizes that more potent biguanides are more efficient inducers of reactive oxygen species. We chose the more potent biguanide HBB and studied in detail its effects on proliferation, ROS induction, apoptosis/necrosis, and cell cycle progression in breast cancer cells. Using cell culture, flow cytometry, and other fluorescence methods, measurements of ROS production, cell growth/death, and dose dependence were obtained with treatments of various drugs. Our findings show that the levels of ROS produced by HBB are greater than the induction of ROS by metformin. At various doses HBB also induces ROS production in both MCF-7 and MBA-MD-231 cell lines sufficient to kill cancer cells.

Poster Title: Do Human APOBEC3A Polymorphisms Affect Enzymatic Activity?

Your Name: Sarah Andres

Home Institution: Bemidji State University

Research Program: Heart, Lung, and Blood

Faculty Mentor: Dr. Reuben Harris

Grad student or post-doc mentor(s): Dr. Allison Land

Department of Faculty Mentor: Biochemistry, Molecular Biology, and Biophysics

An abstract of your work limited to 150 words:

APOBEC3A (A3A) is a DNA cytosine deaminase involved in innate immunity, deaminating foreign DNA in the cytoplasm of cells and triggering DNA degradation. It is part of the APOBEC3 family which is composed of seven proteins that can deaminate DNA cytosines. A3A is the most potent enzyme in the APOBEC3 family. Twenty four single nucleotide polymorphisms (SNPs) in A3A have been identified, all of which are found at an allelic frequency of less than 5% in the human population. We hypothesize one or more of these polymorphisms will result in altered A3A activity. To test the A3A SNPs' functionality, we performed *in vitro* viability and oligo cleavage assays. We have found SNPs that could potentially alter A3A activity. A3A variants with decreased activity could lead to the accumulation of DNA in cells, which has been shown to trigger autoimmune diseases such as systemic lupus erythematosus and Aicardi-Goutiéres syndrome.

Poster Title: Role in Trichome Expression of the *M. truncatula* Gene Medtr1g075570

Your Name: Rafael F. Barbosa

Home Institution: University of Minnesota – Twin Cities

Research Program: Independent Research – HAPMAP

Faculty Mentor: Dr**.** Nevin D. Young

Grad student or post-doc mentor(s): Shaun J. Curtin

Department of Faculty Mentor: Plant Pathology

An abstract of your work limited to 150 words:

Trichomes are appendages expressed in a variety of plant species. They have been linked to multiple roles in plant defense. *M. truncatula* expresses two types of trichomes, glandular and non-glandular. The *M. truncatula* Genome-wide association study identified the MADS-box gene Medtr1g075570 as a strong candidate gene for trichome expression. A MADS-box gene has been shown in Petunia to cause over expression of trichomes as the UNSHAVEN phenotype. Gene sequences for the 244 accessions of *M. truncatula* with published trichome density data were analyzed to establish haplotype blocks showing statistically significant variation in trichome expression. A 3' Rapid Amplification of cDNA Ends (RACE) experiment was conducted to verify the full length of Medtr1g075570. Hairy root transformation (HRT) and whole plant transformation (WPT) protocols were followed, using hairpins for gene silencing and gene overexpression constructs, to create plant lines with genomic modifications which may

yield distinct trichome phenotypes.

Poster Title: Cocaine Hydrolase in Viral Vector to Inhibit Cocaine-Motivated Behaviors in Rats and Monkeys

Your Name: James S. Brown

Home Institution: Morehouse College

Research Program: Neuroscience

Faculty Mentor: Marilyn E. Carroll, Ph.D.

Grad student or post-doc mentor(s): Natalie Zlebnik

Department of Faculty Mentor: Psychiatry and Neuroscience

Abstract: Rats and macaques that had been trained to self-administer cocaine were treated with protein therapeutics to reduce long-term cocaine-motivated behavior. Human butyrylcholinesterase was modified to create a more catalytically efficient enzyme called cocaine hydrolase (CocH). CocH was encoded in a helper dependant adenoviral vector and injected intravenously. Following the virus's transduction in the liver, the animals began to produce chronic plasma levels of CocH, which increased cocaine metabolism in the subjects and sequestered cocaine before it reached the brain. The viral vector was also tested to determine whether it made rats sick or had rewarding properties by determining the hydrolase's effectiveness and specificity. The hydrolase was inhibited with the esterase inhibitor iso-OMPA and the cocaine concentration was replaced with methamphetamine to test specificity. We concluded that the helper dependent adenoviral vector of CocH decreased ongoing self-administration and did not make the subjects sick. Furthermore, rewarding effects are in the drug.

Poster Title: Transitioning from Hoc to Python as the Main Language for Building and Using Computational Models of Neurons and Networks of Neurons

Your Name: Wilka Carvalho

Home Institution: Stony Brook University

Research Program: Neuroscience

Faculty Mentor: Dr. Matthew Johnson

Grad student or post-doc mentor(s): Ben Teplitzky, Joe Xiao

Department of Faculty Mentor: Biomedical Engineering

An abstract of your work limited to 150 words:

The purpose of this project was to begin this lab's transition into utilizing Python for

more of its programs, and ultimately have Python supersede Hoc as the main language for building and using computational models of neurons and networks of neurons. A majority of the Hoc-specific functionality is now available within Python and this, combined with Python's active development within the scientific community, should allow for the production of more accessible and more robust programs. The initial steps of this transition consisted of writing a program in Python to replicate and expand on the functionality of a program written in Hoc that simulated data from a spontaneously active neuron. The new program was to create a histogram of the data – something Hoc is incapable of doing. Successfully accomplishing this strengthened the hypothesis that Python will allow for more powerful and more practical programs.

Poster Title: Modulation of Fibroblast Differentiation by Decellularized Lung Extracellular Matrix

Your Name: Katie Cicolello

Home Institution: Macalester College

Research Program: IR - AHSSRP

Faculty Mentor: Dr. Peter Bitterman

Grad student or post-doc mentor(s): Jeremy Herrera

Department of Faculty Mentor: Department of Medicine: Pulmonology

An abstract of your work limited to 150 words:

Idiopathic Pulmonary Fibrosis (IPF) is a disease characterized by the accumulation of fibroblasts in the lung that are hyperproliferative, apoptosis resistant, and deposit excess extracellular matrix (ECM), leading to suffocation and death. Prior publications suggest that control fibroblasts cultured on decellularized IPF-ECM display increased morphological characteristics of IPF fibroblasts. We hypothesize that IPF-ECM will skew the differentiation of control fibroblasts into fibroblasts harboring the signaling properties of IPF fibroblasts. We compared control fibroblasts cultured on IPF-ECM to those cultured on control-ECM to address our hypothesis. Using immunoblot analysis, we show that the Akt-signaling pathway, a pathway that is upregulated in IPF fibroblasts, is activated by IPF-ECM but not by control-ECM. Using histological techniques, we analyzed fibroblast proliferation (BrdU) and apoptosis (TUNEL). Further research is needed to determine the role of the ECM in IPF pathogenesis. This research will inform IPF therapy development targeting matrix receptors responsible for IPF phenotype acquisition.

Poster Title: Talin Binding Partner

Your name: Christian Coffman

Home Institution: Yale University

Research Program: Molecular Genetics & Proteomics

Faculty Mentor: Dr. Margaret Titus

Department of Faculty Mentor: Genetics, Cell Biology and Development

The "amoeboid" fashion of movement is observed in many types of cells including metastatic cancer cells and immune cells. Because this movement is observed in cancer cells, studies of this pathway are becoming a great interest. Using Dictyostelium discoidium as the model organism, it is possible to study this pathway because of its well characterized cytoskeleton and signal transduction pathway.

It is known that talin is crucial in coupling the cytoskeleton to the integrin receptors and by its nature it has many binding partners. Using an immunopulldown on talin, we recovered most of talins binding partners. We isolated two proteins at 55kDa and 5kDa and used mass spectrometry to decipher its amino makeup. Using an altered FERM domain, we determined locality of binding. Also, interested in the superstructure, we ran a native gel electrophoresis to determine the stoichiometric relationship between talin and its binding partners.

Poster Title: Development of Molecular Markers for Genetic Analysis of New Oilseed Crop

Your Name: Keo Corak

Home Institution: Macalester College

Research Program: Molecular Genetics and Proteomics

Faculty Mentor: Dr. David Marks

Grad student or post-doc mentor(s): Kevin Dorn

Department of Faculty Mentor: Plant Biology

An abstract of your work limited to 150 words:

Pennycress (Thlaspi arvense) is a winter annual plant species that has gained popularity as a winter cover crop and biofuel feedstock. Pennycress can be planted in the fall and grown over the winter, helping limit nutrient runoff and spring weed growth. In the spring, the oil-rich pennycress seed can be harvested in time for the planting a spring crop and used as a biodiesel feedstock. While current pennycress lines show promising agronomic properties, there has been little selective breeding or improvement of traits like seed dormancy, fast development, and oil content. The creation of a dense linkage map will aid in the development of a large-scale breeding program needed to achieve these goals. To this end, the putative location of ten single nucleotide polymorphisms (SNPs) in one pennycress line were identified in a draft genome assembly and tested using cleaved amplified polymorphic sequence (CAPS) marker. Future work will identify additional SNPs in multiple pennycress lines to aid in the breeding program.

Poster Title: Morphine Disrupts Leukocyte Extravasation by Modulating F-Actin

Polymerization

Your Name: Jacqueline Cuellar

Home Institution: University of Wisconsin - Madison

Research Program: LSSURP – Molecular Genetics and Proteomics

Faculty Mentor: Dr. Sabita Roy

Grad student or post-doc mentor(s): Dr. Lisa Koodie

Department of Faculty Mentor: Department of Surgery

An abstract of your work limited to 150 words:

Previous studies have found that morphine inhibits immune cell recruitment. This phenomenon can result in a decreased leukocyte extravasation, causing less infection clearance, slower wound healing, and inhibited tumor angiogenesis. In this study we examined the mechanism underlying inhibition of granulocyte transmigration by morphine treatment. Leukocytes undergo changes in cell shape and motility that involves polymerization of the cytoskeletal protein, F-Actin. We hypothesize that morphine alters F-Actin contractility and downstream signaling to reduce leukocyte recruitment. To test this hypothesis, we used a PCR array to identify signaling involved in cell motility. This was further validated using semi-quantitative real time PCR using granulocytes isolated from human peripheral blood which was treated with morphine and the bacterial endotoxin, LPS, in vitro. Our results show that morphine treatment inhibits LPS induced F-Actin activation, accounting for the reduced leukocyte recruitment following morphine treatment.

Poster Title: Broadening the reaction specificity of alpha/beta hydrolases towards C-C bond forming reactions

Your Name: Alex Eldredge

Home Institution: University of Minnesota

Research Program: Independent Research - BTI

Faculty Mentor: Dr. Romas Kazlauskas

Grad student or post-doc mentor(s): Titu Devamoni

Department of Faculty Mentor: Biochemistry, Molecular Biology, & Biophysics

An abstract of your work limited to 150 words:

Chemists often use enzymes to make pharmaceuticals, fine chemicals, polymers because enzyme-catalyzed reactions are greener, more selective and work under milder conditions than typical chemical reagents. Carbon-carbon bond forming reactions are important because they allow chemists to assemble complex molecules from smaller fragments.

Although enzymes do catalyze formation of carbon-carbon bonds, the range of these reactions is limited and our goal is to discover enzymes that catalyze new ones. Our approach is to look for accidental side reactions catalyzed by enzymes. In particular, we are surveying the catalytic promiscuity of hydroxynitrile lyases. These enzymes catalyze a carbon-carbon bond forming reaction; we hypothesize that they can also catalyze other unnatural carbon-carbon bond forming reactions. This summer, I measured the steady state kinetics for several hydroxynitrile lyases and their ancestral enzymes for two reactions - the natural reaction, cleavage of mandelonitrile and the non-natural nitroaldol cleavage of nitrophenyl ethanol.

Poster Title: 1-aminocyclopropane-1-carboxylate (ACC) Deaminase Enzymes in *Medicago*-Nodulating Rhizobia

Your Name: Yismeilin R. Feliz Mosquea

Home Institution: Interamerican University of Puerto Rico

Research Program: Independent Research HAPMAP

Faculty Mentor: Dr. Michael Sadowsky and Dr. Betsy Martinez-Vaz

Grad student or post-doc mentor(s): Dr. Betsy M. Martinez-Vaz

Department of Faculty Mentor: Soil, Water and Climate

An abstract of your work limited to 150 words:

Elevated levels of ethylene inhibit the association of rhizobia with legumes and prevent effective nitrogen fixation. Bacteria containing ACC deaminases have the ability to reduce ethylene levels and establish effective nitrogen-fixing symbioses. The goals of this study were to determine the functionality of the ACC deaminase homologs present in a laboratory collection of *Sinorhizobia* and investigate the distribution of *acdS* genes in rhizobia isolated from soil. Different ACC deaminase (ACCD) genes were cloned, transformed and over-expressed in *Escherichia coli*. All *acdS* genes analyzed encode functional ACC deaminases with different levels of enzyme activity. Root elongation assays showed limited plant-growth promoting activity in the ACC deaminases studied. PCR revealed that soil rhizobia did not contain ACC deaminase genes homologous to the ones found in laboratory strains of *Sinorhizobium*. These results suggest that *Medicago*-nodulating rhizobia encode functional ACC deaminases; the distribution of *acdS* is different amongst laboratory strains and soil bacteria.

Poster Title: The Possible Function of a Phospholipid Scramblase for the Formation of the Nuclear Exchange Junction during Conjugation in the Ciliate *Tetrahymena thermophila*

Your Name: Kathleen Folsom

Home Institution: Mount Holyoke College

Research Program: Molecular Genetics & Proteomics

Faculty Mentor: Daniel Romero, PhD

Grad student or post-doc mentor(s):

Department of Faculty Mentor: Pharmacology

An abstract of your work limited to 150 words:
Phospholipid scramblases are a family of proteins that, when activated, disturb the asymmetry of the phospholipid membrane bilayer, and are involved in several pathways, including the blood coagulation pathway. At the beginning of conjugation, the two cells' membranes fuse and remodeling occurs. The gene designated as A'13 is a scramblase protein which we hypothesize that when knocked out in *Tetrahymena*, will lead to the cells not being able to conjugate properly. To determine the function of the scramblase gene, we will be placing the flanking sequences of A'13 into the pH4Neo(+) plasmid, so the Neo cassette will knockout A'13. After transformation, we will determine whether loss of scramblase function prevents proper conjugation and mating between wild-type to knockout and knockout to knockout. Research in *Tetrahymena* can lead to discoveries in the function of proteins in other eukaryotes, such as in human patients who have Scott Syndrome, a rare bleeding disease.

Poster Title: Glucose regulation of Novel Protein Complexes that Facilitate Metabolic Reprogramming in leukemia cells.

Your Name: Ryan Graff

Home Institution: Wesleyan University

Research Program: Independent Research

Faculty Mentor: Dr. Ameeta Kelekar

Grad student or post-doc mentor(s): Eric Hanse and Xazmin Lowman

Department of Faculty Mentor: Lab Medicine and Pathology

An abstract of your work limited to 150 words:

Altered metabolism plays a major role in the ability of cancer cells to proliferate indefinitely. This alteration diverts glucose to be preferentially metabolized via anabolic pathways, increasing cell biosynthesis and antioxidant production (for proliferation and oxidative stress control, respectively). Here we explore the contribution of two novel protein complexes to altered glucose metabolism in human leukemia cells. These complexes share a core component comprising the glycolytic enzyme GAPDH and two Bcl-2 proteins known to regulate apoptosis in leukemias in response to glucose stress. We have combined gel filtration chromatography, immunoprecipitation and western blotting with 2-dimensional gel electrophoresis of cell extracts to investigate ways in which these complexes and their components respond to glucose deprivation. Early studies indicate that glucose stress alters both the levels and the make-up of each complex. This supports

the current hypothesis that the complexes are involved in the characteristic metabolic reprogramming of hematopoietic cancers.

Poster Title: DNA barcoding for pharmaceutical discovery in fungal endophytes

Your Name: Brenda Gutierrez

Home Institution: University of Maryland, Baltimore County

Research Program: Molecular Genetics & Proteomics program

Faculty Mentor: Dr. George D. Weiblen

Grad student or post-doc mentor(s): Erin L. Treiber and John B. Vincent

Department of Faculty Mentor: Plant Biology

An abstract of your work limited to 150 words:

A 50-hectare plot in Papua New Guinea (PNG) was established to investigate forest dynamics and to enable pharmaceutical discovery. In this area 500 species of trees have been identified so far. We inferred a phylogeny of 350 species using DNA barcoding (rbcLa) and a Bayesian algorithm. A fungal endophyte (E279) producing novel antibiotics with anti-tuberculosis activity was cultured from a leaf of *Psychotria leptothyrsa* located in the PNG plot. In order to facilitate the discovery of endophytes similar to E279, we used the phylogeny of PNG trees to test the hypothesis that closely related trees share certain characteristics favored by specific endophytes. However, E279 appears to be a generalist with similar endophytes found in many different species of plants from families across the angiosperm phylogeny. Although we found that plant phylogeny does not predict the endophyte distribution in this case, it could be useful in the case of host-specific endophytes.

Poster Title: Identification of an Inhibitory Interaction of Plant Metabolites with Selective Supplements Used in the Detection of *Listeria monocytogenes* in Vegetables

Your Name: Abbie Hohman

Home Institution: University of Minnesota - Twin Cities

Research Program: Independent Research – BTI

Faculty Mentor: Dr. Francisco Diez-Gonzalez

Grad student or post-doc mentor(s): Dr. Ryan Fink (Research Assistant Professor)

Department of Faculty Mentor: Food Science and Nutrition

An abstract of your work limited to 150 words:

The Food and Drug Administration (FDA) regulates the safety of foods in the U. S. and issues mandatory testing and detection of contaminants such as *Listeria monocytogenes*, a

serious food borne pathogen. The objective of this study was to identify inhibitory concentrations of plant metabolites in combination with the FDA selective supplements affecting the growth and viability of *L. monocytogenes*. Quercetin, myricetin, naringenin, thymoquinone, chlorogenic acid and ferulic acid were the plant metabolites studied. Acriflavine and nalidixic acid were the selective ingredients tested. *L. monocytogenes* was researched in a combinatorial experiment of plant metabolites against FDA selective supplements in a 96-well microtiter format. Antimicrobial activity was indicated by lack of growth. Thymoquinone was the only plant metabolite that exhibited synergistic antimicrobial activity with acriflavine at low concentrations. This finding may lead to re-formulation of the FDA's standard enrichment media for contaminants in addition to other applications to inhibit *Listeria* growth.

Poster Title: Evolution of *Geobacter sulfurreducens* Suppressor Strains for the Identification of Alternative Electron Transfer Pathways

Your Name: Devesh Kaushik

Home Institution: University of Minnesota, Twin Cities

Research Program: IR-BTI

Faculty Mentor: Dr. Daniel Bond

Grad student or post-doc mentor(s): Caleb Levar

Department of Faculty Mentor: Microbiology and BioTechnology Institute

An abstract of your work limited to 150 words:

The bacteria *Geobacter sulfurreducens* has many beneficial bioremediation, bioelectricity and carbon cycling capabilities due to its ability to reduce extracellular electron acceptors. However, the electron pathways this bacterium utilizes for these processes are not fully understood. By removal of a gene known to be deleterious to the growth of the bacteria under certain conditions, we hypothesize that the evolution of suppressor strains will allow for the identification of additional proteins involved in electron transfer to acceptors. Ultimately we aim to find parallel pathways of extracellular respiration. Evolving suppressor strains by using different media with acceptors of varying potential, such as Mn(IV)-oxide and Fe(III)-citrate, allow for growth assays and DNA isolation from evolved cells. Isolated DNA submitted for sequencing will identify mutations involved in the rescue of the wild-type phenotype. Preliminary results indicate complex regulation of multiple electron transfer pathways which dictate growth.

Poster Title: The Treatment of Ischemic Stroke Using Stem Cell Therapy

Your Name: Jiaochen Ke

Home Institution: Macalester College

Research Program: IR - AHSSRP

Faculty Mentor: Dr. Walter Low

Grad student or post-doc mentor(s): Dr. Feng Xiao

Department of Faculty Mentor: Department of Neurosurgery

An abstract of your work limited to 150 words:

As the third leading cause of death in the US, stroke is a debilitating illness that affects millions of Americans. Our lab is studying the use of human umbilical cord blood stem cells to ameliorate the area of injury. Research shows that while oxygen deprivation leads to some neuronal death, it is the activation of the inflammatory process in the brain that contributes to a greater area of injury post ischemia. My summer research focuses on small signaling molecules called cytokines that are secreted by many different types of cells. These cytokines can be roughly divided into ones that signal for inflammation and ones that suppress inflammation. By analyzing the concentrations of these cytokines in normal, stroke-induced, and stroke + stem cell treatment rats via RayBio Rat Cytokine Kit, we hope to find that cord blood stem cells are able to ameliorate the damage of stroke by allowing for the secretion of more anti-inflammatory cytokines, and down regulating the secretion of inflammatory cytokines.

Poster Title: The Effects of Inhibiting Myosin II and PTEN on Neurite Formation and Axon Extension by Chick Forebrain Neurons

Your Name: Alexandria Kristensen Cabrera

Home Institution: University of Notre Dame

Research Program: Neuroscience

Faculty Mentor: Dr. Paul Letourneau

Grad student or post-doc mentor(s): Jose San Miguel-Ruiz

Department of Faculty Mentor: Neuroscience

An abstract of your work limited to 150 words:

Normal behavior depends on the correct formation of neural circuits during neuronal development. Developing neurons sprout axons that reach out to other neurons to complete electrical connections. We investigated how to promote growth of immature axons and dendrites (neurites) by neurons from chick embryo forebrains. We conducted three groups of experiments. First, the drug Blebbistatin was used to inhibit Myosin II; which produces contractile forces in axons. Second, the pharmaceutical drug bpV was used to inhibit PTEN; a protein that regulates cell growth, including the synthesis of proteins needed for axon extension. The third experiment determined if combining the two drugs had an additive effect. The drugs were tested in a culture system containing dissociated chick embryonic forebrain neurons in a defined growth medium. Both

Blebbistatin and bpV increased the proportion of cells with neurites. Cells treated with Blebbistatin had longer axons, while cells treated with bpV had more neurites per neuron. When we combined Blebbistatin and bpV we saw the effects of individual treatments, more neurites and longer axons, and perhaps an additive effect on axon length. This project showed that the formation and growth of axons by chick neurons can be promoted using drugs that target a contractile protein Myosin II, and PTEN, which is a negative regulator of cell growth.

Poster Title: A Molded Cradle Approach for Optimizing the Perfusion of Human Hearts

Your Name: Elizabeth Lezama

Home Institution: Milwaukee School of Engineering

Research Program: Heart, Lung, and Blood Program

Faculty Mentor: Dr. Paul Iaizzo

Grad student or post-doc mentor(s): Brian Howard

Department of Faculty Mentor: Department of Surgery

An abstract of your work limited to 150 words:

Perfusion fixation with formalin is an important method used to preserve human hearts, stiffening the tissue and leaving the hearts in their end-diastolic state. Yet, commonly employed apparatus can leave the specimen somewhat distorted: due to incorrect anatomical positioning. To improve on this, a 3-dimentional form was constructed to support the hearts during this process which allows for it to sit in an attitudinally correct anatomical position. More specifically, this frame was carefully designed to reduce amount of contortion which affect the great cardiac vessels relative to the anatomy of a given specimen. The results of this design/anatomical experiment should not only improve the positions of the great vessels but, allow for better perfusion of these hearts during the fixation process. The continued redesigns of the mold will subsequently allow for better quantitative anatomical measurements that will be used for a host of research applications, including medical device design and comparative studies.

Poster Title: Iron overload inhibits cell proliferation in Ovarian Cancer

Your Name: Burton Masem

Home Institution: Macalester College

Research Program: IR - AHSSRP

Faculty Mentor: Dr. Sundaram Ramakrishnan

Grad student or post-doc mentor(s): Erica Schnettler, Geoff Moyer

Department of Faculty Mentor: Pharmacology

An abstract of your work limited to 150 words:

Iron is an essential element for a myriad of cellular processes. Cells must strike a balance between excess and shortage of free iron. Excess iron can be toxic to cells. In this study, we investigated the effects of iron overload on ovarian cancer cells by ferric ammonium citrate (FAC) treatment. FAC bypasses transferrin mediated uptake of iron. Using electric cell substrate impedance sensing, we examined the effect of FAC on ovarian cancer cells. FAC treatment reduced attachment and proliferation of cancer cells. These results were further confirmed by live cell imaging. Since hypoxia plays an important role in cancer metastasis, we investigated the effects of iron overload under hypoxic conditions. FAC treatment under hypoxia caused upregulation of the iron storage protein Ferritin (FTH1). Further studies are in progress evaluating effects of iron overload on the cell cycle. These studies suggest that selective iron overload in tumor cells could be exploited therapeutically.

Poster Title: Competition Among *Sinohrhizobium spp*. Nodulating *Medicago truncatula*

Your Name: Rebecca Maysonet Sánchez

Home Institution: University of Puerto Rico, Arecibo Campus

Research Program: Independent Research/HAPMAP

Faculty Mentor: Dr. Michael Sadowsky

Grad student or post-doc mentor(s): Dr. Chanlan Chun and Matthew Nelson

Department of Faculty Mentor: Soil, Water, & Climate

An abstract of your work limited to 150 words:

Agriculture is dependent upon biologically-fixed nitrogen form symbiotic association between rhizobia and plants. The sinorhizobia are amongst the most well studied members of nitrogen-fixing root nodule bacteria and contribute substantial amounts of fixed nitrogen to the biosphere. Our previous comparative genomics study of 48 *S. meliloti* and *S. medicae* strains with 27 diverse *Medicago truncatula* genotypes indicated that some Type IV secretion genes (T4SS) are symbiosis-related and involved in nitrogen fixation efficiency. In order to better understand the role of these T4SS genes in symbiosis and nodulation, we will conduct competition experiments with two *S. meliloti* stains, KH35b and KH35c which are genetically comparable, but differ in the genes for T4SS. Currently we have developed a fluorescent proteins-tagged plasmid to identify these two strains by flow cytometry. We will also investigate the stability of the tagged strains during the course of culturing, sowing and symbiosis.

Poster Title: Cytotoxic and Viral Combination Therapy for Non-Small Cell Lung Cancer

Your Name: Emily Mesev

Home Institution: Grinnell College

Research Program: Heart, Lung, & Blood

Faculty Mentor: Dr. Robert Kratzke

Grad student or post-doc mentor(s): Dr. Blake Jacobson

Department of Faculty Mentor: Medicine

An abstract of your work limited to 150 words:

Non-small cell lung cancer (NCSLC), the most common form of lung cancer, can be an aggressive and lethal disease for which there is a constant need for new therapeutic strategies. Chemotherapy is often used for its cytotoxic and antineoplastic properties. Oncolytic viral therapy – use of live, replicating viruses to target cancer cells – is relatively recent, although research points to the effectiveness of vesicular stomatitis virus (VSV) to treat NCSLC. In this case, VSV is combined with interferon (IFN) to protect healthy cells, due to the defective interferon pathway in cancer cells. This study looked at the combined use of chemotherapy with VSV-IFN, to determine whether the two agents had an additive effect *in vitro*. Results presented here indicate whether VSV-IFN with certain chemotherapy treatments are more effective than either agent alone.

Poster Title: In Vitro and Intracellular Investigation of hC8 and Mcl-1 Interaction in Leukemia Cells

Your Name: Maya Mills

Home Institution: SUNY Fredonia

Research Program: Molecular Genetics and Proteomics

Faculty Mentor: Dr. Ameeta Kelekar

Grad student or post-doc mentor(s):

Department of Faculty Mentor: Lab Medicine and Pathology

An abstract of your work limited to 150 words:

The anti-apoptotic protein Mcl-1 and its pro-apoptotic binding partner Noxa are pivotal factors in determining the fate of the cell. In the presence of glucose, Noxa is phosphorylated in turn suppressing its apoptotic function and leading to its entry into a multi-protein complex. Mcl-1 and hC8, a component of the proteasome, were both detected in this Noxa-containing complex. We hypothesize that Mcl-1 and hC8 interact directly and that glucose regulates this interaction. This putative interaction was investigated through in vitro binding experiments and intracellular immunoprecipitation studies. Furthermore, the effect of glucose deprivation on the intracellular association of these proteins was also determined. Understanding the interaction of hC8 and Mcl-1 will lead to further insight into the characterization of this novel complex and its contribution to metabolism in cancer cells.

Poster Title: Identifying Root Rot Pathogens of Alfalfa in Minnesota

Your Name: Ashley O'Neill

Home Institution: Vassar College

Research Program: Independent Research

Faculty Mentor: Dr. Deborah Samac

Grad student or post-doc mentor(s): None

Department of Faculty Mentor: Plant Pathology

An abstract of your work limited to 150 words:

We detected *Aphanomyces euteiches* and *Phytophthora medicaginis,* organisms causing root rot of alfalfa on Minnesota farms, and determined their concentration by growing varieties of alfalfa in five soils sampled from across the state. We grew plants for four weeks and scored seedlings based on plant and root health. Using this method, we also tested the efficacy of seed coating to protect against *A. euteiches* and *P. medicaginis*. We isolated pathogens from the roots of plants grown for one week to define the races of *A. euteiches* present in the soils. All Minnesota soils tested were infested with race one and/or two of *Aphanomyces*, however an unknown race was present in Waseca, Minnesota. As *A. euteiches* race 2 is widespread in Minnesotan soils, race 2 resistant varieties will need to be grown. Future studies will utilize our procedures to survey for the presence of *A. eutiches* and *P. medicaginis* in Minnesota.

Poster Title: DNA-protein cross-links Repair in Mammalian Cells

Your Name: Gabriela Ortiz Soto

Home institution: University of Puerto Rico at Cayey

Research Program: Heart, Lung, & Blood

Faculty mentor: Dr. Colin Campbell

Department of Faculty Mentor: Department of Pharmacology

Abstract:

Covalent bonds linking DNA and cellular proteins, referred to as DNA-protein cross-links (DPCs), form spontaneously and in response to certain DNA-damaging agents. It is believed that these lesions interrupt DNA replication, transcription and repair; however, mechanisms of DPC repair are poorly understood. It is hypothesized that the recombinational repair (RR) and nucleotide excision repair (NER) pathways remove these lesions. To test this hypothesis, a DPC substrate was created by cross-linking recombinant human O^6-alkylguanine DNA alkyltransferase protein to plasmid DNA using diepoxybutane. Gel shift and mass spectrometry experiments confirmed that AGT

formed covalent bonds with plasmid DNA. This substrate was introduced into wild-type and NER and RR repair deficient mammalian cells via electroporation. Repair of the DPC lesions were monitored using a sensitive, quantitative luciferase gene reporter system. This study will ultimately provide insight into the relative contributions of nucleotide excision and recombinational pathways to repair of drug-induced DPCs.

Poster Title: CD8+ T cell activation specific for insulin in NOD mice

Your Name: Liannette K. Padilla

Home Institution: University of Puerto Rico - Arecibo

Research Program: Heart, Blood and Lung

Faculty Mentor: Dr. Kristen Hogquist

Grad student or post-doc mentor(s): Gretta Stritesky

Department of Faculty Mentor: Lab Medicine and Pathology

An abstract of your work limited to 150 words:

Type 1 diabetes (T1D) is an autoimmune disease in which pancreatic beta cells are attacked by the immune system. We sought to determine when pancreatic antigen-specific CD8+ T lymphocytes become first activated. We dedicated our study to CD8 because they are directly cytotoxic to pancreatic beta cells. In order to detect if and when the cells become activated, we used NOD mice that express a novel Nurr77GFP transgene, in which the activated TCR express green fluorescent protein (GFP). We used flow cytometry and tetramer enrichment to identify the rare CD8+ T cells that are specific for either insulin (INS) or islet-specific glucose 6 phosphatase subunit related protein (IGRP). Prelimilary results suggest that self-specific CD8 T cells were activated in the pancreas, but not in the spleen of young adult mice. Still, further work will be needed to verify the specificity of the CD8+ T cells.

Poster Title: "Comparative Study of Salivary-Derived Protease Activity for the Early Diagnosis of Oral Squamous Cell Carcinoma"

Your Name: Alberto Palacios-Carbajal

Home Institution: University of California, San Diego

Research Program: Molecular Genetics & Proteomics

Faculty Mentor: Timothy J. Griffin Ph.D.

Grad student or post-doc mentor(s): Ebbing de Jong Ph.D

Department of Faculty Mentor: Department of Biochemistry, Molecular Biology and Biophysics (BMBB)

An abstract of your work limited to 150 words:

Oral Squamous Cell Carcinoma (OSCC) is the sixth most common cancer and it has a five-year survival rate of 50%; while it can be 90% by early diagnosis. Studies suggest saliva to be a viable source for disease screening because of its composition that originates from salivary glands, serum and exfoliated cells. Comparative studies of oral tissue in healthy and OSCC patients have shown high levels of proteases that have been implicated in metastatic spread. Our hypothesis was that OSCC may be detected at early stages by differences in salivary protease activity. To test our assumption, saliva was collected and presented with a nonspecific substrate, azocasein, to yield a colorimetric assay. Maximum salivary protease activity of healthy saliva was found within lysed cells and at pH 8. Future experiment should consider protease identification and protease-substrate interaction. Early detection of OCSS via salivary protease assay may have profound implications.

Poster Title: The Hunt for the Agmatine Receptor on Macrophages

Your Name: Jacelyn Peabody

Home Institution: Carthage College

Research Program: Heart, Lung, and Blood Pre-MSTP

Faculty Mentor: Bryan Williams, MD, PhD

Grad student or post-doc mentor(s): Nick Paulson, Adam Gilbertsen, John Berger, Jennifer McCurtain

Department of Faculty Mentor: Department of Medicine (Pulmonary, Allergy, Critical Care)

An abstract of your work limited to 150 words:

Agmatine, a derivative of L-arginine, is known to act as a neurotransmitter, is associated with lung exacerbations in cystic fibrosis patients, and can augment biofilm formation in *Pseudomonas aeruginosa*. Most CF patients succumb to chronic airway infections from this opportunistic pathogen. Our lab is interested in the host-pathogen dynamic in the CF lung and has found that agmatine plays a pivotal role in this process. Known agmatine-binding receptors are being searched for on primary murine macrophages, a cell we have shown responds to agmatine. Candidates are 5HT-2C-serotonin receptors and α2-adrenoreceptors, whose existence has been partially shown through adrenoreceptor blockade in the presence of agmatine. Western-blots were used to identify the presence of α2-adrenoreceptors and 5HT-2C-serotonin receptors and to quantify the level of expression following stimulus of macrophages with lipopolysaccharide or agmatine at different levels. Understanding the immunomodulatory effects of agmatine allows for future studies of host-pathogen interactions in CF patients.

Poster Title: Validating the Function of Endoglin Over Expression During EB

Differentiation

Your Name: Isomary Poventud-Fuentes

Home Institution: University of Puerto Rico- Mayaguez Campus

Research Program: Heart, Lung & Blood

Faculty Mentor: Dr. Rita Perlingeiro

Grad student or post-doc mentor(s): June Baik

Department of Faculty Mentor: Department of Medicine

An abstract of your work limited to 150 words:

Endoglin (Eng), an ancillary receptor for various members of the TGF-β superfamily, has been shown by our group to play an important role in early hematopoiesis, potentially through BMP-4 signaling. Since to date, there is no report linking BMP-4 and Eng, we have generated a doxycycline-inducible Eng FLAG tagged ES cell line (iEng/FLAG), which will allow us to perform biochemical studies to prove our hypothesis. However, before proceeding with these studies, we need to confirm that this newly tagged iEng ES cell line behaves properly, like the untagged counterpart, which shows increased hematopoiesis upon Eng induction. Our preliminary results suggest this is the case as Eng induction results in increased numbers of hematopoietic colonies and increased phosphorylation of SMAD1/5/8, which is a downstream effector of BMP signaling. Thus this newly generated iEng/FLAG ES cell line can be used to test whether a direct interaction exists between Eng and BMP-4.

Poster Title: CSPG4 Expression in GBM Cell Lines and Its Effects on Migration

Your Name: Alannah Pratt

Home Institution: University of Northwestern – St. Paul

Research Program: Heart, Lung, &Blood

Faculty Mentor: Dr. James McCarthy

Grad student or post-doc mentor(s): Matt Price

Department of Faculty Mentor: Department of Laboratory Medicine and Pathology

An abstract of your work limited to 150 words: Chondroitin sulfate proteoglycan 4 (CSPG4) is a transmembrane proteoglycan expressed in many aggressive cancers and is correlated to metastasis. It is thought that CSPG4 plays a role in the migration of glioblastoma multiforme (GBM) cells, the most common type of primary brain tumor. This project is focused on characterizing CSPG4 expression and its effect on cell migration in GBM. Cell lines analyzed were U251, P9, BT114, BT129, BT132, and U87. Flow cytometry and Western blotting revealed that U251, P9, and BT132 cell lines were negative for CSPG4 expression while BT114, BT129 and U87 were positive. BT114 cells

were subsequently infected with lentiviral particles expressing one of two shRNAs– one to silence expression of CSPG4 or non-targeting shRNA. Migration assays were then conducted on laminin substrata to observe any differences in migration, however there was no significant difference in migration between these treated cells ($p>0.05$). This data was supported by a Western blot that showed off-target effects of the non-targeting shRNA.

Poster Title: Haptoglobin as Treatment for Sickle-Cell Anemia

Your Name: Dinesh Rathakrishnan

Home Institution: Macalester College

Research Program: IR - AHSSRP

Faculty Mentor: Dr. Gregory Vercellotti, John Belcher

Grad student or post-doc mentor(s): Carol Bruzzone

Department of Faculty Mentor: Hematology, Oncology and Transplantation

An abstract of your work limited to 150 words:

Sickle-cell anemia (SCA) is a genetic disorder that occurs due to a mutation on the hemoglobin gene that causes sickled red blood cells to be produced in the body. SCA is characterized by chronic hemolysis and the breakdown of red blood cells, which releases free hemoglobin into the vascular system and causes pain and inflammation. Haptoglobin, a plasma protein made in the liver, binds to free hemoglobin and this complex is removed from the blood. This project will examine haptoglobin gene therapy to treat hemolysis in mouse SCA models. Stroma free mouse hemoglobin was purified from whole mouse blood and a haptoglobin-hemoglobin binding assay was performed. Data generated demonstrated that mouse and human hemoglobin bound to human haptoglobin with similar high affinities, suggesting that future in vivo research on hemolysis can be undertaken in mouse models. The human haptoglobin gene is also being inserted into a p-Select plasmid for in vitro studies and a Sleeping Beauty plasmid for in vivo studies for better expression of the haptoglobin gene in these respective future experiments. With this, we can test if upregulating or overexpressing the human haptoglobin gene in sickle mice can reduce the negative consequences of hemolysis.

Poster Title: Identification of Natural Antibiotics that Suppress Potato Scab Disease

Your Name: Leanne Renner

Home Institution: University of Minnesota - Twin Cities

Research Program: Independent Research - BTI

Faculty Mentor: Dr. Christine Salomon

Grad student or post-doc mentor(s):

Department of Faculty Mentor: Center for Drug Design

An abstract of your work limited to 150 words:

Bacteria of the genus Streptomyces are ubiquitous and generally benign soil inhabitants. However, *S. scabies* is a pathogen responsible for causing the agricultural disease "potato scab," which leads to unsightly lesions on tubers and renders affected crops economically useless. As part of a project to identify biological control agents to protect crops, the primary objective is to identify the chemical structure of an antibiotic produced by an antagonistic *Streptomyces* isolate. The scab-suppressive strain was cultured on solid media, extracted, and isolated by bioassay-guided fractionation in which compounds were separated through chromatographic steps and tested for inhibition of S. scabies. We have enriched several fractions with potent anti-scab activity and determined that the antibiotic is of moderate polarity and produced in low yield under our growth conditions. We plan to purify the active compound and elucidate its chemical structure, thereby providing further insights into controlling agricultural pathogens with natural antagonists.

Poster Title: Functional Comparison of the DELLA, SPY, & SEC Proteins Between *Arabidopsis thaliana* & *Solanum lycopersicum* (tomato)

Your Name: Bryan Rios-Droz

Home Institution: University of Puerto Rico - Humacao

Research Program: Molecular Genetics & Proteomics

Faculty Mentor: Dr. Neil E. Olszewski

Grad student or post-doc mentor(s): Vai Lor

Department of Faculty Mentor: Plant Biology

An abstract of your work limited to 150 words:

Gibberellins (GAs) are important phytohormones for regulating plant growth and development. Studies have demonstrated that the DELLA proteins have a central role repressing GA signaling but evidence suggests the existence of a DELLA-independent pathway in *Solanum lycopersicum* (tomato). SPINDLY (SPY) is another negative regulator of GA signaling. It is an *O*-linked *N*-acetylglucosamine (O-GlcNAc) transferase (OGT), hypothesized to modulate DELLA protein activity via O-GlcNAc modification. SECRET AGENT (SEC) is another arabidopsis OGT but less is known about SEC function. Tomato has a DELLA (PROCERA, PRO), SPY-like, and two SEC-like genes. However, it is unclear if these genes are functionally homologous to arabidopsis. In this project, tomato PRO, SPY, and SEC will be cloned and rescue assays of arabidopsis *della, spy, and sec* mutants will be conducted to test the hypothesis that tomato PRO, SPY, and SEC are functionally homologous to arabidopsis DELLA, SPY, and SEC.

Poster Title: Improving an Artificial RNA Ligase by Fusing RNA-binding Domains

Your Name: Karolyna Rosado-Gómez

Home Institution: UPR-Rio Piedras

Research Program: Independent Research **-** BTI

Faculty Mentor: Dr. Burckhard Seelig

Grad student or post-doc mentor(s): Dana Morrone

Department of Faculty Mentor: BMBB

An abstract of your work limited to 150 words:

An artificial RNA ligase (10C) was recently generated *de novo* by *in vitro* evolution from a non-catalytic protein scaffold. 10C performs a 5'-PPP to 3'OH ligation in the presence of a complimentary splint spanning the ligation site. As prokaryotic mRNA transcripts contain a 5'-triphosphate, our ligase could be uniquely used for bacterial mRNA isolation. However, 10C exhibits low catalytic activity. In an attempt to improve its activity we designed fusion proteins of ligase 10C and different double-stranded RNA Binding Domains (dsRBDs) from previously characterized proteins containing varying numbers of dsRBDs (1-3 dsRBDs). We cloned three fusion protein constructs using PCR, restriction digests and ligation. Two fusion constructs have been solubly expressed in *E. coli* and we are currently working on expression and purification. Future work includes *in vitro* activity assays of each construct.

Poster Title: Preparation of wax ester synthase gene and insertion into *Rhodococcus*: *Escherichia coli* shuttle vector

Your Name: Richard W. Rossing

Home Institution: University of St. Thomas

Research Program: Molecular Genetics and Proteomics

Faculty Mentor: Dr. Claudia Schmidt-Dannert

Grad student or post-doc mentor(s): James Ellinger

Department of Faculty Mentor: BMBB

An abstract of your work limited to 150 words:

This summer we worked on preparing a wax ester synthase (WS) gene for insertion into our model organism *Rhodococcus opacus*. This was done to facilitate the production of fatty acid alcohol esters (FAEEs), or biodiesel, within R. opacus, which functions as a constituent of a larger three-microbe consortium, each with specific roles in the biodiesel

production process. The engineered DNA for the WS gene was amplified by PCR, cut with selected restriction digest enzymes, and ligated into a plasmid for later insertion into R. opacus by electroporation. This is an important step towards functionalizing the proposed three-microbe consortium and thus a step towards a more sustainable process for the production of biodiesel.

Poster Title: Tunneling Nanotube Formation Promotes Intercellular Communication between HUVEC and MCF-7 Cells

Your Name: Jaclyn L. Rybin

Home Institution: University of Arizona

Research Program: Heart, Lung, & Blood

Faculty Mentor: Dr. Clifford Steer and Dr. Emil Lou

Grad student or post-doc mentor(s): Dr. Venugopal Thayanithy

Department of Faculty Mentor: Medicine

An abstract of your work limited to 150 words:

Tunneling nanotubes (TNTs) are a recently discovered mechanism of intercellular communication between cancer cells. These cytoplasmic extensions serve as direct channels between cancer cells. The purpose of this study was to investigate whether TNTs form between Human Umbilical Vein Endothelial Cells (HUVEC) and breast cancer cell line (MCF-7), and transfer lipophilic contents between connected cells. Two different lipophilic staining solutions (DiO green and DiI red) and time lapse microscopy were used to identify the transfer of lipophilic contents via TNTs between HUVEC and MCF-7 cells cultured separately. Co-cultured MCF-7 and HUVEC cells were imaged using this method. TNTs form and transfer intracellular materials between these homogenous and heterogeneous cell types. The next step will be to investigate the transfer of Vascular Endothelial Growth Factor (VEGF) via TNTs and possible stimulation of tumor angiogenesis.

Poster Title: The Role of Morphine in Mast Cell Activation in Tumors

Your Name: Rocío del M. Saavedra

Home Institution: University of Puerto Rico - Mayagüez

Research Program: Heart, Lung and Blood

Faculty Mentor: Dr. Kalpna Gupta

Grad student or post-doc mentor(s):

Department of Faculty Mentor: Department of Medicine

An abstract of your work limited to 150 words:

Opioids are the mainstay for treating pain in numerous diseases. When treating chronic pain in cancer, morphine inhibits apoptosis, promotes angiogenesis, tumor progression, and cell proliferation. In transgenic mice with sickle cell anemia, morphine enhances mast cell activation thus contributing to inflammation and pain. We hypothesize that morphine activates mast cells in the tumor, which release cytokines and neuropeptides that lead to cancer progression and pain. We examined release of substance P from mast cells in tumors of transgenic mice bearing breast cancer following treatment with morphine. We analyzed tumor sections for the co-localization of blood vessels (CD31), mast cells (c-Kit/FceR1), and substance P using immunofluorescence microscopy. In preliminary results, we found that morphine stimulates increased mast cell degranulation and neuropeptide release in the tumors as compared to vehicle treatment. Therefore, morphine used to attenuate pain via the central nervous system may simultaneously induce inflammation and hyperalgesia in breast cancer.

Poster Title: Prey Capture Potentiation in Zebrafish Larvae

Your Name: Ismael Santiago-Santiago

Home Institution: University of Puerto Rico - Ponce

Research Program: Independent Research

Faculty Mentor: Dr. Mark A. Masino

Grad student or post-doc mentor(s): Aaron M. Lambert

Department of Faculty Mentor: Neuroscience

An abstract of your work limited to 150 words:

At 4 days postfertilization (dpf) zebrafish larvae use vision to hunt paramecia. We have shown that larvae allowed to hunt for motile paramecia from 4 to 6 dpf exhibit increased prey consumption rate at 7dpf, an effect we refer to as prey capture potentiation. However, paramecia pre-fed animals also display increased spontaneous swimming activity. We hypothesized that potentiation may be due to visuomotor learning and/or increased energy expenditure. Thus, we used high-throughput video tracking to compare swimming activity, prey capture performance, and hunting kinematics of 7dpf larvae between powder food pre-fed, unfed and paramecia pre-fed animals. Powder food pre-fed larvae had greater spontaneous total distance traveled than unfed larvae but no improvement in prey capture. Hunting kinematics revealed that paramecia pre-fed larvae had better visual detection and capture rate of paramecia than unfed larvae. These results suggest that prey capture potentiation from pre-feeding requires motile paramecia and involves visuomotor learning.

Poster Title: Generation of Recombinant Cytomegalovirus Expressing eGFP Reporter Gene for *In Vivo* Pathogenesis Studies

Your Name: Megan Schmit

Home Institution: University at Buffalo

Research Program: Heart, Lung, & Blood

Faculty Mentor: Dr. Mark Schleiss

Grad student or post-doc mentor(s): Jason Zabeli

Department of Faculty Mentor: Pediatric Infectious Disease

An abstract of your work limited to 150 words:

More than 30,000 children are born each year with congenital cytomegalovirus (CMV) infection. Over 5,000 of those children each year will suffer from long-term effects of CMV, including mental retardation and deafness[1]. Since human CMV will not infect animals, models of infection must use species-specific CMVs. Guinea pigs represent a compelling model because guinea pig CMV (GPCMV) can cross the placenta and cause fetal infection[2]. Unfortunately only one strain of GPCMV has historically been available for use, limiting research on strain variation and re-infection, which has been suggested to account for a significant percent of symptomatic congenital CMV in humans[3]. Recently a second GPCMV strain, the CIDMTR strain, has been isolated. To enable studies where infection can be visualized *in vivo*, particularly in reinfection studies, fluorescent proteins are being inserted into the genomes of different GPCMV strains using recombinant approaches.

Poster Title: Investigating the Biomechanical Properties in Normal and Ablated Swine Pulmonary Venous Tissue

Your Name: Ashley Scott

Home Institution: University of Maryland Baltimore County

Research Program: Heart, Lung, & Blood - MGP

Faculty Mentor: Dr. Paul Iaizzo

Grad student or post-doc mentor(s): Stephen Quallich

Department of Faculty Mentor: Department of Surgery

An abstract of your work limited to 150 words:

Atrial fibrillation, a condition characterized by a fast irregular heartbeat, affecting 5.1 million Americans, is often treated with ablative therapies. These ablation procedures ultimately block abnormal signals from altering the heart's normal rhythm: a common site for such abnormal activity is within the pulmonary vein. Yet, pulmonary vein stenosis, the narrowing of the pulmonary vein, can be a life-threatening complication of such procedures. The primary goal of this research project was to use biaxial stress testing, to investigate the biomechanical properties of normal, cryoablated and

radiofrequency ablated swine pulmonary vein tissue. More specifically, we were interested in determining what types of changes are occurring during and acutely after ablation that may result in pulmonary vein stenosis. Controls and ablated vein samples were strained 20% on a biaxial testing machine, and the resultant forces were recorded. It is predicted that the force changes during and following ablation will vary between the modalities, suggesting a link between biomechanics and stenosis.

Poster Title: Construction of Tn-Seq Libraries in Sinorhizobium Strains

Your Name: Roxanna Seda-Vélez

Home Institution: University of Puerto Rico – Mayagüez Campus

Research Program: IR - HAPMAP

Faculty Mentor: Dr. Michael Sadowsky & Dr. Betsy Martínez-Vaz

Grad student or post-doc mentor(s): Ping Wang

Department of Faculty Mentor: Biotechnology Institute

An abstract of your work limited to 150 words:

Studying and describing *Sinorhizobium* bacteria and the interactions that enhance or worsen its symbiotic relationship with legumes is key for efficiency in the agriculture industry. To gain a better understanding of the link between genotypes and phenotypes in diverse *Sinorhizobium* strains, the novel method Tn-seq was used to create a library of strains submitted to random mutagenesis by utilizing a Mariner transposon. 6 from a total of 51 strains initially tested for Kanamycin resistance, which the transposon encodes, were conjugated with *E. coli* WM3064. These were grown, harvested and tested with PCR to confirm transposon presence. *S. medicae* A321 was selected for determining its fitness on a specific environment, different pH media, and to prepare it for Illumina sequencing.

Poster Title: Improving Systemic Mesechymal Stromal Cell Therapy by CD26 inhibition

Your Name: Christopher Simwinga

Home Institution: Pittsburg State University

Research Program: Heart, Lung, & Blood Pre-MSTP

Faculty Mentor: Dr. Jakub Tolar

Grad student or post-doc mentor(s): Timothy Livett

Department of Faculty Mentor: Pediatric Blood and Marrow Transplant

An abstract of your work limited to 150 words

This study aims to improve the homing of mesechymal stromal cells (MSCs) to the skin

after intravenous infusion through inhibition of dipeptidylpeptidase IV (CD26) by the modification of the cytokine CXCL12. MSCs are reparative cells that aid healing. In patients with recessive dystrophic epidermolysis bullosa (RDEB), MSC numbers are greatly reduced due to the large skin destruction associated with RDEB and inactivation of CXCL12 by CD26. CXCL12 plays a major role in MSC migration to skin wounds. Sulfhydryl groups were introduced to primary amines of CXCL12 through derivatization reactions with *N*-succinimidyl S-acetylthiopropionate at various conditions. Multiple reactions were carried out to determine the reaction rates between CD26 from bone marrow extract and CXCL12, and the derivitized CXCL12. Migration assays were utilized to determine the affinity of the derivitized CXCL12 to MSC receptor, CCR4. Derivitized CXCL12 was found to be less hydrolyzed by CD26 than CXCL 12 and to have an efficient affinity to CCR4.

Poster Title: Role of VGF in Pain Signaling After Nerve Injury

Your Name: Hannah Springer

Home Institution: St. Olaf College

Research Program: Neuroscience

Faculty Mentor: Dr. Lucy Vulchanova-Hart

Grad student or post-doc mentor(s): Jaclyn Dykstra

Department of Faculty Mentor: Neuroscience

An abstract of your work limited to 150 words:

Peripheral tissue damage and nerve injury create changes in protein expression in sensory neurons, including the expression of the neurosecretory protein VGF (non-acronymic), and may contribute to such abnormal nociceptive processes as neuropathic pain. In order to understand the role of VGF in the pain pathway, we examined: (1) its expression in dorsal root ganglion (DRG) neurons, and (2) the effects of VGF-derived peptides on microglia. In DRG neurons, we found upregulation of VGF after nerve injury, although it was also slightly upregulated due to inflammation alone when comparing DRG from rats that received SNL surgery and sham surgery. In microglia, we found evidence for both inhibitory and stimulatory effects of VGF peptides. In summary, our results demonstrate that VGF is upregulated in sensory neurons after nerve injury and inflammation. Furthermore, the VGF peptides released from these sensory neurons may participate in activation of spinal microglia after nerve injury.

Poster Title: Molecular and genetic characterization of shb1-D suppressors in light signaling and seed development

Your Name: Milton Torres Cabán

Home Institution: University of Puerto Rico in Aguadilla

Research Program: Molecular Genetics and Proteomics

Faculty Mentor: Dr. Min Ni

Grad student or post-doc mentor(s): Yuguo Xiao, Chen Chen, Xiaojun Kang

Department of Faculty Mentor: Department of Plant Biology

An abstract of your work limited to 150 words:

The molecular mechanisms that regulate early plant seedling photomorphogenesis are largely unknown. A *short hypocotyl under blue 1 Dominant* (*shb1-D*) gain-of-function mutant was isolated from *Arabidopsis Thaliana* based on its defective long hypocotyl phenotype under red, far-red, and blue light. Surprisingly, *shb1-D* also shows a large seed phenotype. SHB1 is a nuclear protein and a member of the SYG1 protein family in fungi, worms, flies, and mammals. To study SHB1 function, we mutagenized shb1-D plants with EMS and isolated a series of suppressor mutants with a short hypocotyl phenotype. We aim to identify the SNPs in two suppressor genes by rough genetic mapping and high-throughput sequencing. A portion of the suppressors also show a small seed phenotype. We thoroughly characterized the suppressors with an altered seed developmental phenotype. Future efforts will identify the mutated genes that may play significant roles in the signal cascades that regulate photomorphogenesis and seed development.

Poster Title: Investigating The Synergistic Effects And Suppression Of Inflammatory Agents Within Neutrophil Cells

Your Name: Alexis Vance

Home Institution: Xavier University of Louisiana

Research Program: MGP-HLB

Faculty Mentor: Dr. Patrick Arndt

Grad student or post-doc mentor(s): Dr. Weiyu Zhang (RA)

Department of Faculty Mentor: Department of Medicine- Division of Pulmonary, Allergy, Critical Care, and Sleep Medicine

An abstract of your work limited to 150 words:

Neutrophils are critical to the innate immune response through their release of pro-inflammatory cytokines, proteases, and reactive oxygen species. One such response is to bacterial infections, where neutrophils are required for the induction of inflammation and bacterial clearance. In bacterial pneumonia due to Pseudomonas auroginosa, lipopolysaccharides (pLPS) and flagellin (Fl) are the two major components of the bacteria cell wall that activates neutrophils. We hypothesized that these two stimulants, synergistically, increase cytokine expression through a p38 map kinase dependent pathway. Exposure of neutrophils to stimulants resulted in a synergistic increase in

cytokines by ELISA and PCR. However, there was no significant difference in p38 activation. Alternatively, preliminary data suggests that this synergistic response is mediated through an ERK dependent pathway, which may alter apoptosis induction. Further investigation of this novel synergistic effect, ERK pathways, and the mechanisms controlling this response in neutrophils will help scientists develop more advanced, effective anti-inflammatory treatments for bacterial infections.

Poster Title: The protective effect of N-Acetylcysteine and Pioglitazone on protein carbonylation induced by TNF-a in 3T3-L1 adipocytes

Your Name: Gabriella Vázquez-Rosario

Home Institution: University of Puerto Rico, Rio Piedras Campus

Research Program: Heart, Blood and Lung - MGP

Faculty Mentor: Dr. David Bernlohr

Grad student or post-doc mentor(s): Rocio Foncea

Department of Faculty Mentor: Biochemistry, Molecular Biology and Biophysics.

An abstract of your work limited to 150 words:

Oxidative stress, characterized by overproduction of reactive oxygen species (ROS), is correlated with obesity and the onset of type 2 diabetes. ROS are linked to the production of reactive lipid aldehydes, trans-4-hydroxy-2-nonenal and trans-4-oxo-2-nonenal, that non-enzymatically modify the side chains of histidine, cysteine and lysine residues in a process termed protein carbonylation. Carbonylation is associated with loss of protein function and is significantly linked with obesity and insulin resistance. We investigated the effects of N-acetylcysteine (NAC), an antioxidants, and Pioglitazone, an anti-diabetic drug, on protein carbonylation induced by TNF-a (1nM) in 3T3-L1 adipocytes. We evaluated the profile of carbonylated proteins in 3T3-L1 adipocytes using an anti 4-hydroxy-trans-2,3-nonenal (4-HNE) antibody that can detect both 4-HNE and the corresponding 4-oxo derivative (4-ONE) when the samples are reduced. We show that TNF-a treatment increased protein carbonylation in 3T3-L1 and this effect is prevented by pretreatment with NAC or Pioglitazone.

Poster Title: Defining the MGluR5 Receptor's Role in Aggression-Induced Neuroplasticity

Your Name: Kiara S. Vega Bellido

Home Institution: University of Puerto Rico at Mayaguez

Research Program: Neuroscience

Faculty Mentor: Dr. Robert Meisel

Grad student or post-doc mentor(s): Dr. Laura Been

Department of Faculty Mentor: Neuroscience

An abstract of your work limited to 150 words:

Aggression, along with eating, sleeping and having sex, is classified as a type of motivated behavior. As with most components of motivated behavior, there are an abundant number of cases where the motivation or drive to engage in aggressive conduct evolves to an extreme, thus becoming pathological in an individual. Recent studies performed on Syrian female hamsters have linked aggressive experience to increases in dendritic spines on medium spiny neurons found in the nucleus accumbens. This effect is mediated by an extensive collection of neurobiological mechanisms that have yet to be accurately defined. The goal of our research is to establish the role of the glutamate receptor mGluR5 in the signaling pathways involved in aggression-induced neuroplasticity and determine whether it should be considered a potential therapeutic target. Understanding the neurobiological mechanisms that underlie this type of behavior would contribute to the development of more effective treatments and target-specific therapy.

Poster Title: Analyzing the Synthetic Ecology between *Shewanella oneidensis* and *Geobacter sulfurreducens*

Your Name: Ashley Wallin

Home Institution: Arizona State University, Lake Havasu

Research Program: Molecular Genetics & Proteomics

Faculty Mentor: Dr. Jeffrey A. Gralnick

Grad student or post-doc mentor(s): Nick Kotloski

Department of Faculty Mentor: Microbiology and BioTechnology Institute

An abstract of your work limited to 150 words:

Engineering synthetic relationships between two complex biological systems can have many uses in energy production. *Shewanella oneidensis* is a Gram negative, facultative anaerobe capable of utilizing a wide array of terminal electron acceptors under anaerobic conditions. *S. oneidensis* was engineered to metabolize glycerol—a non-native carbon source—by inserting a plasmid that carries the genes *glpF*, *glpK*, *glpD*, and *tpiA*. The metabolism of glycerol by *Shewanella* produces acetate in which can be taken up and consumed by *Geobacter sulfurreducens*. *G. sulfurreducens* utilizes a gold electrode as a final electron acceptor—doing so generates current. Co-cultures of *Shewanella* and *Geobacter* can be used to generate electricity. This study will focus on the genes needed for glycerol uptake and utilization in *Shewanella*. Throughout a series of ten transfers to a medium containing glycerol, it was found that an evolutionary change occurred in *Shewanella* that increased glycerol metabolism. This study will focus on sequencing the mutations that increased glycerol metabolism in *Shewanella* and inducing those

mutations in an unevolved plasmid.

Poster Title: Targeted DNA-Protein Crosslinks in the Human Genome at Specific Loci

Your Name: Galina Yakovlev

Home institution: University of Minnesota

Research Program: LSSURP

Faculty mentor: Dr. Colin Campbell

Department of Faculty Mentor: Department of Pharmacology

Abstract:

Proteins can become covalently attached to DNA when cells are exposed to a variety of chemicals including certain cancer chemotherapeutics. While it is known that DPCs are cytotoxic and mutagenic, our understanding of the molecular biology of the cellular response to drug-induced DNA-protein crosslinks (DPCs) is quite limited. To address this issue we designed a novel drug capable of targeting a DPC at a defined locus. This bipartite molecule is a recombinant fusion protein comprised of the human alkylguanine alkyltransferase (AGT) protein joined to a synthetic transcription activator like (TAL) polypeptide. Chemical modification of specific residue on the AGT moiety renders the fusion protein capable of forming a DPC and the TAL domain will target the fusion protein to the human hypoxanthine guanine phosphoribosyl transferase (HGPRT) gene. Our goal is to introduce this molecule into intact human cells and determine the cellular response to DPC introduced into a chromosomal gene target.

Poster Title: The Interaction Between Estrogen Receptors and Caveolin Proteins

Your Name: Mekuria Zemede

Home Institution: University of Wisconsin – Eau Claire

Research Program: Neuroscience

Faculty Mentor: Paul Mermelstein

Grad student or post-doc mentor(s): Valerie Hedges

Department of Faculty Mentor: Neuroscience

An abstract of your work limited to 150 words:

Estrogen Receptors (ERs) play a significant role in maturation as well as the development of reproductive behaviors and numerous diseases. We believe that palmitoylation of the Estrogen receptor alpha (ERα) at Cysteine residue 452 is necessary for ERα to interact with a caveolin protein (CAV1), shuttling it to the membrane. In our study, we used HEK 293 cells that were transfected with either ERα+CAV1 or a mutated ERα+CAV1, in which the palmitoylation site was mutated from a cysteine to an alanine (C→A). With

that, we tested different ERα antibodies to determine what region of the ERα is interacting with the caveolin protein when being shuttled. To this effect we used co-immunoprecipitation between CAV1 and either ERα or CAV1 and C→A mutant followed by Western blotting. Co-immunoprecipitation between ERα and CAV1 was detected with both antibodies with different patterns of expression. Interestingly, the C→A ERα mutant co-immunoprecipitated similarly to ERα. Additionally, no differences were detected between ERα and the C→A mutant with either antibody. These results indicate that the palmitoylation of Cysteine on ERα may not be necessary for ERα to interact with CAV1.

Poster Title: Novel Biologically Relevant Proteins Within Synthetic Gene Libraries

Your Name: Amanuel Zewdie

Home Institution: University of Minnesota

Research Program: Independent Research BTI

Faculty Mentor: Dr. Burckhard Seelig

Grad student or post-doc mentor(s): Dr. Misha Golynskiy

Department of Faculty Mentor: Biochemistry, Molecular Biology and Biophysics (BMBB)

An abstract of your work limited to 150 words:

Numerous studies have investigated the function of natural life sustaining proteins, though, relatively little is known about how unique these proteins are in executing their reaction. This study searched for enzymes capable of catalyzing biologically relevant reactions by transforming various single-gene deletion strains of *E. coli* incapable of surviving on nutrient poor media (auxotrophs) with two synthetic gene libraries; rescued clones were then characterized. One library consists of unfolded polypeptides with 80 randomized amino acids that may resemble primordial proteins. The other library contains proteins that fold into a structure called $(\beta/\alpha)_8$ barrel. A novel gene called *metC4*, discovered from the $(\beta/\alpha)_8$ barrel library, was found to rescue *E. coli* missing the *metC* gene, a strain missing an enzyme in the methionine biosynthesis pathway. The mechanism by which *metC4* rescues *ΔmetC E. coli* and whether *metC4*'s activity can be increased by directed evolution is currently being explored.