UROC-PREP

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Bailey Buchanan

University of Arizona, Biomedical Engineering

Mentor: Dr. Jen Watson Koevary – Biomedical Engineering

A New Regenerative Approach to the Treatment of Chronic Heart Failure

ASTRACT: Chronic heart failure following a myocardial infarction is the leading cause of death in the United States (Singelyn et al., 2009). With the inability of myocardial tissue to regenerate itself there have been obstacles in developing a treatment plan that has the ability to regenerate cardiomyocytes in the scar tissue following a myocardial infarct (Singelyn et al., 2009). A new potential treatment plan is in development that consists of treatment using a patch comprised of human induced pluripotent stem cell-derived cardiomyocytes (hiPSC-CMs). The efficacy of this treatment is currently being examined in gold-standard models of chronic heart failure. The double blinded study consists of four treatment groups. One way to analyze the efficacy of this treatment is through the analysis of heart rate obtained from the swine. Heart rates of the swine, collected from a daily six-minute walk test, are analyzed at the major time points in the study. Once the study concludes, the treatment groups will be revealed. This will allow for the analysis of the collected heart rate data from each swine model, in each of the four treatment groups, to aid in determining the efficacy in this treatment. Ideally, the active form of the treatment would reveal heart rates returning to baseline levels. This would also correlate to an improved quality of life in the swine. Quality of life, beyond an efficacious treatment, is an important parameter in determining the translatability of this treatment in human patients suffering from chronic heart failure following a myocardial infarction.

Andre Coello Hernandez

University of Arizona, Biomedical Engineering

Mentor: Dr. David Stephen Margolis – Orthopedic Surgery

Phenotypic Stability of Adipose Mesenchymal Stem Cell Derived Chondrocytes

ASTRACT: Osteoarthritis is a debilitating joint disease that results from degeneration of the articular cartilage that is found on the ends of bones. There are limited options to treat large focal cartilage defects or generalized cartilage wear seen in patients with arthritis. Some recent research has shown that adipose derived mesenchymal stem cells (ADSCs) can be converted into cartilage producing cells, which may be useful for regeneration of cartilage as a treatment for cartilage defects and osteoarthritis. While multiple labs have shown that ADSCs can differentiate into chondrocytes, little is known of the stability of the differentiated chondrocytes under varying conditions. The goal of this project is to test the stability of ADSCs that have been converted into chondrocytes and are subsequently exposed to a variety of cell culture conditions. ADSCs were isolated from human peripatellar adipose tissue. The cells were cultured until confluent, and then 6x104 cells/well were seeded in 2% agarose gel, to recreate a three-dimensional cell culture environment. ADSCs were differentiated into chondrocytes through the use of chondrogenic differentiation media (Sigma-Aldrich). After two weeks, the cells are placed into one of 3 culture conditions: control group, chondrogenic group, or osteogenic group for another two weeks. Then the cells will be sent for a histological analysis. The histological analysis will consist of testing for the presence of collagen I (in bone) and collagen II (in cartilage) in each group to determine if cartilage is being produced and the purity of the phenotypic expression.

Monique Davila

University of Arizona, History

Mentor: Dr. Katherine Morrissey - History

Diné (Navajo) youth experiences in education during changing Native American federal policies from 1928 to 1946

ASTRACT: In 1928, a group of researchers from the Brookings Institute released a report The Problem of Indian Administration, popularly known as the Meriam Report, which heavily criticized the Bureau of Indian Affairs (BIA), including the disturbing conditions of Native American boarding schools. This report led to significant changes in federal policies for Native Americans between 1928 to 1946. During the 1930s, newly appointed Commissioner of Indian Affairs John Collier, and other progressive U.S. officials believed they knew how to adjust the "Indian Problem." Their new policies, however, greatly troubled some Native American communities, including Diné. This paper argues that despite the fact that the Meriam Report praised some of the educational efforts made on the Navajo Reservation, the new assimilationist policies continued to hinder Diné youth education. Building on a rich scholarly literature on the history of Native American education and using historical research methods, this study analyzes archival primary documents to uncover and interpret Diné youth experiences during this era of changing U.S. federal policies of Native American education from 1928 to 1946. The documents, including correspondence between various individuals such as U.S officials and school coordinators, letters and report cards from Diné students, school curricula, legal documents, and images, reveal the voices of Diné youth and their experiences during this time frame.

Cristina Moraga

University of Arizona, Nutritional Sciences

Mentor: Dr. Floyd Chilton – Nutritional Sciences

Identification of Biomarkers to Determine Prostate Cancer Status

ASTRACT: Prostate cancer is one of the top causes for cancer related deaths in the United States. Proper diagnosis, as well as the ability to detect harmless versus aggressive tumors in prostate cancer is crucial. The need for more specific and sensitive biomarkers has been highlighted by shortcomings of current prostate cancer screening tools (ie. PSA). In this study, metabolic analysis was conducted to determine if there were molecular networks and biomarkers associated with aggressive prostate cancer. Plasma from a total of 180 men with varying aggressiveness of prostate cancer (as determined by Gleason score) was obtained from the North Carolina Louisiana Prostate Cancer Project and metabolites were extracted. Ultra-performance liquid chromatography-tandem mass spectrometry analysis was conducted at Colorado State University and results were analyzed utilizing ANOVA tests, T-tests and Partial least squares - discriminant analysis (PLS-DA). Compounds most altered were associated with the ceramide pathway, with concentrations of trihexosylceramide and tetrahexosylceramide most associated with aggressive cancer. To further analyze the pathway, we examined genetic alterations affecting genes within the pathway using the online database cBioPortal. Anabolic genes associated with conversion of ceramides to hexosylceramides were amplified in numerous cancers including prostate. In fact, B3GALNT1 was amplified in ~ 26% of severe prostate cancer. Together, this study suggests that metabolomic and gene alterations in the ceramide pathway are highly related to aggressive prostate cancer.

Rikki Riojas

University of Arizona, History and Mexican American Studies

Mentor: Dana Hemmenway – Center for Creative Photography

Negative condition survey and rehousing of collections at the Center for Creative Photography

ASTRACT: The goal of the study was to record the current state of deterioration within the archives at the University of Arizona's Center for Creative Photography. Negative surveys and A-D strip tests were conducted for determination of deterioration and recorded by hand for later computer transcription. Negative surveys were conducted on Eugene Smith's Minamata and Hitachi sections. A-D strip tests were conducted on the following collections: Aaron Siskind, Dean Brown, Frederick Sommer, Harry Callahan, Herbert Bayer, and McGraw Colorgraph. Common conservation procedures were followed for both the survey and test. Results from the negative surveys found low levels of deterioration within the Eugen Smith sections surveyed- with no rating above 2 being given. Results from the A-D strip testing revealed high levels of deterioration within the Harry Callahan and McGraw Colorgraph collections. The remaining collections tested for low levels of deterioration. It is recommended all of the collections tested be moved into freezer storage when available, with priority being given to the Harry Callahan and McGraw colorgraph collections due to their high levels of deterioration. Negative surveys and A-D strip tests of the Center for Creative Photography's collections will continue beyond the scope of this 10-week study- ending only when all of the collections have been evaluated for state of deterioration. Also conducted, but without results, was the rehousing of parts of the Aaron Siskind collection. This was done to ensure proper storage of materials before their eventual move into freezer storage.

Bennett Van Camp

University of Arizona, Biochemistry and Molecular & Cellular Biology

Mentor: Dr. Lisa Nagy – Molecular and Cellular Biology

Analyzing the Spatiotemporal Regulation of Segmentation in *Tribolium castaneum*

ASTRACT: Vertebrates, annelids, and arthropods, while in evolutionarily distant clades, all go through segmentation during development. This process is driven by a cycle of periodic transcription factor (TF) gene expression. In *Tribolium castaneum*, there is a three gene pair-rule oscillator of *even-skipped* (*eve*), *odd-skipped* (*odd*), and *runt* (*run*) with a posterior activating gradient from the maternal effect gene *caudal* (*cad*). This forms a bare-bone negative feedback loop with no known secondary regulators. However, it is currently unknown if characteristics of other segmentation models, such as an anterior wavefront or a method of local synchrony exist in *Tribolium*. In addition, it has been shown that *Tribolium* segmentation exhibits variable periodicity. This suggests that there are additional uncharacterized regulators of this system. Previously, an MCAST analysis created a map of predicted binding sites of clusters of TF's based on *Drosophila melanogaster* models. Our goal is to create mCHERRY promoter fusions, using Gateway cloning, of enhancer regions previously identified using MCAST. By creating these constructs we hope, in the future, to create transgenic lines of *Tribolium* using p-element transposition. Then, by observing the mCHERRY expression we will be able to characterize what enhancer regions are important for segmentation gene expression. This will allow for future analysis into novel upstream regulators of the *Tribolium* segmentation process.

Aimee Wheeler

University of Arizona, Physiology

Mentor: Dr. Richard Simpson – Nutritional Sciences

iNKT Cell Mobilization with Exercise and Their Role in HSCT Outcomes

ASTRACT: The following research is looking to improve Hematopoietic Stem Cell Transplant (HSCT) outcomes. Graft versus host disease is a common concern for transplant patients since this disease causes the donor graft to attack the host through alloreactive cells. The donor graft can attack different organ systems and have the potential to cause death in transplant recipients. In order to improve these transplant grafts, we are looking at exercise to change the immune cell composition and hopefully reduce the number alloreactive cells. This specific research project is looking at a subset of immune cells called invariant natural killer T-cells (iNKT cells). iNKT cells possess the ability to activate other immune cells to fight against alloreactive cells and also has the ability to secrete cytokines that are known to fight tumor growth. iNKT cells possess characteristics that would likely be beneficial to HSCT grafts. We are first looking to see if iNKT cells are being mobilized through exercise, providing further evidence that exercising participants before donating their hematopoietic stem cells will lead to positive HSCT outcomes. The second part of this project will be looking to see if exercised mobilized iNKT cells are able to persist in a humanized mouse model. Our study found that iNKT cell numbers were increasing through exercise. The next part of this research project will look to see if these exercised mobilized iNKT are able to persist in a HSCT model. This data will contribute to a larger study that is looking to use exercise mobilization of immune cells to improve HSCT grafts.