STUDENT POSTER ABSTRACTS

4TH ANNUAL

2016 LSMCE CONFERENCE

Prism of Possibilities: Focus on the Future

lscmeconference.org
October 28-29, 2016
Hyatt Regency Lisle
Lisle, Illinois

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Louis Stokes Midwest
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Poster Session

Friday, October 28
9:00 PM - 11:00 PM
Hyatt Regency Lisle Pavilion

Quick Stats

- 130 Posters
- 46 Institutions Represented
- 10 Master's Student Posters
- 120 Undergraduate Posters
- Top 6 Posters Win Cash Prize

Awards Ceremony

Please plan to join us on Saturday, October 29, at 3:30 PM for the Poster Awards Ceremony.

WELCOME TO THE POSTER RESEARCH PRESENTATION

Dear Friends,

You are cordially invited to the Louis Stokes Midwest Center of Excellence (LSMCE) Student Poster Session on Friday, October 28, 2016, at the Hyatt Regency Lisle from 9:00 p.m. to 11:00 p.m. We received 130 poster abstracts from talented undergraduate and graduate students attending 46 colleges and universities across the nation. The students are here to showcase the outcomes of their hands-on research and learning under the mentorship of faculty members in Science, Technology, Engineering, and Mathematics (STEM) at their institutions.

One of the LSMCE goals for this conference is to highlight the value of student research and to provide underrepresented minority students the opportunity to showcase their scholarly accomplishments and personal commitments to disciplinary learning. The poster session offers a unique opportunity for underrepresented minority students to learn from each other, to network, to engage with faculty and administrators in career development opportunities, and to experience the essence of disciplinary professionalization.

Welcome!

Rafael E. Bahamonde, Ph.D.
Director of Faculty Outreach, Louis Stokes Midwest Center of Excellence
Associate Dean and Professor of Kinesiology, Indiana University-Purdue University Indianapolis

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Adogamhe, Pontian

A PROPOSAL TO APPLY GENE MODIFICATION OF ALCANIVORAX BORKUMENSIS FOR EFFECTIVE CLEANING OF OIL SPILL

Bioremediation is fast becoming an option for crude oil spills due to its relative cost and eco-friendly nature. Although bioremediation is an effective option for crude oil spills, it is a slow process largely affected by environmental factors and the slow metabolic rate of the organisms used. In this proposal we outlined a potential target to increase the rate of this process. Cytochrome P450 153A (CYP 153A) are genes that produce alkane degrading enzymes. The enzymes are able to breakdown alkanes through oxidation. The genes are located in several bacteria and environments. In ecological surveys of organisms involved in bioremediation of crude oil in polluted areas, Alcanivorax borkumensis was the dominant bacteria and the bacteria was shown to encode alkane hydroxylases. Bioremediation using Alcanivorax borkumensis is physically sped up using nitrogen and phosphorus as nutrients. Cytochrome P450 BM3 (CYP 450 BM3) have similar enzyme structures to CYP 153A and it is a good model system which can alter its substrate selectivity with several mutations on its active site. In this review, we propose to speed the metabolic rate of Alcanivorax borkumensis genetically by increasing the activity in the active site of the enzyme by transferring P450 BM3 active sites gene sequence mutations using transgenesis to CYP153A. Considering the above analysis, it is anticipated that there will be an increase in the catalytic rate as well as an increase in the rate of crude oil degradation by the mutant Alcanivorax borkumensis. The application of the methods employed can be utilized in the bioremediation of oil-contaminated environments and play a catalytic role in petrochemical industries to ensure a cleaner environment. Keywords: Crude oil, Alcanivorax borkumensis, Cytochrome P450 153A (CYP153A), Transgenesis, Bioremediation. Funding: Wisconsin Alliance for Minority Participation (WiscAMP) Funding Acknowledgement: Wisconsin Alliance for Minority Participation

Aguilar, Maria

ANALYSIS OF MICROBIAL ECOSYSTEMS USING WINOGRADSKY COLUMNS FROM TWO DIVERSE ECOLOGICAL NICHES

Winogradsky columns were assembled as a model to observe and analyze the microbial ecosystems. These columns were assembled in the presence of light using the pond sediments from Humble Park Chicago and Lake Huntoon, Waubonsee Community College, Sugar Grove Illinois. Environmental gradients developed within the columns creating diverse niches allowed the enrichment of specific bacteria based on nutrient needs.

In this study, we used the microscopic and staining techniques to characterize the microbial community dynamics within the columns. Over a period of 90 days, the observation of the microbial community changed dramatically based on the chemical component that was added to the column. This project can be further elaborated to study structure and composition of soil bacteria which are sources for new antibiotics that can kill species including methicillin-resistant Staphylococcus aureus (MRSA) Funding Acknowledgement: Waubonsee Community College

Akwabli, Steven

QUANTUM GAMES AND WINNING STRATEGIES VIA THE CLASSIC TIC-TAC-TOE GAME

In the last several decades new ideas based on quantum mechanics, which governs how the microscopic physical world of light and matter behaves, have been applied to the field of information processing and communication. Using quantum systems for the information processing tasks offer tremendous advantages over their classical counterparts in terms of efficiency, speed, and resources. On similar lines, quantum ideas can help improves strategies applied to classical games with the aim of developing winning strategies that are more efficient than their classical counterpart. We present an example of the classic tic-tac-toe game, which does not always end up with a result and its quantum version, which always has a winner. Because quantum rules do not quite match our common sense, the question is whether we can translate the quantum steps into strategies that can help us win this game with higher probability. The larger goal of the project is to understand applications of quantum mechanics to game theory.

Alawi, Wissam

COMPARISON OF BELIEFS, PRACTICES, AND KNOWLEDGE REGARDING ALCOHOL BASED HAND SANITIZERS

Studies indicate that college students possess a higher risk of attracting upper respiratory infections, colds, and influenza-like illnesses from infectious organisms that are present throughout the campus environment. Accordingly, the morbidity of these illnesses impact students' learning and academic scores due to absenteeism and impaired productivity (Baker et al. 2001; Nichol et al. 2005; White et al. 2005). Preventative measures for college students include use of CDC and WHO hand hygiene recommendations to defend against bacterial and viral infections which cause URIs, colds, and ILIs. This study compares Marygrove College (Detroit, MI) science and non-science students' knowledge and beliefs regarding soap and water hand washing (SWHW), and alcohol based hand sanitizers (ABHS) to determine if science majors exhibit a higher degree of knowledge. Fifty-six upper-level students (27 science majors and 29 non-science majors) participated in the study. The participants completed a 16 question survey in which a t-test revealed no significant difference of knowledge between the two groups. Limitations of this study included small sample size from one college, survey design, and participant bias. A future avenue of research could involve repeating this study with a greater number of students from more than one college or university, which may lead to a different set of findings. Although a statistical difference between science and non-science majors' knowledge scores was not established, this study found that Marygrove students, regardless of major, may benefit from further hand hygiene education. Funding Acknowledgement: Marygrove College

Amoah, Sylvester

HIGH PRECISION METROLOGY AND IMAGING VIA QUANTUM INTERFEROMETRY

Interferometry, where two or more light or matter waves are mixed with each other, small phase differences between the constituent waves can be measured very precisely. Interferometry is useful, for example, in the field of astronomy to increase effective resolution of a system of telescopes. We are particularly interested in the applications of interferometry to the fields of metrology and imaging. The field of metrology deals with measuring physical quantities such as small electric, magnetic, and gravitational fields and small rotational velocities. Precise measurements of these quantities are important to meet a large class of technological needs of the humankind. I will discuss basics of interferometry of light and matter. I will also discuss some of the modern trends in interferometry, where the quantum properties of the constituent waves are used as a tool to increase sensitivity of the interferometers.

Anaya, Luisa

CHARACTERIZATION OF ADDITIVELY MANUFACTURED INCONEL 718

The need to reduce waste, emissions, and lower the cost of production has fueled the rise of additive manufacturing (AM), also known as three-dimensional (3-D) printing. Inconel 718 (IN718), a nickel-based superalloy is one of many metals that can be produced from additive manufacturing. This alloy is used for its high strength properties at high temperatures, such as liquid fueled rockets, sheet metal parts for aircraft, land-based gas turbine engines, and similar applications at high temperatures. To characterize additive manufactured IN718, several mechanical tests were conducted. The CSM Nano/Micro Indentation System was used to output hardness data, by using a diamond indent tip which measures the material's ability to resist change in length. An MTS 810 material testing system performed the uniaxial tensile tests. A Proto LXRD Residual Stress Measurement System performed in-depth analysis of residual stresses created from its manufactured process. Also, an optical microscope was utilized to photograph observations of its resultant microstructure. Comparison of hardness and elastic of additive manufactured IN718 to Forged/Cast showed AM IN718 to be harder and on average stiffer than forged. Comparison of tensile strength between AM IN718 and Forged/Cast showed that the forged material displayed 14% higher yielding strength than AM IN718. Whereas, the ultimate stress for AM IN718 was 4% higher than that of the forged. The residual stresses data showed that there are tensile stresses created due to the additive manufacturing process and are almost biaxial, since they are nearly the same for both 0° and 90° angle rotations. Microstructure revealed 3D print consisting of columnar dendritic grains. Additive Manufactured IN718 has higher hardness and comes at a cheaper production price. It is an effective solution to eliminate emissions, waste, and cost while still maintaining quality as good as its counterpart. Recommendation for further research and development of the additive manufacturing process will verify its ability to yield satisfactory results. Funding Acknowledgement: National Science Foundation (NSF), Louis Stokes Alliances for Minority Participation (LSAMP)

Armijo, Nicholas

OTUD6B ISOFORMS REGULATE GROWTH AND PROLIFERATION OF NON-SMALL CELL LUNG CANCER CELLS

Deubiquitinases are increasingly linked to the regulation of fundamental processes in normal and cancer cells, including DNA replication and repair, programmed cell death, and oncogenes and tumor suppressors signaling. Here we present evidence that the deubiquitinase OTUD6B regulates protein synthesis in nonsmall cell lung cancer (NSCLC) cells, operating downstream from mTORC-1. OTUD6B associates with the protein synthesis initiation complex and modifies components of the 48S preinitiation complex. The two main OTUD6B splicing isoforms seem to regulate protein synthesis in opposing fashions: the long OTUD6B-1 isoform is inhibitory, while the short OTUD6B-2 isoform stimulates protein synthesis. These properties affect NSCLC cell proliferation, since OTUD6B-1 represses DNA synthesis while OTUD6B-2 promotes it. Mutational analysis and downstream mediators suggest that the two OTUD6B isoforms modify different cellular targets. OTUD6B-2 influences the expression of Cyclin-D1 by promoting its translation while regulating (directly or indirectly) c-Myc protein stability. This phenomena appears to have clinical relevance as NSCLC cells and specimens have a reduced OTUD6B-1/OTUD6B-2 mRNA ratio compared to normal samples. The global OTUD6B expression level does not change significantly between normal and malignant tissues, suggesting that modifications of splicing factors during the process of transformation are responsible for this isoform switch. Inhibition of protein synthesis is being investigated as a therapeutic strategy for NSCLC. We propose that OTUD6B-2, by being specifically linked to NSCLC and its growth, may represent an attractive, novel targetfor therapy and for the development of additional biomarkers for early diagnosis of malignant NSCLC. Funding Acknowledgement: NCI grant CA134503

Ayers, Mayla

STUDENT ENGAGEMENT: CLICKERS AND CONFIDENCE

The purpose of this study is to pinpoint means that would effectively engage and emit a sense of validation among (college) students. Our research was conducted to increase retention rates of said students, as our statistics show that the starting number of incoming freshmen noticeably decreases as they advance toward upperclassman status. We observed the impact of the individual response teaching technique (i.e. clickers) on establishing a better sense of community. In the classroom, the clickers would be used along with traditional means of involvement (hand raising, open discussion, etc.) with select classes, then be compared to other classes which did not use clickers. We hypothesized that students would participate more freely without hesitance which is usually caused by fear of disapproval or judgement. We used the Teaching Dimensions Observation Protocol to observe classroom behavior and methods of learning. From this, we found that in a class that used clickers, there was increased student-led dialogue, one method to gauge student engagement. Focus groups were also held to evaluate how both clicker and non-clickers students felt about group activities. We found that while both groups did not favor group activities in general, students using clickers were more willingly to engage themselves in class. The collective experience in college consists of progression and satisfaction in academic and social dynamics; this is what we call "campus climate". The overall goal is that by increasing a sense of academic validation through the clicker system, students would want to remain at their undergraduate institution, thus increasing retention rates and degree completion. Funding Acknowledgement: National Science Foundation

Ballard, Mikiah

PHENOTYPIC EFFECTS OF SILENCING FATTY ACID DESATURASE 3 IN TOMATO

Fatty acid desaturase 3 (FAD3) and Fatty acid desaturase 7 (FAD7) are enzymes that are involved in fatty acid synthesis, and that are found throughout the plant kingdom. Manipulating the expression of FADs in certain plants using overexpression, antisense suppression, or null mutations has previously been shown to influence many plant phenotypes, including chlorophyll content and resistance to many stresses. For example, loss of function of FAD7 in tomato has recently been shown to immunize plants against the potato aphid, Macrosiphum euphorbiae. The goal of this study is to examine the phenotypic effects of enhancing or inhibiting expression of FAD3 in tomato. FAD3 expression levels, plant growth, and leaf number were measured in transgenic tomato lines with antisense suppression [AS line] or overexpression [OE line] of FAD3 compared to untransformed wild-type controls. These experiments allowed us to test the hypothesis that suppressing expression of FAD3 would influence plant health and immunity. Funding Acknowledgement: This project was supported by the Arkansas INBRE program, with a grant from the National Institute of General Medical Sciences, (NIGMS), P20 GM103429 from the National Institutes of Health, National Science Foundation Award Numbers CHE-1263119, IIA-14304.

Banks, Asia

THE BIOLOGICAL EFFECTS OF MICROAGGRESSIONS

Many US minority groups experience frequent and casual negative interactions known as microaggressions. The purpose of this research is to determine how significantly a person's mental health is effected due to microaggressions. I will conduct this research using a subject group of African American students at Valparaiso University. I will provide them with a rating scale to determine if a person has actually encountered microaggressions. Subjects will be divided into two groups, according to whether they have been frequently or infrequently confronted with microaggressions, and from there I will determine how microaggressions affected their mental health overall. Group comparison, linear modeling and other statistical procedures will be used to test for significant effects. Funding Acknowledgement: Jim Nelson

Barrow, Amber

HIGH FAT DIET EFFECTS ON LEARNING AND MEMORY WITH AGE

High fat diets, especially the kind typical of Americans and of people from other developed nations, have been shown to cause a myriad of health problems such as those accompanying metabolic syndrome and Type 2 diabetes (T2D). While efforts have been made to increase scientific evidence for peripheral health issues, little is known about how these unhealthy metabolic profiles in the periphery affect the brain, particularly across later life stages. This study aims to investigate how high fat diets modulate cognition and associated brain function. This study assesses shifts in learning and memory, and in neurochemical profiles across two brain regions engaged by learning, i.e. the hippocampus and striatum, with a focus on changes in bioenergetics and trophic factors. Over the course of 13 weeks 48 rats are given either high fat diets (42% calories from fat replacing protein) or control diets (13% calories from fat) to induce an unhealthy metabolic profile that can produce metabolic syndrome/insulin resistance. Throughout the diet exposure, rats are weighed daily, and weekly blood lactate, glucose, cholesterol, and triglyceride measures are taken. Levels of activity and anxiety are examined using an open field test. At the end of the 13 weeks, we will determine how these peripheral and behavioral changes correlate to biochemical brain changes and the resulting effects on learning and memory tasks. We believe rats on the high fat diets will present with metabolic changes early in the diet regimen that may eventually lead to metabolic syndrome, impaired insulin sensitivity and increased levels of circulating blood glucose. One key target of interest is brain derived neurotrophic factor (BDNF), a protein with a key role in brain plasticity and cognition that also has stabilizing effects on blood glucose levels. Finding that tissue levels of BDNF predict metabolic health would support the possibility that trophic factors play a key role in development of diseases with underlying metabolic pathology.

Beauregard, Paris

SILENCING CCN1 IN OSTEOBLASTS BLUNTS PTH'S ANABOLIC ACTIVITY IN BONE

CCN1 is a matricellular protein involved in many processes of cell regulation. In bone, CCN1 regulates osteoblast differentiation, resulting in increased bone density via osteoblast activity. A key factor in the regulation of bone density in response to mechanical load is parathyroid hormone (PTH); anabolic activity from intermittent administration of PTH increases bone formation by osteoblasts. Because CCN1 can bind to integrins, we hypothesized that CCN1 also plays a role in the osteoblast response to mechanical load, possibly acting in the same pathway as PTH. To test this, mice lacking CCN1 in osteoblasts and osteocytes were generated and given PTH injections. In comparison to controls, CCN1 mutants did not respond to PTH treatment and exhibited lower bone mass, suggesting that CCN1 acts downstream of PTH in the response to mechanical load. This relationship was also studied in vitro by developing a CCN1-deficient MC3T3 osteoblast precursor cells using CRISPR/Cas technology. These studies revealed that CCN1 is required for normal levels of expression of the PTH receptor (PTH1R). The cells were then exposed to CCN1, which elevated the expression of PTH1R in comparison to controls. In order to confirm CCN1's role in PTH signaling, a viral vector was engineered to express PTH1R. CCN1-deficient MC3T3 cells were then infected with the viral vector and exposed to PTH. Results showed increased expression of Nurr1, a downstream target of the PTH pathway. Both phenotypic rescues, in conjunction with the previously mentioned in vivo research, indicate that CCN1 is an activator of the PTH pathway via regulation of PTH1R expression. Implications of this study could include more effective targeted gene therapy for osteodegenerative diseases such as osteoporosis, as well as a better understanding of mechanotransduction in bone. Funding Acknowledgment: AR052686, UCLA Jonsson Comprehensive Cancer Center, Department of Education: SMC HSI Initiative # 58680 *Note: Author is enrolled at Santa Monica College; however, research was conducted at the University of California, Los Angeles.

Bonds, Ravon

PERCEIVED RELIABILITY OF CONSUMER RATINGS AND REVIEWS

User-generated ratings and reviews have become a necessary part of consumers' everyday online shopping experience. The authors developed a model that will hopefully provide new insight into the reliability of user-generated ratings and reviews. An online survey based on the authors' hypotheses will be administered to undergraduate students to gage their perceptions of reliability. The results from this study can provide guidance to consumers and to companies that use ratings and reviews while making online purchasing decisions. The anticipated findings from this research will help to shed light on which reviews and ratings are most helpful to consumers and which platforms whether, social media, brand related messages, or commerce websites provide the most reliable responses. These findings will also explore the motivating factors that contribute to consumers' ratings and reviews that be less reliable than others and why some consumers feel that their reviews may not be as helpful as possible. These results would provide implications for consumers to avoid using biased reviews and ratings in the future, and make consumers more aware of their own biases while reviewing products and services. Funding Acknowledgement: McNair Scholars Program

Borum III, Larry

ANALYZING AND MODELING SOIL HEAT TRANSFER UNDER A GREENHOUSE

Inside a high-tunnel greenhouse, soil has an important influence on heat conduction and convection which are processes of heat transfer. To this day, there are many models that can simulate and predict climatic conditions inside the greenhouse from outside environmental conditions. However, there is a lack of a model describing heat loss to the ground inside a high-tunnel greenhouse. Our objective is to develop a model to analyze heat transfer to the soil. We also propose an in-situ method to find thermal conductivity. This task was fulfilled by measuring soil temperature across the soil bed inside a high-tunnel greenhouse at numerous depths. Once data was collected we use the conduction heat transfer equation through Excel to calculate an overall soil thermal conductivity. Our results were based on the overall performance and accuracy of the model. We concluded that the proposed in-situ method resulted in a 45% difference compared to other laboratory results. The further investigation of this model would give future greenhouse users the opportunity to determine the thermal conductivity and other thermal properties of the soil. As a result, users can asses to their needs of harvesting wasted energy in the soil. Funding Acknowledgement: The Ohio State University Summer Research Opportunity Program

Brown, Gregory

IMPACT OF CHAIN ARCHITECTURE ON THE THICKNESS DEPENDENCE OF PHYSICAL AGING RATE OF THIN POLYSTYRENE

The dynamics of polymer thin films have been demonstrated to be significantly altered from the bulk, but the origins of such differences are not well defined. In this work, we seek to understand the differences in the structural dynamics (or physical aging) of polystyrene (PS) through branching and other well defined architectures (comb and centipede). The aging dynamics of ultrathin films (< 30 nm) differ from relatively thick films (100-150nm) with linear PS thin films aging more rapidly than the relatively "bulk-like" thick films. Ellipsometric measurements are used to characterize the physical aging rate of the films. The change in film thickness and refractive index as the films are held below the glass transition temperature (Tg) provides a simple measure of the physical aging. In this study, four different architectures (linear, comb, 4 arm star, and centipede) will be investigated. For each PS architecture, the aging rate will be determined for film thickness ranging from 10nm to 100nm over aging temperatures from 65C to 95C. Preliminary investigation shows that the branching of the PS will decrease the aging rate. Funding Acknowledgement: National Science Foundation

Burkinshaw, Breeanna
USING REDUCED AMINO ACID ALPHABETS TO DETERMINE SIMILARITIES IN PROTEINS.
Reduced amino acid alphabets have paired together amino acids with similar structure and function. The best performing alphabets are between 10 to 12 letters and help to determine fold recognition in proteins, which then determines the structure and the function of the protein. With the reduced amino acid alphabet, we are trying to determine if there is homology between the eukaryotic protein MIC19 and a possible protein in the bacteria Pseudomonas aeruginosa. We are also investigating if eukaryotic apoptosis proteins have orthologs to proteins involved in cell lysis in bacteria. This is important in determining the unknown structure and function of proteins. If MIC19 has similar fold recognition to a known protein, then we may be able to determine its structure. Additionally, if CidA has orthologs to an apoptosis protein then we may be able to determine similarities between apoptosis and cell death in bacteria. Throughout this research a student-developed a sequence conversion program, in addition to online tools such as MUSCLE, online BLAST, stand alone BLAST, and I-TASSER were used in determining which amino acid alphabet was producing the most similarity between proteins and what possible proteins could have homology. Thus far the results show that there is no significant similarity between the apoptosis proteins and the proteins involved in cell lysis. However, possible structures have been discovered for MIC19 using I-TASSER, a protein structure and function prediction tool, and these structures differ from the previous possible structure. This shows that the reduced alphabet is producing different results than the normal 20 letter amino acid alphabet and it is still unclear which structure is more accurate. Funding Acknowledgement: Doane University summer research funding was provided as well as a grant from the INBRE program.

Burnett, Kayla
EFFECT OF CURVULARIA, AN ENDOPHYTIC DARK SEPTATE FUNGUS, ON PLANT GROWTH
Plants in natural ecosystems depend on symbiotic relationships with fungi for growth and survival in stressful condition. Fungal species in the genus Culvularia have been shown to provide thermotolerance in plants. In this study we determine the effect of different isolates of Culvularia on plant growth under different stressful conditions. Fungi were isolated from roots of different type of grasses across the United States. We conducted two germination experiments with five Culvularia isolates (CK330, CK432, CK1110, CK1276, and DS63) using MEA Media with antibiotics and Water Agar Media. Germination experiments with Zea mays (corn) were conducted at room temperature and a heat stress experiment was also performed. In the heat stress experiment, seeds were exposed to 50°C for 6, 12, and 24 hours. At room temperature, several isolates of Culvularia improved root growth and stem elongation. For the heat experiment, 6 and 12 hours of heat held optimal results for plant growth for Culvularia species in comparison to the controls. CK330, CK1110, CK1276, and CK432 improved plant thermotolerance under 12 hours of heat stress. Additional experiments will be conducted to determine the capacity of this genus to provide thermotolerance to different grass species. Funding Acknowledgement: National Science Foundation 1457002 and Los Alomos National Lab

Burt, De'von
A BUG'S LIFE: DNA BARCODING OF CADDISFLIES FROM THE ROUGE RIVER, MICHIGAN
Due to their sensitivity to pollution and poor water quality, caddisflies are one type of insect often used in assessing stream health. The better the water quality, the more diverse the macroinvertebrate community will be. However, it can be challenging to identify different species based on the morphological characteristics of their aquatic larvae. We partnered with the Friends of the Rouge to collect caddisflies as part of their ongoing monitoring and restoration of the Rouge River watershed, and applied DNA barcoding as a tool for molecular identification. Twenty individuals were collected from Johnson Creek site 5 (Rochester, Michigan) in February 2015 and sequenced for their mitochondrial cytochrome oxidase subunit 1 (CO1) gene in the winter of 2016. Using Geneious software and comparison to previously identified individuals from GenBank, we identified two hydropsychid genera (Ceratopsyche and Cheumatopsyche) from potentially three different species (Ce. bronta, Ch. oxa, Ch. wrightii). Based on a neighbor-joining phylogenetic tree, the species clustered in two main groups according to genera. These data contribute to ongoing studies of river health and caddisfly population genetics in southeast Michigan. Our data will also be archived as part of the Barcode of Life Datasystems (BOLD) initiative, which aims to categorize the genetic diversity of organisms around the world. Funding Acknowledgement: Work reported in this abstract was supported by the National Institutes of Health Common Fund and Office of Scientific Workforce Diversity under three linked awards RL5GM1189XX, TL4GM1189XX, 1UL1GM1189XX, NRMN U54GM119023 and CEC U54GM119024 administered.

Butler, Kayla
PRIVATE LANDOWNERS AND THEIR PERCEPTIONS OF URBAN STREAMS
Urban stream syndrome is defined as the process by which streams degrade due to their existence in an urbanized setting. In order to address this widely researched issue, private landowner involvement is necessary to help maintain the exposed streams. Landowners in Rock Island, IL living within 10 yards from a stream (N=898) completed online or paper surveys, providing their perceptions of the streams lying within their respective properties. Descriptive statistics and further analysis were used to understand the relationship between those who held high value toward streams and those who did not. The main goal is to use these attitudes to better develop ecological education and community conservation efforts that will protect these urban streams for future generations. Funding Acknowledgement: IINSPIRE-LSAMP

Caballero, Jeniffer

COMPARISON OF SUBSTRATE UTILIZATION AND GROWTH KINETICS OF PSEUDOMONAS AERUGINOSA

Introduction: Bacteria, including Pseudomonas aeruginosa, can exist in both the planktonic and biofilm form and show different metabolic characteristics in each form. This investigation compares the growth kinetics between the two forms through measurements of growth rate and yield during log phase. The system considered was the PA01 strain of Pseudomonas aeruginosa with a single substrate, glucose, in a minimal mineral media. Biofilm growth occurred in a high shear stress environment provided by a CDC bioreactor. Glucose concentration varied between 0.01 - 0.25%. Methods: Growth kinetics for the planktonic form were determined using a batch reactor held at constant temperature, 37 [C], with constant shaking using an incubator shaker. Cell concentration was determined using calibrated optical density measurements at 600 [nm]. Growth kinetics for the biofilm form were determined using a CDC bioreactor operated in CSTR mode at constant temperature and stir rate. Cell accumulation in the biofilm was measured using a crystal violet assay. Glucose concentration in the media was measured using a Bioreactor Sciences BMS 100 Glucose Meter. Results: Growth rate in log phase as a function of glucose concentration for both planktonic and biofilm forms of PA01 fit a Michaelis-Menten kinetics model. Growth rates for the biofilm form were significantly smaller than for the planktonic form. Conclusion: This study confirmed that there are significant differences in the values of growth rate and yield between planktonic and biofilm forms of Pseudomonas aeruginosa grown in a glucose-minimal mineral media. The growth rate for both forms fit a Michaelis-Menten kinetics model. Funding Acknowledgement: LSMAP

Cabrera, Maria

EXPLORING PROTEASE INHIBITION IN NATURAL PRODUCTS ISOLATED FROM MARINE SPONGES

The chemical diversity of marine natural products introduces potential drug candidates for human disease through investigation of their structure, synthesis, and biological properties. Previously discovered compounds isolated from marine sponges have demonstrated antifungal activity for example, and other biological effects undiscovered compounds might have can lead to new kinds of pharmaceutical treatment. Natural products exhibiting inhibitory activity is of interest to our lab, in particular products that may inhibit the protease thrombin, an enzyme involved in the clotting process. A compound that can stop blood coagulation may be vital in making drugs for people that are susceptible to clotting, which increases the risk of strokes and cerebral aneurysms. Enzyme inhibitory assays compared reactivity between natural product extracts to a known inhibitor of thrombin. Samples with noticeable inhibitory activity were then separated and purified by HPLC and analyzed through LC-MS and NMR. Isolation and total structure determination of the specific inhibitory compound continue the investigation. A unique structure of natural products might relate to protease inhibition, impacting the discovery of drug leads for diseases involved with blood coagulation such as strokes. Student is enrolled in University of California, Berkeley while research was conducted at University of California, San Diego. Funding Acknowledgement: STARS Program and the National Institute of Allergies and Infectious Diseases (NIAID AI100776)

Castillo, Israel

EINSTEIN'S PHOTOELECTRIC EFFECT EXPERIMENT: DETERMINING PLANCK'S CONSTANT

The importance of the photoelectric effect experiment proves that light can be quantized. Albert Einstein used Max Planck's research on black body radiation, which lead to the discovery of Planck's constant. Planck's constant is the relationship between the energy of a photon and the frequency of its electromagnetic wave. Using this fundamental pillar, Einstein suggested that energy in each "quanta of light" (photon) was equal to the frequency multiplied by Planck's constant. This suggestion would finally strengthen the theory that dictates photons have a particle nature of light and resolve the mysterious photoelectric effect discovered by Heinrich Hertz in 1887. Recreating Einstein's experiment at a Physics Lab on Valencia College West Campus gave me the opportunity to investigate the quantum theory of light and to determine Planck's constant. The average value obtained for Planck's constant in my experiment is 6.62961x10-34 J s with a 0.48% difference compared to the theoretical value Funding Acknowledgement: Seneff Honors College, LSAMP

Chakkalamuri, Marilyn

COMBINED THERAPY FOR T-CELL LYMPHOMA

Approximately every 9 minutes, a person in the United States dies from a blood cancer. Of these, lymphoma is the most common. Lymphoma occurs with the abnormal growth of white blood cells called lymphocytes and is a very aggressive form of cancer. This project focused on T-cell lymphoma (TCL). One key component of TCL is the Hedgehog (HH) signaling pathway. When functioning aberrantly, it has been tied to the development of human cancer. Within this pathway, transcription factors called GLI's- specifically GLI1, 2 and 3- facilitate transcription of certain genes. Our interest is in investigating the impact of inhibition of the HH pathway as well as GLI1 and GLI2 alone as well as in combination with other therapies for T-cell lymphoma (TCL). This was done using various therapies currently clinically used for treatment, and studying the proliferation of several T-cell lymphoma cell lines after treatment. The metabolic XTT Assay was used to study proliferation and RT-PCR procedures were used to study aspects of HH gene expression in the cells. Results showed that GANT61 as well as Romidepsin reduced cell proliferation. Funding Acknowledgement: NIU Foundation

Chavez, Angel

GENETIC BASIS OF THE EPIGENETIC CONTROL OF HEART FAILURE

Heart failure(HF) affects 20% of individuals after the age of 40 and is the number 1 cause of hospitalization after age 65. HF occurs when the heart is unable to pump a sufficient amount of blood needed for normal physiological function. The pathogenesis of HF involves changes in gene expression. Gene expression is in turn controlled to a significant extent by epigenetic modifications, including DNA methylation and histone modifications. In preliminary studies, we used a systems genetics approach in a large cohort of mouse strains to identify DNA methylation profiles across the entire mouse genome associated with the onset and progression of heart failure under pathological stress. Using reduced representation bisulfite sequencing approach, we identified several hypervariable DNA methylation sites throughout the mouse genome that are significantly associated with heart-failure related traits. Candidate genes which may play a role in HF-related phenotypes at these sites were identified based on their expression profile, genomic proximity and known function. In particular, we focused on four genes (Anks1, Rbm45, Mospd3, Rcor1) for functional validation. By using primary Neonatal Rat Ventricular Myocytes (NRVM) as an in vitro model we tested the impact of these genes on cellular viability and hypertrophic growth. NRVM cells were transfected with siRNAs for the selected genes as well as scramble controls. The cells were imaged under light microscope to measure cell size, contractility, and cellular viability. We found that inactivation of Anks1 by siRNA reduced cellular contractility. The Rbm45 siRNA decreased cell size. Strikingly, inactivation of Mospd3 and Rcor1 genes via target specific siRNA caused a large and significant reduction in cell size. These results support our hypothesis that the epigenetic differences observed at DNA methylation levels can significantly affect the outcome and progression of cardiac hypertrophy and dysfunction. The identified genes may function as the molecular links between epigenetic changes and the onset of heart failure. Investigating more about these genes will lead to a better understanding on how stressed heart leads to heart failure, and whether these novel players in heart failure can be used as potential tools for disease diagnosis and treatment. Funding Acknowledgement: NIH Grant 5R01HL12329503; Santa Monica College Science Research Initiative Program

Chiang, Andrew S.-C.

EFFECT OF FATIGUE ON PHYSICAL PROPERTIES OF SEMICONDUCTING POLYMERS

Organic electronic materials have many characteristics that make them attractive for applications in which mechanical deformability—i.e., flexibility and stretchability—are required. While deformation often degrades the performance of these devices, very little is known about the effects of cyclic loading—i.e., mechanical fatigue—on the microstructure and mechanical properties of the active materials. This paper examines the evolution of microstructure, stiffness, and ductility of thin films of poly(3-heptylthiophene) (P3HpT) as the film undergoes cyclic straining using ultraviolet-visible (UV–vis) spectroscopy and film-on-elastomer techniques. Thin films of P3HpT are cyclically stretched by 5, 10, or 25 percent (i.e., below, at, and above the yield point—the point at which the polymer plastically deforms with strain) up to 10000 cycles. UV–vis absorption spectroscopy is taken in intervals and the weakly interacting H-aggregate model is used to determine the aggregate quantity (from the vibronic progression) and quality (from the exciton bandwidth) in the films. Films cyclically strained at 5 and 10 percent (below and at the yield point) do not undergo significant reduction in the aggregated fraction of polymer chains, while films strained to 25% (above the yield point) undergo a reduction in aggregated fraction of over 10% by the 2000th cycle. At 25% strain, a significant reduction in the buckling wavelength from 3.4 ± 0.4 mm to 2.4 ± 0.3 mm is observed within the first 100 strain cycles suggesting a significant reduction in the stiffness and resilience of the films. A significant decrease in ductility is observed in films cyclically strained, and the effect is found to increase with increasing levels of strain. These results suggest that materials cyclically strained below their yield point will retain a microstructure that is their most electronically favorable, and that the mechanical properties of materials strained above their yield point will evolve significantly under repeated deformation. This information can be used to inform design where accommodation of repetitive strain is required, such as outdoor, portable, and wearable devices. Funding Acknowledgement: National Science Foundation, Novartis, Department of Energy

Conley, Aliyah

QUANTIFYING HOME HEALTH SECTOR SURGE CAPACITY CONSIDERING NURSE WILLINGNESS AND ABILITY

Since September 11, 2001, there have been an unrelenting number of public health emergencies including hurricanes, H1N1, and outbreaks of food borne illnesses. Due to numerous demands, hospitals routinely operate at or near 100% capacity every day. As a result, the number of persons seeking medical treatment during a public health emergency could quickly overwhelm the capacity of hospitals and emergency rooms. Surge capacity is defined as the ability of the health system to expand to quickly meet increased demand in the event of a large-scale public health emergency (American College of Emergency Physicians, 2011). Home health care is an ideal segment of our health care system for providing surge capacity in these situations. However, the amount of surge capacity home health care could provide during a public health emergency is unknown. The objective of this research is to quantify the surge capacity of the home health sector for various emergency scenarios, considering nurse willingness and ability to report to work. Funding Acknowledgement: LSAMP

Cooksey, Teonna
THE SUBSTANCE OF HOME: ARCHITECTURE, FORECLOSURE AND EVICTION
Introduction: The transformation of American cities caused by urbanization and gentrification has created an outlet where foreclosure and eviction have become sources of capital. Policies that were implemented in the past, such as redlining, have created areas within American cities where poverty is highly concentrated. The low income rates and high housing cost that have resulted from redlining has greatly contributed to the vast amount of foreclosures and evictions within impoverished communities like Washington Park. Consequently, these communities are exposed to the negative impacts associated with living in areas that have large amounts of vacant homes and homeless residents. Methodology: This research presents a vivid century long pictorial, structural and economic transformation of two foreclosed homes that were used as a case study. These houses are in the Washington Park Neighborhood in Milwaukee, WI, once a vibrant middle class neighborhood, but has since morphed into a poor neighborhood as a result of redlining. One home was vacant and the other was filled with the belongings of the previous tenant who had been evicted. This study aims to examine how foreclosure and eviction impacts the architecture and cultural landscape of the community.

Results: The findings from this research shows that the interconnectivity between income, foreclosure and eviction has created an inability for Washington Park residents to become self-sufficient. As a result, the architecture of the homes has deteriorated over time because most of them are hardly utilized or repaired. The cultural landscape has diminished due to the displacement of community members and the disinvestment in jobs and other basic resources throughout the neighborhood. Conclusion: Homes tell a story about a community or individual's character, investment, class and power. This research provides a historical perspective of the Washington Park Neighborhood as well as details that could be used for revitalization. In addition, the results could broadly provide insight to some of the challenges that are disabling impoverished communities from becoming stable—economically and socially. Funding Acknowledgement: Ronald E McNair Post-bachelorette Achievement 2016 Summer Program

Cortez, Franklin
DEVELOPING AND EVALUATING THE NEW POSSIBILITIES OF CREATING MAGNETIC OBJECTS USING A 3D-PRINTER
3D printing or additive manufacturing is the process of making three-dimensional solid objects from a digital file by using plastic filament. The current set of materials for 3D printing is largely limited to different types of plastics, limiting the functionality. Recent work has begun to look at printing functional materials, such as magnetic polymers, but the existing work has only demonstrated polymers that are magnetic in t¬¬he presence of an external magnet. Furthermore, there has never been a tool that can magnetize 3D printed polymer during printing, which would enable definition of any form of 3D magnetic structure. We studied and developed an alternative magnetic filament that can sustain a magnetic field, as well as an expansion to existing 3D printers that will allow for magnetization of the polymer during printing. We first worked on the creation of a new magnetic filament using ABS pellets and iron powder. Secondly, we began designing a control circuit, which is needed to provide the bidirectional current of the coil to define the direction of the magnetization of the new filament in the 3D printer. We found that it is possible to create an alternative magnetic filament. These results support the idea that magnetism opens up a new world of practical applications and useful creations in using a 3D printer. In addition, Understanding how the magnetic filament and control circuit are used in the 3D printer will allow us to test other types of magnetic filaments. Our future directions are to decode the 3D-printer program to control exactly which part of the object to magnetize. Funding Acknowledgement: University of California Los AngelesUCLA Electrical Engineering Department, SMC/UCLA SRRP

Cox, Jessica
METFORMIN SYNERGISTICALLY ENHANCES RADIATION SENSITIVITY OF HUMAN BRAIN CANCER CELLS
Glioblastoma (GBM; stage 4) is the most commonly diagnosed and malignant human brain cancer. GBM has a dismal prognosis of only 12-15 months, even with aggressive treatment. One strategy to overcome the extreme resistance of GBM to radiation therapy is to combine irradiation with a radiation-modifying drug. As found in a number of clinical trials, metformin synergistically enhanced radiation-induced cell death in 2 GBM cell lines. However, the mechanism of metformin actions is disputed. Using a non-toxic exposure of 2 mM metformin in 2 GBM cell lines, we monitored metabolic stress by assessing autophagy, cellular ATP levels and the ability of cells to maintain their size and shape (not die by necrosis) in cells treated with 2 mM metformin alone, 10 Gy radiation alone or combination of 2 mM metformin plus 10 Gy radiation. Autophagy was elevated in cells exposure to 2 mM metformin or 10 Gy irradiation treatment and the combination treatment was higher than each treatment alone. Changes in cellular levels of ATP also indicated metabolic stress. Finally, GBM cells retained their size and shape after exposure to metformin but not 10 Gy radiation. Two mM metformin did not increase necrosis when it was administered in combination with the radiation in U251 cells. These results suggest that the additional metabolic perturbation introduced by metformin treatment is sufficient to synergistically increase radiation-induced cell death in U87 and U251 GBM cells. Funding Acknowledgement: Research Rookies Program, Northern Illinois University

Cruz, Jasmine

PROTEIN ABUNDANCE OF INNEXIN7 IN THE MIDGUT OF AEDES AEGYPTI.

Aedes aegypti, known as the yellow fever mosquito, is the vector of viruses such as dengue fever and most recently, the Zika virus. Specifically with the Zika virus, the consequences are most severe if the infected victim is pregnant, because the virus can cause defects within the developing brain of the fetus. Gaining an understanding of the biological processes of Ae. aegypti will lead to having better control over the mosquito and virus. Gap junctions are found in the cells of multicellular organisms, where they mediate direct communication between neighboring cells. Specifically they allow for the intercellular transport of small molecules and ions. In mosquitoes, the proteins that form gap junctions are called innexins. Inhibition of gap junctions is known to kill mosquitoes and prevent excretion, however roles of individual innexins remain to be elucidated. This research focuses on the protein abundance of Innexin7. Previously it has been found that inx7 mRNA is abundantly expressed in the midgut of adult female mosquitoes, which is a tissue in the alimentary canal of the mosquito. This suggests that inx7 is midgut specific. Mosquitoes were collected with an aspirator and anesthetized on ice in order to dissect and collect tissues. Techniques such as a protein assay and Western blotting were used to determine protein abundance. We found that inx7 immunoreactivity was present in the midgut, but was not expressed as a single band at the expected size, suggesting that the protein was degraded or post-translationally modified. Future experiments to localize the cellular expression of inx7 in the midgut using immunohistochemistry will allow for a better interpretation of its roles in intercellular communication in the alimentary canal of Ae. aegypti. Achieving insight on inx7 may lead to new strategies for the possible control of Ae. aegypti and creation of an effective insecticide. This research was completed with The Ohio State University at the Ohio Agricultural Research and Development Center. Funding Acknowledgement: Student Research Opportunities Program

Danno, Amanda

USING BIOLUMINESCENT AND FLUORESCENT TRANSGENIC ORGANISMS AS ENVIRONMENTAL SENSORS

Reporter genes are highly useful in the biotechnology field. Bioluminescence and fluorescence are both examples of the output of reporter gene systems. Bioluminescence occurs when enzymes catalyze light releasing reactions, whereas fluorescent proteins release light of one wavelength when excited by light of another wavelength. We are developing a kit that teaches about reporter genes. In this kit, the model organism Caenorhabditis elegans, a free-living nematode, will be used to detect the presence of heavy metal or other contaminants in water using bioluminescence and/or fluorescence. Heavy metals pose threats to human health and are commonly found in the environment. C. elegans can serve as a model for multicellular organisms due to its sensitivity to heavy metals and conserved stress response signaling pathways. We are currently conducting 'proof of principle' experiments to see if either a bioluminescent or fluorescent reporter gene system is amenable to classroom experiments. For the bioluminescence system, transgenic C. elegans expressing the luciferase gene are used to determine the metabolic state of the nematodes. In the presence of heavy metals, the amount of light released is reduced due to mitochondrial stress, which lowers ATP, a required cofactor for luciferase. When the transgenic worms were exposed to copper sulfate light levels decreased with increasing concentrations of copper sulfate, as measured by a luminometer. Due to the cost of luminometers, we are now trying to determine whether a smartphone camera can be used to capture the bioluminescence. This would allow an instructor to easily share results with students and allow students to be hands on in visualizing the experiment results. The fluorescent system uses transgenic C. elegans that express green fluorescent protein, GFP, under control of a heat shock promoter. We have observed increased GFP in response to stress using a fluorometer fluorescence microscope and black light pen, but the results have not been consistent. Development of this kit will allow students to conduct open ended experiments to test for environmental contamination while learning about reporter gene systems. This is potentially very topical considering recent problems with contamination of public water supplies. Funding Acknowledgement: University of Wisconsin - Whitewater Biological Sciences Department, University of Wisconsin - Whitewater Undergraduate Research Program

Davis, Anthony

COMPARISON OF TRACE ELEMENTS WITHIN GRAY AND RED TILL DEPOSITS IN SOUTH CENTRAL WISCONSIN

Waterloo, Wisconsin has glacial features that are unique in consistency among two variations of differentiating till constructions which are distinctly different in color, consistency and grain size. Glacial tills that have been transported by the Green Bay Lobe and other exogenic processes are typically thoroughly homogenized and consistent throughout, with mixing of sediment grain sizes, color patterns, and elemental construction. These tills however were not homogenized and were instead two separate entities with distinct differences in composition. Based on this discovery we hypothesis that the Green Bay Lobe has transported pieces of the Neda Iron Formation within northeastern Wisconsin in order to make the red till matrix appear within a mix of grey tills with differences in elemental construction. Upon discovering this conundrum we underwent compositional research using specific methods including Particle Size Analysis, X-Ray Diffraction and X-Ray Fluorescence to show differences regarding the two tills. Future goals of the study include trying to find origin of the red till within the matrix and doing comparisons between the Neda Iron Formation and the red till. Funding Acknowledgement: McNair Scholars Program

Davis, Cashae

INVESTIGATING BREWING METHODS

One of the biggest current trends in tea consumption is to cold brew tea instead of doing a traditional hot brew. For hot brewed tea the tea is typically steeped in warm to boiling water for 3-7 minutes. In comparison to the well-established hot brew methods cold brewing tea methods are still being developed. This is because many of the pleasant chemicals extracted from the tea leaves during a hot brew cannot be easily extracted with cold water. To combat this extraction problem the amount of tea leaves used is often increased and also the steep time is drastically altered. This produces a different flavor of tea, but it is not clear how the caffeine content is altered. This study will develop a standard method for the analysis of the caffeine content of differently brewed teas. Funding Acknowledgement: CAS-UGR

Dayfield, Daniel

EXAMINING ATRAZINE ACCUMULATION IN THE HEPATOPANCREAS OF CRAYFISH POST-EXPO

The transformation of American cities caused by urbanization and gentrification has created an outlet where foreclosure and eviction have become sources of capital. Policies that were implemented in the past, such as redlining, have created areas within American cities where poverty is highly concentrated. The low income rates and high housing cost that have resulted from redlining has greatly contributed to the vast amount of foreclosures and evictions within impoverished communities like Washington Park. Consequently, these communities are exposed to the negative impacts associated with living in areas that have large amounts of vacant homes and homeless residents. This research presents a vivid century long pictorial, structural and economic transformation of two foreclosed homes that were used for the case study. These houses are in the Washington Park Neighborhood in Milwaukee, WI, once a vibrant middle class neighborhood, but has since morphed into a poor neighborhood as a result of redlining. One home was vacant and the other was filled with the belongings of the previous tenant who had been evicted. This study aims to examine how foreclosure and eviction impacts the architecture and cultural landscape of the community. The findings from this research shows that the interconnectivity between income, foreclosure and eviction has created an inability for Washington Park residents to become self-sufficient. As a result, the architecture of the homes has deteriorated over time because most of them are hardly utilized or repaired. The cultural landscape has diminished due to the displacement of community members and the disinvestment in jobs and other basic resources throughout the neighborhood. Homes tell a story about a community or individual's character, investment, class and power. This research provides a historical perspective of the Washington Park Neighborhood as well as details that could be used for revitalization. In addition, the results could broadly provide insight to some of the challenges that are disabling impoverished communities from becoming stable—economically and socially. Funding Acknowledgement: Work reported in this abstract was supported by the National Institutes of Health Common Fund and Office of Scientific Workforce Diversity under three linked awards RL5GM1189XX, TL4GM1189XX, 1UL1GM1189XX, NRMN U54GM119023 and CEC U54GM119024 administered.

Deligiannis, Marina

WADING THROUGH THE WATER: WATER QUALITY AT NAHANT MARSH

Water quality plays an important role when it comes to maintaining a healthy marsh and protecting biodiversity. Marshes act as buffers for the ecosystem in which they are located by filtering different pollutants that enter the marsh from neighboring land. My research focuses on Nahant Marsh in Davenport Iowa. Nahant watershed is shared between residential, agricultural and industrial land therefore collecting water runoff from all of these different environments. For my methodology I tested four main points at Nahant, levels of nitrate, chloride, calcium, dissolved oxygen, phosphates, and pH. On testing days which occurred once a week for 6 straight weeks during the months of June and July, I took note of the time of day, water temperature, outside temperature, surrounding land use, any noticeable smells coming from the marsh and how much rainfall occurred over the preceding 24 hours. The four testing sites that I studied were where (1) the water enters the marsh, (2,3) through the marsh and then (4) where Nahant releases into the Mississippi River. These four points allowed me to observe any trends showing the improvement of water quality as it traveled through the marsh. Although I still have more research to conduct, there is a trend that the marsh is in fact doing its job as a buffer for different substances that enter the marsh. One way that this trend is represented is by looking at the levels of dissolved oxygen and nitrate and how the levels of each lessen as we test through the four sites. I plan on testing the water quality through the fall and early winter months to collect a larger data set. I also am looking into the land use history of Nahant to provide a better understanding of how land use and the water quality of Nahant are related. Funding Acknowledgement: LSAMP Inspire Program and Nahant Marsh Education Center

Diallo, Mouhamad
ENHANCED THERMAL PROPERTIES OF N-EICOSANE PHASE CHANGE MATERIAL WITH NANOPARTICLE DISPERSIONS
Phase change materials (PCMs) are increasingly being investigated especially for solar devices because of their ability to act as an efficient thermal storage material. However, thermo-physical property characterization of new potential PCMs is not well established in the literature. This work presents a combined experimental and molecular simulation guided analyses for determining the thermo-physical properties such as density, thermal conductivity and viscosity, of a low temperature paraffin based PCM – n-eicosane [CH3(CH2)18CH3]. Our initial simulation results are in accord with our experimental findings. To further explore the possibility of an increase in heat transfer, we introduce graphitic and metallic nanoparticles in the PCM. The role of nanoparticles in bringing about variation in heat transfer and fluid flow characteristics is one of the significant aspects of the present investigation. Funding Acknowledgement: LSAMP IINPIRE, NSF

Dumre, Sabita
SCREENING OF A PEPTIDE LIBRARY FOR A NEUROPROTECTIVE BINDING TARGET
Emerging evidence has shown that the well-known glycolytic enzyme, glyceraldehyde-3-phosphate dehydrogenase (GAPDH), interacts with numerous binding partners in the cell to perform a wide range of functions, including the mediation of cell apoptosis. The subsequent identification of small molecules that inhibit apoptosis and provide neuroprotection in cell culture and animal models, through their binding interaction with GAPDH, suggests that this protein may be a potential target for the treatment of neurodegenerative disorders. With the emergence of combinatorial library design and screening strategies, peptides provide an attractive scaffold to select individual sequences in the laboratory with desired interactions with a defined target, from a large collection of candidate sequences. In this project, we utilized phage display to screen trillions of unique peptide sequences for interactions to GAPDH. Multiple rounds of biopanning and amplification enriched the library over 10 billion-fold for binders to GAPDH. Preliminary analysis of selected peptide sequences has identified members known to interact with GAPDH, as well as novel sequences which could elucidate other cellular interactions as well as possibly be considered candidates for future cellular neuroprotective studies. Funding Acknowledgement: Luke Bradley, University of Kentucky College of Medicine

Dzide, Kenan
LECTIN AFFINITY CHROMATOGRAPHY AND IMMUNOEXTRACTION TO STUDY GLYCOSYLATION OF AGP
There are nearly 3 million cases of Arrhythmia per year in the U.S. Cardiac Arrhythmia occurs when electrical impulses in the heart have an abnormal rhythm. In addition, 610,000 people die annually in the U.S. due to heart attacks. Specific pharmaceuticals such as disopyramide and warfarin are known to alleviate abnormal heart rhythms and heart attacks; respectively. Alpha1- acid Glycoprotein (AGP) is an acute phase glycoprotein of the human body that acts as an important carrier protein for many of these basic pharmaceuticals. AGP has heterogeneous glycosylations which consist of three different types of glycan structures: di-, tri-, and tetra- antennary branched complex-type glycans. It is our long term goal to analyze how these branchings can affect its drug binding properties. Lectin affinity chromatography and immunextraction will be used as a tool to study the effect of glycosylation on its drug binding properties. Concanavalin A lectin affinity chromatography will be used to separate AGP into glycoforms with different degrees of branching. These glycoforms will be collected and further captured into an anti-AGP immunoextraction microcolumn. Disopyramide will be used as a model drug to investigate the interaction of this drug with the captured AGP glycoforms. Funding Acknowledgement: National Science Foundation

Ellis, Radaya
TRPC3 AND NFATC1 AND THEIR EFFECTS IN PROMOTING ATRIAL FIBRILLATION
Background: Atrial fibrillation (AF) is the most common cardiac arrhythmia, which is an irregular heartbeat, and a major cause of cardiovascular morbidity and mortality. Several members of an Utahan family have a shared a mutation in the NFATc1 gene that correlates with inherited AF. We used inducted pluripotent stem cells derived from members of the family to investigate the mechanisms by which the M527L mutation of NFATc1 contributes to AF. NFAT proteins are a family of transcription factors activated by calcineurin, a calcium (Ca2+)-dependent phosphatase. The Calcineurin- NFAT (Cn/NFAT) system can promote by AF via transcriptional regulation of miR-26, a common pathway for at least 2 important changes in ion channel function associated with AF. One of those changes involves the regulation of TRPC3, an ion channel that mediates calcium the movement into cell. TRPC3 upregulation in AF is due to repression of its regulatory microRNA, miR-26, under the control of NFATc3. Moreover, previous research determined acute activation of cardiac TRPC3 increase contractility and promotes arrhythmias. Based on this information, we hypothesized that the M527L mutation of NFATc1 promotes atrial fibrillation via misregulation of TRPC3 in cardiomyocytes. Methods: Cardiomyocytes were derived from induced pluripotent stem cells (iPSCs) of two patients with the M527L variant of NFATc1 and two unaffected siblings. Quantitative Polymerase Chain Reaction (qPCR) was used assess the expression of the NFAT family and TRPC3. Results: All cardiomyocytes cell lines showed expression of TRPC3 channels. However, there was inconsistent data to support my hypothesis that TRPC3 aides NFATc1 in promoting Atrial Fibrillation. Micro-RNA expression was tested in the iPSCs however there was no indication of expression. Conclusion: Atrial Fibrillation is a major cause of heart disease and affects all ages. This research tested if TRPC3 aids NFATc1 in promoting AF the research gather was insufficient to determining if hypothesis is supported or rejected. Future research should focus on the relationship of TRP channels and micro-RNAs (mRNA) since mRNA have been demonstrated involvement in Atrial Fibrillation. Funding Acknowledgement: NSF funded through Medical College of Wisconsin minority initiative

Esparza, Jessica

INSULIN AFFECTS BIOFILM FORMATION BY PSEUDOMONAS AERUGINOSA

Diabetes is one of the most significant chronic healthcare problems in the United States. Diabetes falls into two categories, Type 1 or "juvenile onset" diabetes and Type 2 or "adult onset" diabetes. Early onset diabetes is usually treated with supplemental insulin. Recently, it has been noted that bacterial infections in diabetics treated with insulin are characterized by more biofilm growth compared to infections occurring in non-diabetics, and thus are more difficult to treat. This research focuses primarily on the effect of insulin on biofilm formation in the presence of 250 ug/mL of purified fish sperm DNA. Biofilm formation in the presence or absence of 0.1-1.0 ng/uL of insulin was investigated using the 96 well plate method and two strains of Pseudomonas aeruginosa, PA01 and PA14. P. aeruginosa was incubated overnight in 25 mL of TSB media at 37 degrees Celsius and 180 rpm. The crystal violet assay and spectrophotometry were used to determine absorbance in wells, an indirect measure of the amount of biofilm formed. All treatments were carried out in replicate sets of 8 wells per treatment. Significance was determined by T test. Trials indicate that insulin increases biofilm formation in PA01 but decreases it in PA14. The reason for the difference in response of the strains to the presence of insulin is unclear. PA01 is an environmental isolate, while PA14 is a clinical isolate, although the origin of the isolates may or may not affect the in vitro biofilm response. Funding Acknowledgement: LSAMP INSPIRE Program

Faronbi, Paul

MACROPHAGES REPROGRAMMING USING MICROPARTICLES TO REDUCE ANTI-INFLAMMATORY RESPONSES

Microparticles are an interesting and growing field of study that have the potential to transform the way peripheral nervous system injuries are treated. They have proven to be an effective method of drug delivery because its small size limits the body's autoimmune response. It was hypothesized that proteins could be adsorbed to the surface of a polymer to maintain a sustained release of it as the polymer slowly degraded. For this study, 20-80 CPTEG-CPH polymer was manufactured using spraying drying techniques for the reaction. From here, the polymer was submerged in a solution of interleukin-4 (iL-4) for an in-vitro study of interactions with transdifferentiated mesenchymal stem cells (tMSCs) and undifferentiated mesenchymal stem cells (uMSCS) from Brown Norway rats. An experiment to study the survival and migration of these cells in the presence of macrophages was developed that consisted of using cell inserts and Boyden chambers. The two experiments were run simultaneously to compare how M1 and M2 macrophages would interact with the mesenchymal stem cells. A CK8 cell counting assay and Sytox green staining were done at the end of the experiment for quantitative analysis to see how many cells survived and how they migrated. A Meta-Xpress image analysis software was used to compile images of the staining patterns and compare it to previously acquired data to form a release profile of iL-4. The results show that sustained release of the iL-4 could lead to significant strides in peripheral nervous system repair research. This would be helpful in using the macrophage infiltration that occurred in a previous experiment when a PLA conduit was used to stimulate nervous system repair. Further replicates will be done before in vivo studies in Brown Norway rats will be pursued as the next step in developing an effective method for treating peripheral nervous system injuries. These microparticles provide a hope of using M1 macrophages to our benefit, which would be revolutionary for stimulating nerve growth after a traumatic injury or disease. Funding Acknowledgement: This research is largely funded by the US Army Medical Research and Material Command grant.

Frost, Shyleen

WATER QUALITY FOR HUMAN AND ENVIRONMENTAL HEALTH IN THE GAMBIA

This study measured the water quality of various water sources in the Gambia, a small country in West Africa. The Gambia River is one of the largest rivers in Africa, which is used for many purposes in the country including irrigation, transportation, cooking, cleaning, and in religious ceremonies. The Gambia is one of the lowest ranked countries worldwide for environmental performance and management of water resources. During a previous visit, UIS faculty and students observed the use of a city dump site (Bakoteh) and its effects on the local population. Visitors noticed the lack of waste management and the use of a pond on the site for watering vegetable plants. In this study, water was collected at the Bakoteh dump site for chemical analyses, along with village well water and sites along the river. The water quality was assessed using multiple parameters such as turbidity, coliforms, pH, chlorophyll, dissolved oxygen, ammonia, temperature, nitrate, and total phosphorus. Samples taken in close proximity to the dumpsite showed a lower level of water sanitation than the sites which were further away. The results showed increased levels of chemicals (ammonia, nitrate, phosphorus), contaminants of concern (e.g. Cr(VI) 0.061 ± 0.023 mg/L), and E. coli. The Gambia River had lower levels of pollution (e.g. $NO_3^- < 6$ mg-N/L) than the Illinois River, but when compared to WHO or US sanitation standards, none of the sample sites were found to be safe for drinking or cooking. Many steps need to be taken to improve the quality of waste management in the country and to educate the public, especially in regards to water at the Bakoteh dump site. Funding Acknowledgement: Hach Company

Fuentes, Gabriela
SYNTHESIS, CHARACTERIZATION AND APPLICATION OF LITHIUM INTERCALATED BORON NITRIDE NANOTUBES
Synthesis of Lithium Intercalated Boron Nitride Nanotubes (Li-BNNT) was conducted in an attempt to gain access to their promising applications for electronics, lithium batteries, hydrogen storage, and supercapacitors. Through a series of reactions pure nanotubes intercalated with lithium are expected to show in the product. A variety of reactions are engineered to create optimal conditions for the product and the reaction is conducted at 700º or 800ºC with zinc acting as a catalyst. The products were then purified using hexane and characterized using Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Fourier Transform Infrared Spectroscopy (FTIR), and Energy-dispersive X-ray Spectroscopy (EDX). Further purification, functionalization, and application will be performed to access the promising applications that Li-BNNT offers Funding Acknowledgement: Student Engagement Fund

Garcia, Gabriela
GENE EXPRESSION OF CORN EARWORM IN RESPONSE TO INFECTION BY PSEUDOMONAS AERUGINOSA
Due to an increased selection pressure for insecticidal resistance, more and more insect pests are becoming resistant to insecticides making them progressively harder to control. Due to this selection pressure, an alternate form of pest control has been utilized; the development and application of different types of microbial pathogens for the control of pests. Work on the development of new insect control methods require that we understand the mechanisms involved in pathogen infection and resistance. We examined how a common pest the corn earworm, Helicoverpa zea, reacts when exposed to the pathogenic Pseudomonas aeruginosa, by measuring the transcriptomic gene expression followed up by key insect detoxification, metabolic, and molting genes. Corn earworms were fed on diet treated with broth containing bacteria or control diet for 24 hours. Caterpillar microarrays and Real-time quantitative polymerase chain reaction analysis of caterpillar tissue revealed that caterpillars had a significant increase in the expression of key detoxification genes GOX and CYP, and key digestive genes APEP, LPS, and TRYP in the bacteria treated larvae compared to the control. The expression of azurocidin-like serine proteinase (AZY) showed significant down regulation in the bacteria treated larvae compared to the control. Additionally, the expression of lysozyme (LYZ) was shown to not differ significantly from our control groups compared to caterpillars treated with P. aeruginosa. There was no change seen in the key molting gene ecdysone oxidase (EOX), and a down regulation in ecdysone receptor (ECR) and prothoracicotropic hormone (PTTH) in caterpillars treated with S. marcescens. This study shows the specific gene response in caterpillars in response to the bacterial pathogens P. aeruginosa. Funding Acknowledgement: The Biology Department

Glover, Aliyah
CHARACTERIZATION OF AN INFLUENZA INFECTION MODEL IN PORCINE AIRWAY EPITHELIAL
Background: Cystic fibrosis (CF) is an autosomal recessive disease caused by mutations in the gene encoding the cystic fibrosis transmembrane conductance regulator (CFTR). Our goal is to develop an infection model using a medically relevant virus (influenza), which we can use to study the antiviral responses of cultured airway epithelia from CF and non-CF pigs. Influenza causes acute respiratory infections responsible for seasonal epidemics and occasional pandemics. In a previous study, Xu and colleagues (2006) showed that CF airway cells have a delayed/reduced immune response to influenza A infection. We hypothesized that influenza A would have a dose-dependent ability to infect and replicate in well-differentiated primary cultures of airway epithelia from wild-type pigs. Methods: We are using influenza virus, A/Memphis/4/82 (H1N1), thought to have originated in swine. Well-differentiated porcine airway epithelial cultures grown at an air-liquid interface were infected with this virus at a range of MOIs. At 12 hr, 24 hr, 48 hr and 72 hrs post infection, we collected: 1) washes from the apical surface, and 2) whole-cell lysates. We assessed viral infection/replication by performing western blots on the cell lysates. We also assessed viral replication by performing plaque assays to detect shed virus in the apical washes. Results: Western blotting showed that viral antigen was present in lysates at 48 hr and 72 hr post infection. Viral progeny were detected in apical washes from the cultures at all time points, with a peak in viral shedding at 48 hr post infection. Conclusions: We found that infecting cultured porcine airway epithelia with influenza A/Memphis/4/82 at an MOI of 0.001 is sufficient to produce efficient infection and replication in our culture model, with maximal replication and viral production occurring at 48 hr post infection. We will use the results from this pilot study to guide future experiments using airway epithelia from CF and non-CF pigs. This viral infection model will help us gain insight into antiviral host defense mechanisms in CF airways. Funding Acknowledgement: NSF, NIH grants P01 HL-51670 and P01 HL-091842, HHMI, CFF, and the Roy J. Carver Charitable Trust

Goldsmith, Carrington

HISTOCHEMICAL AND MICROBIOLOGICAL DELINEATION OF THE GASTROINTESTINAL TRACT OF THE MADAGASCAR ROACH

In order to identify the organs and regions of the Madagascar Hissing roach gastrointestinal tract, we used a histochemical approach which included staining for endocrine cells. In addition, we also tested the pH levels throughout the gastrointestinal tract. Using these tests, we were able to posit the function of different regions of the roach gastrointestinal tract. Predictably, we note that many roach features seem to be analogous to mammals, like humans. We were also interested in making observations about the roach microbiome, the native microorganisms that are found within the roach. As the roach gastrointestinal tract was analogous to the mammalian digestive system, we were curious if a human pathogen, E. coli, could colonize the roach. Out of the eight recorded portions within the gastrointestinal tract, the crop, comparable with the mammalian stomach, was not colonized by E. coli. The other seven portions were, however, colonized. Further, we wanted to test whether the behavior of the bacteria isolated from the roaches was different than predigested bacteria. In our swim plate assay and in our preliminary biofilm assays, our findings suggest that there is no difference in the populations of bacteria. Funding Acknowledgement: Work reported in this abstract was supported by the National Institutes of Health Common Fund and Office of Scientific Workforce Diversity under three linked awards RL5GM1189XX, TL4GM1189XX, 1UL1GM1189XX, NRMN U54GM119023 and CEC U54GM119024 administered.

Gumberg, Anna

DEVELOPING A SYSTEM IDENTIFYING COMPOUNDS THAT SUPPRESS DMD NONSENSE MUTATIONS

DMD is a severe neuromuscular disorder caused by mutations in the dystrophin gene, one of the largest genes identified to date. Read-through of nonsense mutations is a promising approach to treating DMD due to its ability to restore a fully functional dystrophin protein. The Bertoni lab has been actively involved in the identification of novel small molecules called read-through compounds (RTCs) which are capable of skipping premature termination codons in the dystrophin mRNA. The main goal of this project was to screen all DMD patient registries reported worldwide on public databases in order to identify nonsense mutations that could be considered hotspots for the dystrophin gene and to generate an efficient reporter system to be used for the screening of RTCs. Among all databases analyzed, 726 patients (approximately 10% of all mutations reported) were characterized by nonsense mutations. These patients were subsequently divided into subgroups based on the location of the specific mutation, the number of cases reported and their geographic origin. DNA segments spanning the mutations were subsequently generated using Polymerase Chain Reaction (PCR) and cloned into a plasmid vector to generate a reporter system capable to rapidly identify and quantitate levels of full-length dystrophin expression restored by RTCs. Competent cells were transformed and colonies were screened using gel electrophoresis and sequencing analysis in order to identify clones containing the desired vector. These vectors will be instrumental in future studies in the lab and can ultimately lead to the identification of an efficient RTC to be administered to patients. Funding Acknowledgement: SMC UCLA SRI

Havenridge, Shana

DIP-PEN NANOLITHOGRAPHY PATTERNED FUNCTIONAL FILMS AS REACTIVE LAYERS FOR CLICK REACTIONS

Dip-Pen Nanolithography (DPN) is a scanning probe lithography technique to generate functional molecular patterns on the nano-scale size, with their main application focusing on biomolecular studies. This research project investigates the potential of phospholipid-based reactive inks, written on polymer-based substrates by DPN, for thiolene click chemistry. Previously, shadow mask-based UV lithography has been utilized to spatially control these reactions. However, this approach is strongly limited in lateral resolution, as the UV exposure may only be performed under specific parameters. As an alternative route, DPN may provide a significantly improved resolution. In this work, different thiolene-terminated click-reactive compounds, such as allyl alcohol, were mixed into phospholipid-based inks, which were then deposited by DPN onto disulfide-modified polymer surfaces, to control the binding reaction to sub-micron sized dimensions. It will be shown how various process parameters, including reagent concentration, writing speed and process humidity, influence the binding results. Funding Acknowledgement: National Science Foundation, Andrea Holmes

Hernandez, Naarai

CO2 SOURCE IDENTIFICATION IN HORSESHOE LAKE USING STABLE ISOTOPE ANALYSIS

In 1989, a series of earthquakes beneath Mammoth Mountain caused a carbon dioxide (CO2)- emitting fissure that greatly increased the CO2 concentration in the soil of the surrounding areas. This increase in CO2 gas has resulted in the mass kill of lodgepole pine trees and vegetation, most notably in the Horseshoe Lake area. Previous studies have examined CO2 gas flux patterns in Horseshoe Lake, however none have attempted to study the direct source of the gas and its potential implications. This study is the first to do so by using stable carbon isotope geochemistry. We measured the CO2, CH4 and H2S gas flux to determine whether other gases were having an impact on the affected area, and how much gas was being emitted. CO2 gas δ13C values were also measured in order to identify the origin of the gas. CO2 gas samples were extracted using a West Systems soil gas flux meter, purified in the lab through a vacuum line, and analyzed by a Nu Instruments Perspective mass spectrometer. All research and measurements were made in the University of California, Los Angeles. Our results showed that high CO2 flux remains throughout the area, while other gases are negligible. Measured CO2 δ 13C values assert that this excess CO2 gas is in fact volcanic, and is not sourced from biological activity. δ 13C values were, in some cases, more positive than expected for volcanic CO2, which may indicate that carbonate rock at depth is decomposing due to increased temperature and releasing CO2. This research helps to identify and quantify natural carbon emissions in the state of California and allows further understanding of the ecological change impacting the affected tree-kill areas around Mammoth Mountain, California. Funding Acknowledgement: SMC-UCLA Summer Research Initiative

Hines, Lane

DEBRIS-COVERED ROCK GLACIERS IN THE ACONCAGUA RIVER BASIN

An inventory of firn fields, glaciers, debris-covered glaciers, and rock glaciers was conducted in order to assess water resources in the Aconcagua river basin of the semi-arid Andes of central Chile. A total of 916 landforms were identified, of which, rock glaciers were the most abundant (669) and occupied the most total area. Glaciers and debris-covered are less numerous, but are larger in comparison. The total area occupied by glaciers and debris-covered glaciers is roughly equivalent to the total area of rock glaciers. Rock glaciers accounted for 20% of the area above snowline (2,000 m). Debris-covered glaciers and rock glaciers were subcategorized into 6 classes based on their ice content through interpretation of surface morphology on high-resolution satellite imagery. Extensive coring data allowed empirical formulas to be developed that associate the size of the landforms to water storage estimates. Minimum and maximum water storage was calculated based on a range of debris to ice content ratios for debris-covered glaciers and rock glaciers. In the Aconcagua basin, rock glaciers accounted for 48-64% of the water stored within the landforms analyzed; glaciers accounted for 15-25%; debris-covered glaciers were estimated at 15-19%; firn fields contained only about 5-8% of the water stored. According to an NDVI analysis, irrigated agriculture has expanded 62% (664 km2) from 1989 to 2010. The majority of this expansion has occurred in the foothills of the valley in less fertile soils. The valley has experience a reduction in winter precipitation of about 30-40% because of ENSO events (La Niña), which has produced a mega-drought since the year 2000. By mid-summer, less than 10% snow cover typically exists within the basin, suggesting that snowpack is a seasonal, temporary water resource. The water stored within rock glaciers provide a significant late season addition to stream flow to support irrigation during drought. However, these landforms are being removed for exploitation of mineral resources such copper. In order to develop long-term, sustainable solutions, the importance of the water stored in rock glaciers or other alpine permafrost landforms such as talus slopes must be weighed against the economic value of mineral resources. Funding Acknowledgement: Colorado Opportunity Alliance MInority Program

Huss, Maya

STEALTH AND CELL PENETRATING NANOPARTICLES IN CERVICAL CANCER TISSUE MIMICS

Background: Cervical cancer is highly prevalent in developing countries, due to an insufficient access to health care. Inadequate screening combined with a lack of vaccines often leads to undetected tumors and elevated mortality rates. Relative to preventative options, cervical cancer treatments are often invasive and painful procedures that include surgery, chemotherapy, and radiation. For systemic chemotherapy in particular, it is challenging to achieve distribution within the tumor, thereby harming normal noncancerous cells in the process. As an alternative, polymeric nanoparticles (NPs) may be used as drug and gene delivery vehicles to target and/or enhance the distribution of therapeutic agents in cervical cancer tumors. To date, in vivo studies are the primary method of evaluating distribution; but require limited patient samples and expensive animal models. To circumvent this challenge, three-dimensional (3D) cell culture models can be utilized to create a more physiologically relevant in vitro system to assess and predict NP distribution. Objective: In this study, our goal was to evaluate the penetration and distribution of stealth and cell penetrating NPs through three types of 3D tumor models: liquid overlay spheroids, hanging drop spheroids, and multicellular layers (MCLs). We used these 3D models of three different cervical cancer cell lines (HeLa, CaSki, and SiHa) to represent different stages of cancer progression: nascent tumors, mid-stage avascular tumors, and stratified epithelial layered tumors. Hypothesis: We hypothesized that NP co-treatment would offer the greatest penetration and distribution within the tumors, relative to unmodified NPs. Methods: To test our hypothesis, we utilized confocal microscopy to image the 3D tumors, and analyzed the images with ImageJ software to evaluate NP distribution within the different tumor types and cell lines. Results: We found that MPG and MPG-PEG co-treatment NPs often offered the greatest distribution within the 3D tumor models relative to unmodified NPs. However, NP distribution in the tumors varied based on cell and tumor types, due to their differing sizes and morphologies. Conclusions: NP co-treatments offer a promising method to enhance delivery to and the treatment of cervical cancer. However, tumor composition and morphology must be considered in the early stages of therapeutic screening and development to establish the best treatment type. Funding Acknowledgement: Research is supported by the University of Louisville Cancer Education Program NIH/NCI R25-CA134283.

Hutchison, Kennen

MOSQUITO MAYHEM: ARE ILLINOIS MOSQUITOES READY FOR CHIKUNGUNYA?

Chikungunya virus (CHIKV) is a flavivirus that is transmitted by Aedes aegypti and Aedes albopictus mosquitoes. Although the virus has a low mortality rate in humans, it causes third several severe symptoms. In 2005, an outbreak of CHIKV was identified on the French La Reunion Island and infected more than a third of the island's population. This outbreak was later attributed to a CHIKV strain that exhibited a single amino acid change in the viral glycoprotein, and used the Ae. albopictus mosquito as a vector. The mutation, an alanine to valine change at amino acid 226 (A226V), allowed for a leap in vector, from Ae. aegypti to Ae. Albopictus and resulted in a high number of CHIKV cases on the island. The fact that one amino mutation can expand vector competency throughout Aedes species is of interest to our lab. The aim of our project is to identify if other amino acid mutations in CHIKV's glycoprotein could permit or increase CHIKV competency in Aedes species currently located in west-central Illinois. At this time, invasive Aedes species albopictus, japonicus and. triserriatus are found throughout Illinois. The results of our study will help to indicate if west-central Illinois currently has a mosquito vector that is competent for CHIKV infection and could therefore put the communities of west-central Illinois at risk of facing the virus before the invasion of Ae. aegypti reaches our state. As a secondary objective, our research will look at the mechanisms of viral entry by CHIKV into mosquito cells. Funding Acknowledgement: Western Illinois University

Ibarra, Gabriela

HEDGEHOG-GLI INHIBITION IN DIFFUSE LARGE B-CELL LYMPHOMA

The goal of this project was to examine the potential role of GLI transcription factors in the different subtypes of Diffuse Large B-cell lymphoma (DLBCL). DLBCL is an aggressive lymphoma that is further subdivided into activated B cell (ABC) and germinal center B cell (GCB) like subtypes. Each type responds to therapy in a different way. Our lab investigates the role of GLI transcription factors in cancer. We investigated GLI1-3 expression by qPCR in 12 DLBCL cell lines belonging to ABC and GCB DLBCL. We found an increase in GLI3 expression in GCB subtype, but that did not reach statistical significance, possibly due to the small sample size. We therefore used publically available data published on Gene Expression Omnibus (GSE10846) to analyze the expression of GLI1, GLI2 and GLI3 in the DLBCL subtypes. Comparing the expression of GLI1-3 in ABC and GCB DLBCL, we found a significant increase in GLI2 ($p=.0021$) and GLI3 ($p<.0001$), but not GLI1 expression in GCB DLBCL. We used DOHH2 cells (GCB subtype) and RIVA cells (ABC subtype) to examine the effect of inhibition of GLI through either the hedgehog (HH) signaling or GLI directly on cell growth. We performed XTT assay to examine the effect of HH inhibition using Cyclopamine or GLI1/2 inhibition using Gant61 on DOHH2 and RIVA cells. Inhibition of HH and GLI1/2 had no effect on cell growth. To target GLI3, we used RNAi to inhibit GLI3 expression in DOHH2 cells. We were able to knockdown GLI3 expression in DOHH2 and are currently examining the effect this has on cell growth and cell survival. Funding Acknowledgement: OSEEL

Jacobs, Jontavius

AN EXAMINATION OF HUMAN SPACE EXPLORATION: THE MARTIAN FRONTIER

Human space exploration helps address fundamental questions about our place in the universe and the historical context of our very own solar system. In the midst of addressing the challenges related to human space exploration, we have steadily paved new roads toward creating new technological innovations, cutting-edge industries, and fostered countless peaceful diplomatic connections worldwide. The planet Mars has always been as such, a source of pioneering inspiration for both astronomers and scientists alike. Much of the planets' discovered history and planetary characteristics have proved to share vast similarities to Earth's anatomy. But even so, there still remains striking differences between the two planets that we have yet to begin to understand. In the more recent discoveries over the past decade, exploratory missions of Mars by space probes and autonomous lunar rovers have discovered the strongest evidence of water flow on the Martian surface. In the course of expanding Martian exploration, humanity can build upon these discoveries made, and continue to push the boundaries in our greatest search for new signs of life in space. Investigations of Mars' geological evolution can also provide insight for improved scientific methods that can be applied toward making mankind's impact on planet Earth less detrimental. The scope of this research is to examine the National Aeronautics and Space Administration's (NASA) exploratory robotic and scientific Mars missions, and further investigate data obtained throughout the Martian research NASA has completed. This was accomplished with the assisted articulation of NASA's National Collegiate Aerospace Scholars Program, in an encompassing study of past, present and future purposed Mars missions. Identifying the human impact that can be made by discovering new frontiers on Mars highlights the significance of human space exploration, in the cultivation of our human race. Curiosity and exploration have deemed to be vital aspects of nourishing the human spirit. Accepting the challenge of going deeper into space, invites the citizens of the world today and the generations of tomorrow, to be captivated to join the STEM community on this exciting journey forward. Funding Acknowledgement: Funding for this poster presentation is supported through a grant from the National Science Foundation LSAMP Program.

Jaime, Jaime

RESOLUTION OF IMPERFECTIONS IN OPTICS, SENSORS, AND ATMOSPHERIC TRANSMISSION

Every image taking device has imperfections in optics, atmospheric transmission and image sensor imperfections. These imperfections vary by system. Some examples of variation include not having the same sensor sensitivity, accuracy and leakage phenomena that varies from pixel to pixel and temperature variations distorts pixel readings. To achieve accurate readings of an image we have to compensate for these imperfections. We tested several techniques to minimize their impact on image accuracy. We determined the best techniques to counteract their effect and achieve high image accuracy using various configurations of hardware: telescopes, cameras, hard disk drive(HDD) recorder and filters to capture images. We captured images on different dates to test various atmospheric conditions. Our configuration varied for each trial for Trial 1: Star-shoot 8-bit camera with optical density one combine with a Coronado telescope with a 60mm diameter with built in filters. Trial 2: Star-shoot combine with an Orion telescope 100 mm diameter with back loaded ultra-violet calcium filter at 393 nanometers wave-length. Trial 3: Coronado telescope with a 60mm diameter with two built in hydrogen filters at 656 nanometers wavelength with no additional filters, high definition video converter. We used Regi-Stax and Image-J software to stack the images to reduce the noise, calibrate and off-set imperfections. We successfully saw improvements in image quality and accuracy. In future research these techniques can be tested with more configurations of hardware and software to further improve image quality and accuracy. Funding Acknowledgement: SMC/UCLA Summer Scholars Research Program

Jivani, Mariyam

COST-OPTIMIZATION OF A COMPACT, LIGHTWEIGHT AUTOMATED 2D SPERM HEALTH ANALYSIS PLATFORM

The on-going hardware revolution has enabled the digitization of biomedical sensing and imaging devices. Conventional optical light microscopes require expensive and bulky lenses that make them fragile and difficult to use in field settings. In recent years, our lab has developed a lens-free holographic microscopy platform, which replaces the lenses in a microscope with image sensors and computational methods, and demonstrated its capability as a 2D sperm health analysis platform. This approach not only makes these microscopes cost-effective but also enables portability without compromising the spatial and temporal resolutions of the microscope. For the development of a potential consumer device in the same modality as one of our existing sperm health analysis platforms, we identified the image sensor as the only costly component and developed a test bed for installing and comparing more cost-effective image sensors (i.e., <$200) while retaining the sperm tracking capabilities of our current platform. We identified a variety of commercial off-the-shelf image sensor platforms between $10-$100 and tested their capabilities by imaging micron-scale beads and counting the beads in the reconstructed hologram images to estimate sperm count measurement performance against our current platform. We further aim to evaluate applicable sensors by imaging live sperm samples and tracking sperm movement in the reconstructed holograms to estimate sperm motility performance. This lensfree microscopy platform can enable the creation of portable and cost-effective 2D sperm health analysis systems potentially deployable in field and clinical settings for automated sperm counting for human fertility as well as animal breeding applications. Funding Acknowledgement: SMC-UCLA SRI STEM Program, Ozcan Research Lab (UCLA), and its funders

Johnson, Jasmine

DIPEPTIDYL PEPTIDASE 4 INHIBITORS AUGMENT THE ACTIVATION OF CARDIAC FIBROBLASTS

Dipeptidyl Peptidase 4 (DPP4) inhibitors, for example sitagliptin, are a class of antidiabetic drugs that increase insulin release by blocking the metabolism of incretins, which are insulin releasing hormones. Several randomized controlled clinical trials and observational studies suggest that DPP4 inhibitors increase the risk of heart failure, although the mechanism remains unclear. We hypothesize that DPP4 inhibitors, by blocking the metabolism (inactivation) of peptides such as SDF-1α, neuropeptide Y (NPY), and peptide YY (PYY), stimulate the proliferation of and extracellular matrix production by cardiac fibroblasts (CFs), a process that could induce cardiac fibrosis and dysfunction. To test this concept, we examined whether sitagliptin augments the effects of SDF-1α, NPY, and PYY on cell proliferation (by cell counting), total collagen production (by proline incorporation), and collagen I synthesis (by ELISA) in CFs obtained from genetically hypertensive rats. The results showed that both NPY and PYY augment the proliferation of CFs and that this response is enhanced by sitagliptin. Similar results were obtained with SDF-1α. To date these findings support our hypothesis and suggest that antagonists of SDF-1α receptors (CXCR4) or NPY/PYY receptors (Y1) could improve the clinical safety of DPP4 inhibitors. Funding Acknowledgement: National Science Foundation, American Society for Pharmacology and Experimental Therapeutics

Jones, Elizabeth

FUTURE PROSPECTIVE MODELING OF HUMAN CARPAL TUNNEL TENDON

Carpal Tunnel Syndrome is a nerve entrapment disease experienced by varying occupational fields. The research community has investigated how tendon gliding may create a fibrosis in the subsynovial connective tissue, which causes increased volume of the soft tissue within the carpal tunnel canal. Preliminary 2-D modeling was based on bench results and limited data of material properties of the tendons of human upper extremities existed. The goal of this research is to begin the process of understanding various components of Carpal Tunnel Syndrome through mathematical three dimensional modeling and to obtain accurate tendon material properties. Data collection included harvesting 49 cadaver forearm flexor tendons, performing tensile and cross sectional area of the flexor pollicis longus, flexor digitorum profundus, and flexor digitorum superficialis tendons. Reported research has used the technique of laser measurement or various slicing techniques of the tendon. It was determined that 5-mm frozen slices were necessary in order to capture a cross-sectional measurement. Image J software was used to obtain the measurements of each cross sectional area. Measurements were completed by three students, the results were compared against each other for linear regression analysis and a student's t-distribution was used to construct confidence intervals and determine the true mean of the measurements. In instanes where it was determined that two of the three measurements were outside of the established confidence intervals, the tendon was measured a second time to verify the accuracy of the measurements. Upon completion, the average cross sectional area was used to develop the beginning tendon structure. This initial tendon structure was constructed in Creo-Parametric. Initial 3-D tendon modeling has been completed in both Creo-Parametric and Abaqus, and includes the material properties to show the gliding movement of the tendons and subsynovial connective tissue. Further tensile and compression test data has been gathered and will be included in the full model. This model will be created in order to quantify the tendons of the carpal tunnel so that the medical community can better understand Carpal Tunnel Syndrome and its potential causes via finite element analysis. Funding Acknowledgement: Heuser Research Award, Bradley University Center for Teaching Excellence and Learning – Special Emphasis Grant Program

Jones, Danielle

ILLINOIS ODONATE SURVEY: CITIZEN SCIENCE IN DUPAGE COUNTY

One of the most exciting developments in the practice of science in the 21st century is the rise of "citizen science". Public engagement in research projects can crowdsource such activities as data collection, analysis, or reporting. This past summer, we participated in one such citizen science project right here in Dupage County, Illinois: "The Illinois Odonate Survey". Modeled on a monitoring project started for butterflies by the Nature Conservancy in 1987, the Illinois Odonate Survey has been crowdsourcing location and abundance counts of odonates (Dragonflies and Damselflies) since 2011. Here, we summarize the methodology and observations from the 2016 field work. We compare our observations to crowdsourced observations at the county level from 2012-2014. In addition to location and abundance counts, the phenology (seasonal flight activity) of a diverse array of odonates is also recorded. This basic natural history information can prove to be invaluable for research on such topics as climate change. Funding Acknowledgement: Dominican University

Kachadimangalam Ramakrishnan, Hemanth Kumar
EMBEDDED PROCESSOR IN REMOTE LABORATORY DEVELOPMENT
The Internet of Things (IoT) has added a new dimension to the world of engineering and Technology. With the advent of IoT, a large number of devices are now being connected to the web for data collection, management, and control. As a subset of IoT remote laboratories allows one to access laboratory equipment over the web for performing experiments. The project investigates the implementation of a remote laboratory using an embedded processor. The embedded processor replaces a full scale computer/server and hence reduces the cost and complexity of remote laboratory design. The embedded processor used for this project is a Raspberry Pi, which is a small scale computing system with its own operating system. At the current phase of this project, a number of actuators and sensors will be connected to the Raspberry Pi and will be controlled over the web. The sensors and actuators are array of light emitting diodes, temperature sensor, liquid crystal displays, servo motor, and ultrasonic sensor. A suitable graphical user interface has also been designed and developed so that remote user can manipulate the controlled entities with very little difficulty. As a software platform, Python is used for interfacing and control activities, while html is used for web design. Funding Acknowledgement: Northern Illinois University

Kahler-Quesada, Arianna
HETEROGENEOUS PALLADIUM-CATALYZED CATELLANI REACTION IN A SUSTAINABLE MEDIA
In this investigation, we have studied the efficacy of heterogenous palladium catalysts in the Catellani reaction. The Catellani reaction is a palladium-catalyzed reaction where, in the presence of norbornene, aryl iodides are ortho-functionalized, followed by a Mizoroki-Heck reaction. Use of Pd EnCat® 30 and Pd/Al2O3 as catalysts led to fairly high yields and good selectivity (41-79%), though leaching of palladium into solution poses an issue for the contamination of the final product. In addition, -valerolactone, a chemical derived from lignocellulosic biomass, was shown to be a sustainable solvent suitable to replace classical organic media for this reaction. Funding provided by: NSF award DMR#1262908) and the American Chemical Society IREU (International Research Experience for Undergratuates. Funding Acknowledgement: American Chemical Society, National Science Foundation (award DMR#1262908)

Karpio, Sylvia
DROSOPHILA MELANOGASTER BEHAVIORAL RESPONSES TO REPELLENT ODORS
The rules by which odor receptors encode odors and allow behavior are still largely unexplored. Although large data sets of electrophysiological responses of receptors to odors have been generated, few hypotheses have been tested with behavioral assays. We use a data set on odor responses of Drosophila larval odor receptors coupled with chemotaxis behavioral assays to examine rules of odor coding. In previous work, we analyzed the coding of attractant odors and the roles of specific odor receptors. In our current project, we are analyzing repellent odors. We have found four odors that act as bona fide repellents, but only at high concentrations. Interestingly, when these repellent odors are mixed with attractant odors, the repellent effect is dominant, either fully or partially. We have examined the repellent effect in a variety of behavioral assays, and the results are robust. We are finally examining mutants of specific odor receptors to determine their role in odor coding. Funding Acknowledgement: Undergraduate Research Assistantship Program (URAP), Dr. Kreher

Kifelew, Jerusalem
CREATING A TEACHING MODULE IN ORDER TO UNDERSTAND NUCLEIC ACID THERMODYNAMICS
Point of care diagnostics devices are aimed at eliminating health disparities in low resource settings. They are cheap, easy to use and offer quick results. These devices involve the amplification of DNA, and employ molecular diagnostic tools such as PCR to do so. PCR is a process which utilizes DNA Denaturation, where the hydrogen bonds that form between DNA and complementary strands break under various temperatures, forming to single strands of DNA. The melt temperature, the point where half of a given solution is single stranded DNA, and half of the solution is double stranded DNA, can be calculated by using fundamental thermodynamic equations. Our goal is to create a lab teaching module in which students can perform experiments measuring the melt temperature of various pieces of DNA with its complementary strand. Learning Objectives were produced, and a lab was designed in order to fulfill each objective. The module consists of a prelab portion, in which students review the basic concepts behind thermodynamics, read and analyze scientific papers, and calculate melt temperatures (by using thermodynamic values as well as industry standard software). The actual lab portion consists of an experiment which tests the effect of DNA length on melt temperatures. Students will then interpret and analyze the melt curves generated in lab. Lastly, during the post lab portion students will brainstorm future experiments and solidify their understanding of how thermodynamic tools can be used to measure various nucleic acid processes, namely denaturation. Funding Acknowledgement: Lutz Research Group, Washington NASA Space Grant Consortium

Legesse, AtakIti

FACILITATING ACCESS TO INFORMATION COLLECTED USING FACIAL RECOGNITION SOFTWARE

The Collegiate Science and Technology Entry Program (CSTEP) and Louis Stokes Alliances for Minority Participation (LSAMP) Program at Onondaga Community College provide student support services such as counseling, academic coaching and tutoring. To optimally allocate resources, CSTEP tracks the students and the services that they use. To improve the tracking of students, CSTEP/LSAMP started investigating the use of the biometrics of facial features last year. The algorithm developed to track student use of support services included capturing student data (their image) upon entering the CSTEP/LSAMP Office, resizing the image for processing and the processing(or feature extraction and classification) to identify the student. Once the student was identified, the student was also queried for the type of service they were using on this visit. The data was documented and prepared for use. The data included student ID, service used, and a timestamp. Students that were not identified were referred to a staff member, but the image capture of the student was completed. The data was saved into a text file generated by MatLab and then accessed through an Excel spreadsheet to facilitate statistical analysis, sorting, filtering, charting and presenting of the data. Limitations to the data collection include dealing with a student not in the face gallery database of CSTEP/LSAMP students. The non-CSTEP student was sometimes matched with an existing student which led us to take another look at the classification system being used (possibly suggesting the use of a different feature extraction function). Future work will also focus on capturing an exit timestamp for a student as well as allowing students to use their voice to provide the type of service needed at their visit. Funding Acknowledgement: CNY Works, Synergy, Mercy Works, Upstate LSAMP, and Onondaga Community College

Long, Darrion

PREDICTION OF ENERGY CONSUMPTION IN BUILDINGS BY SYSTEM IDENTIFICATION

This purpose of this project was to investigate and present multiple modeling methodologies for predicting energy consumption using system identification. The models discussed predicted a systems performance of a unique building using the measured energy input and output. This research is important as it provides concrete options for businesses as they attempt to decrease energy consumption and costs. To test and train the models, data was gathered from an existing building. The data-driven techniques used to process the models were based on a method called black-box modeling also known as system identification. State space, nonlinear, and polynomial mathematical models were tested with different parameters such are temperature, time, and dew point. The results show that the proposed models can output similar energy results, but the model that shows the most precession is the state space model. Additional approaches based on results and conclusion will be implemented in upcoming revisions of this research that will consist of optimization and further analysis of inputs that affect energy consumption for more defined models. The developed model can be eventually be used for energy assessment and diagnosis of a currently used system. Funding Acknowledgement: NCAT REU Program, Department of Energy MSIPP Program - Consortium for Advanced Manufacturing.

Lovings, La'Nese

SYNTHESIS AND CHARACTERIZATION OF ALXSC2-XMO3O12 USING NON-HYDROLYTIC SOL-GEL METHODS

Positive thermal expansion (PTE) of materials has been known for many years. Recently, negative thermal expansion (NTE) materials have been explored for use in composites to counteract the undesirable positive thermal expansion of other materials in certain applications. Here we study NTE materials in the A2M3O12 family (A = trivalent cation, M = Mo, W). In this family some materials undergo a phase transition from an orthorhombic NTE phase at high temperatures to a PTE monoclinic structure at low temperatures. This project aims to determine the factors that affect this phase transition as well as the temperatures where it occurs. Some trends have been proposed, but not all materials can be described by these trends. For example, AlScMo3O12 shows a much lower transition temperature than either Al2Mo3O12 or Sc2Mo3O12. The goal of this research is to synthesize mixed A-site occupancy materials and probe their phase transition behavior as a function of composition. Various AlxSc2-xMo3O12 compounds have been synthesized using non-hydrolytic sol-gel methods, and their variable temperature behavior characterized.

Macias, M.; Rashidi, E.; and Valenzuela, S.

CONSTRUCTION OF HAND OPERATED CENTRIFUGE

The primary goal of this project was to construct a hand-operated centrifuge that could work for small and large test tubes (larger than 20 mL) as well as separatory funnels. A major driving force behind this project to construct a manual centrifuge that is more cost efficient than conventional, electronically powered centrifuges and is also environmentally friendly. The centrifuge can be accessible and affordable for academics and research facilities with limited access to electricity and monetary funds. Centered around global citizenship, this project is related problems that can be solved through scientific research. For example the main goal of this research group is extraction, identification and quantification of provitamin-A carotenoids in staple crops. Vitamin A deficiency is one of the main causes of malnutrition in developing world. The centrifuge constructed was versatile and adaptable meaning that it can be used not only for small test tubes but also for large test tubes and separatory funnels. Breaking the emulsion caused by immiscible solvents during extractions within the separatory funnel speeds experiments up and also saves ionic solids used to aid in separation. The internal mechanism of the constructed centrifuge is a 90o spur gear derived from a metal egg beater, which was transformed to build the centrifuge in combination with sheet metal and wood. A number of power tools were used to make the modifications, including a power drill, dremel and a milling machine. All the materials used to bind, bolt, and tighten the centrifuge were purchased from a local hardware store. Two removable platforms were developed so the user could either centrifuge up to four large test tubes or four separatory funnels in two sizes. The centrifuge can easily reach 180 revolutions per minute (rpm). It was designed to provide comfort, stability, and effectiveness. The centrifuge constructed will be used as prototype to develop more cost-effective and reproducible hand-operated centrifuges which will be inexpensive and widely available. Other potential future paths of this project include improvements of design to increase the rpm, decrease waste (wood, sheet metals, electricity), and creating a detailed schematic for reproduction in different settings. Funding Acknowledgement: Northrup Grumman, Marvin Elkin Chair of Excellence in Physical Sciences Grant as a part of SMC Foundation

Macias, M.; Rashidi, E.; and Valenzuela, S.

EXTRACTION AND QUANTIFICATION OF TOTAL CAROTENOIDS USING GREEN SOLVENTS

Carotenoids are a yellow to red pigment found primarily in plants which provide various health benefits such as boosting immune system, vision and other health benefits. There are many different carotenoids found in nature and few are vitamin A precursors and antioxidants. Over the years many experiments have been conducted on extracting carotenoids from fruits and vegetables using environmentally unsafe organic solvents such as hexane and acetone. The purpose of this experiment was to determine whether or not green solvents can be a successful substitute for conventional organic solvents within classroom applications. Coconut oil, sunflower oil, safflower oil, and grapeseed oil were used to extract carotenoids using solid-liquid and liquid-liquid extraction. The absorbances of the resulting extracts were analyzed using a spectrophotometer. An established calibration curve was used to calculate the concentration of carotenoids within the samples. The concentrations were then used to calculate the mass of the carotenoids within the samples. The concentrations were then used to calculate the mass of carotenoids in micrograms per gram of sample (µg/g). The results indicated that coconut oil was the most efficient solvent with a mean of 207 µg/g (8.24). The lowest extraction value was found to belong to grapeseed oil with a mean of 143 µg/g (18). It was concluded that of all the green solvents used, the coconut oil provided an efficient and sustainable method for the extraction of carotenoids; the similarities in polarity between the oil and non polar carotenoids, coupled with the oil's transparency, it was a perfect platform to extract the carotenoids in red yams. Funding Acknowledgement: Northrup Grumman, Marvin Elkin Chair of Excellence in Physical Sciences Grant as a part of SMC Foundation

McKelphin, Courtney

KINETIC STUDY OF CATALYTIC DECARBOXYLATION/DECARBONYLATION OF TRIGLYCERIDES TO FUEL-LIKE HYDROCARBON

The use of algae to capture CO2 from coal-fired power plants constitutes an innovative solution in the field of carbon capture and utilization, particularly because algae can intermediate the conversion of these emissions into valuable fuels such as biodiesel and green diesel. However, there are several problems associated with the high oxygen content of biodiesel that render it a less than ideal biofuel. Similarly, the method currently used to deoxygenate algae oil to fuel-like hydrocarbons – hydrotreating – is problematic due to the high pressure of hydrogen and the sulfided catalysts required. Decarboxylation/decarbonylation (deCOx) is an advantageous alternative because this process produces drop-in hydrocarbon fuels without the problematic requirements of hydrotreating. In this project the kinetics of the catalytic conversion of pure triolein (a model compound representing algae-derived lipids) in dodecane was examined as a means to gain fundamental understanding of how algae oil is converted to hydrocarbons via deCOx. This study required the use of a reactor and a series of reaction conditions designed to eliminate diffusion limitations – which was accomplished by minimizing heat and mass transport resistances – while ensuring operation in differential mode and at steady-state. The effect of critical variables including reactor and particle size, catalyst dilution, and the nature of the reaction (heat effects, equilibrium conversion, vapor-liquid equilibrium) was considered. By establishing the kinetic parameters of this reaction, such as activation energy and reaction order, we intend to elucidate the relevant kinetic pathways and optimize yields of fuel-like hydrocarbons. Funding Acknowledgement: KY-WV LSAMP, NSF KY-EPSCoR

McKnight, Brandi

SYNTHESIS OF SMALL MOLECULE BIOMARKER RESULTING FROM OXIDATIVE DAMAGE TO DNA

Highly reactive oxygen species produced through endogenous processes such as cellular respiration or exogenously through ionizing radiation tend to proliferate during oxidative stress, and cause severe damage to DNA, proteins and other macromolecules. Various conditions such as heart failure, cancer, and Alzheimer's have been linked to oxidative stress. Site selective generation of DNA damaged products is an effective means to generate the damaged DNA lesions, study the mechanisms involved in their formation and determine their metabolic fate. Here, a photolabile group is introduced in the in the 2-deoxyribose of thymidine with the goal to generate a at the 5¢-thymidinyl radical at that specific site. Photolytic cleavage followed by the successful characterization and quantification of the resulting fragments can help to identify additional biomarkers for oxidative stress. The 5′-thymidinyl radical precursor was synthesized in 8 steps starting from commercially available thymidine. Bisprotection of the 3′ and 5′-hydroxyls was achieved using TBDMSCl before selective acid catalyzed desylation and oxidation at the 5′position yielded a 5¢-aldehyde. Wittig methylenation followed by a hydroboration oxidation generated a 6¢-primary alcohol that was further oxidized to an aldehyde. Finally, the generation of the photolabile methyl ketone group was achieved by subjecting the aldehyde to a Grignard reaction followed by a Dess-martin oxidation. The precursor will then be irradiated to generate the 5¢-thymidinyl radical. The reaction products will then be analyzed using high performance liquid chromatography and mass spectrometry. Funding Acknowledgement: The National Science Foundation, The University of Toledo Undergraduate Summer Research Program

Mehreteeab, Alexander

FUNGAL BIOREMEDIATION OF HUMAN SOLID WASTE

The accumulation of solid human waste is a major problem for long-term space expeditions. Fungal bioremediation of solid waste could provide a solution to this problem. Filamentous fungi can be used to biodegrade human solid waste. We report here the comparison of a variety of wild-type filamentous fungi for their ability to rapidly degrade solid waste. Certain strains of wild-type filamentous fungi, such a Neurospora crassa and Gelanispora cerealis, yielded waste to fungal-mass conversion rates of over 60 percent in seven days. Several strains, including Neurospora crassa, are edible and average about 50 percent amino acid content by mass, potentially providing a high-protein food generated in-flight to explorers of the final frontier. Funding Acknowledgement: Indiana Space Grant Consortium (INSGC)

Miller, Anna

EFFECTS OF INHIBITION OF THE MEDIAL PREFRONTAL CORTEX ON SYMPTOMS OF DEPRESSION IN AN ANIMAL MODEL

Introduction: Depression is the most widespread disability on Earth affecting more than 350 million people worldwide. Depression mostly affects women and can lead to self-injury, substance abuse, and even suicide. Self-focus (i.e. the process by which one engages oneself in self-referential processing) is a core issue in the psychopathology of major depression. Previous studies have used functional neuroimaging to identify that the cortical midline structures, including the medial prefrontal cortex (MPFC), play a key role in self-referential processing in depressed subjects. The research holds significance in that it builds on previous findings that have aimed to link specific patterns of activity to specific areas of the prefrontal cortex as mediating symptoms of depression with conflicting results. Further examination of the medial prefrontal cortex is warranted in order to provide support for a dominant pattern of brain activity (inhibition) which interacts with symptoms of depression. Methods: The study aims to look at drug-induced medial prefrontal cortex inhibition in animal models of depression. The study uses an animal model of learned helplessness, lethargy and anhedonia as a measure of self-referential processing in depression. In order to maintain high external validity the proposed study utilizes female Long Evans rats in order to more accurately generalize findings to the population of women which make up the majority of depressed individuals in humans. Subjects are tested for latency in regards to learned helplessness, for lethargy in a radial arm maze and open field test, and for anhedonia using sugar pellets. Results: Preliminary results indicate significant time differences in latency between control and depressed groups in the hot plate test and Porsolt Forced Swim test measuring learned-helplessness. Conclusions and implications: Preliminary data suggests the inhibition of the mPFC alleviates symptoms of learned-helplessness in Long Evans Rats. Further data collection is needed to determine the scope of this implication in the study of depressive symptoms in a human population. Funding Acknowledgement: Ronald E. McNair Program - UWRF, URSCA Office- UWRF

Miller, Malachi

EARTHWORM SOIL PREFERENCE

People all over the world may know what an earthworm is, but many may not know the role earthworms play in the agriculture field. Earthworms help to increase the amount of air and water that gets into the soil, and when they eat, they leave behind castings that are a very valuable type of fertilizer for plants and soils. We hypothesized that earthworms have a preference for cover crops. Cover crops are crops planted in between regular crop seasons to prevent soil erosion. We wanted to determine which type of cover crops earthworms are more attracted to in order to help attract more worms and keep the soil healthy. We examined five different soil samples from different cover crop treatments: rye, hairy vetch, rape seed, a cover crop mix, and a chemically sprayed cover crop as a control. Using a Preference Chamber, the worms were placed in chambers, incubated, tallied through statistical analysis. Each test was repeated three times with ten worms each time. In conclusion, we determined that among cover crops: Rye > Vetch > Rape seed > Control were the earthworm's preference and the moisture content of the soil has an effect for earthworm preference. Funding Acknowledgement: Bridging the Divide: A program to broaden participation in STEM Ph.D. NSF Grant #1348389

Modock, Tierra

THE REACTION OF PYRIDINIUM YLIDES WITH MICHAEL ACCEPTORS

Annulations of pyridinium ylides via Michael additions typically lead to indolizines, bicyclic aromatic compounds. The reaction sequence consists of two major steps, a [3+2]-cycloaddition followed by aromatization. The goal of this project was to find substitution patterns on the starting materials and reaction conditions that would allow for the study of the unstable cycloadducts. Substituted pyridines were N-alkylated using bromoacetates, and then reacted with Michael acceptors like ethyl acrylate, acrylamide or N-substituted maleimides to obtain the corresponding tetrahydro-indolizines. Reaction conditions, temperature and the nature of the base used to initiate the Michael addition appear to have little influence on the yield of the indolizines, many of which were isolated in good to excellent yields. On the other hand, some Michael acceptors hinder aromatization and no indolizines are formed. Experiments with these building blocks are ongoing. Funding Acknowledgement: Work reported in this abstract was supported by the National Institutes of Health Common Fund and Office of Scientific Workforce Diversity under three linked awards RL5GM1189XX, TL4GM1189XX, 1UL1GM1189XX, NRMN U54GM119023 and CEC U54GM119024 administered.

Mohammedhussein, Fahad

DELIVERY OF NANOPARTICLES IN HUMAN CELLS

Nanoparticles are particles ranging in size from 1 nm to 100 nm. Due to their very small size, they are able to diffuse through cells and target specific areas in the cell. However, delivery methods of nanoparticles are not yet investigated thoroughly. Therefore, the purpose for this project is to investigate ways to deliver nanoparticles to human cells with the ultimate goal of using these nanoparticles to deliver therapies to cancer cells. In this project, we used fluorescent nanoparticles composed of silica shells over fluorescent nanoparticle cores. This allows tracking and detection of the nanoparticles using fluorescent-based techniques. In previous work, we have used electroporation to deliver these nanoparticles to human cells. Here, we show that these fluorescent nanoparticles can directly diffuse into cells and are easily detectable using a fluorescent microscope. Furthermore, we were able to detect cells harboring the nanoparticles using fluorescenceactivated cell sorting (FACS) analysis. Therefore, these nanoparticles can be used to target human cells. Future studies will be aimed at coupling these nanoparticles to specific markers to target cancer cells. Funding Acknowledgement: NIU OSEEL

Montilla, Natalia

OPTIMAL IMAGE FILE FORMATS FOR STUDENT IDENTIFICATION USING FEATURE EXTRACTIONS

The Collegiate Science and Technology Entry Program (CSTEP) and Louis Stokes Alliances for Minority Participation (LSAMP) Office at Onondaga Community College is trying to improve keeping track of how many students use the available support services on a daily basis. Tracking the use of support services is needed to continue to receive funding and also to better allocate resources. A previous CSTEP student observed that CSTEP/LSAMP students enjoyed being photographed and decided to investigate using biometrics software for facial recognition available in the Computer Visions System Toolbox in MatLab to aid in tracking the use of support services. The decision was made to use biometrics for facial features because it was considered a biometric more readily available and not security-related or as personal like fingerprint or eye retina biometrics. Some areas identified as needing improvements in tracking student use of support services were the extraction process of facial features to create the database of extracted features and also the extraction process in real-time to quickly process a student visiting the office for services. This led to an investigation of the image file formats used to create the database of extracted features. The most efficient image file format was defined as minimizing the time to generate the extracted features vector and the size of the matrix of the extracted features. To determine the optimal image file format, we identified a set of typical image image file formats (TIFF, JPG, PNG, GIF and BMP) and the different types of extraction processes in MatLab (SURF, BRISK and HOG) that could work with the existing program. We used a group of twenty students, generated their image for each type of format and determined feature extraction times, using the default size for the size of the vector of extracted features. The most efficient extractions occurred with GIF formats for HOG and SURF extractions and with PNG format for BRISK extractions. Continued work will focus on increasing the face gallery database, exploring the use of TIFF images and investigating the effect of image file format and extraction process on the accuracy of student identification. Funding Acknowledgement: CNY Works, Synergy, Mercy Works, Upstate LSAMP, and Onondaga Community College

Moore, Christina

CLINICAL CHARACTERISTICS OF ASPARAGINASE REACTIONS IN PATIENTS UNDERGOING TREATMENT FOR ALL

Background: Asparaginase poses a substantial risk for hypersensitive reactions during and after administration; however, these reactions vary by the type of asparaginase and route of administration. PEG-asparaginase administered intravenously (IV) has been found to have fewer incidences of hypersensitivity when compared to intramuscular. It is imperative that nurses be knowledgeable of potential side effects associated with PEG-asparaginase IV administration, as well as the typical timing of these reactions without ignoring the possibility of a delayed reaction. Purpose: The purpose of this retrospective study was to describe the clinical factors associated with hypersensitive reactions to PEG-asparaginase and to support the development of evidence-based monitoring guidelines. Methods: Clinical data including the frequency of reactions, the dose of asparaginase, the severity of the reaction, the timing of the event during treatment, and the time frame between administration and reaction were collected on patients who were identified as having a hypersensitive reaction to PEG-asparaginase while undergoing treatment for Acute Lymphoblastic Leukemia. Results: 63 patients (12.8%) suffered an allergic reaction to PEG-asparaginase. Patients experienced this reaction at a median of 3 doses in both low and standard/high risk patients. An adverse reaction was noted ≤ 60 minutes after the initiation of administration in 98% of patients, and no reactions were fatal. Conclusion: Nurses are in an optimal position to actively monitor and anticipate an adverse reaction to PEG-asparaginase. Patients should be carefully observed over the 60-minute course of PEG-asparaginase IV administration, and patients and parents should be aware of the rare occurrence of delayed reactions. Funding Acknowledgement: National Science Foundation, St. Jude Children's Research Hospital

Moraga, Roxana

BORON NITRIDE NANOTUBE (BNNT) INTERCALATION WITH MAGNESIUM: SYNTHESIS AND CHARACTERIZATION

Intercalation of Boron Nitride Nanotubes (BNNTs) with magnesium (Mg) is explored due to its potential super-conductive properties. Various syntheses were performed under different sets of conditions in order to optimize reaction conditions. These include the presence of zinc as a catalyst and the temperature at which the reaction is carried out (either 700 or 800°C). All products were then analyzed and characterized, using methods such as Transmission Electron Microscopy (TEM), Scanning Electron Microscopy (SEM), Energy-dispersive X-ray Spectroscopy (EDX), and Fourier-Transform Infrared Spectroscopy (FTIR). Both TEM and FTIR results confirmed the formation of BNNTs, and EDX showed the presence of magnesium in the product, indicating possible intercalation with Mg. Further characterization of the purified product, including electronic properties, will be performed. Funding Acknowledgement: Student Engagement Fund (NIU)

Ndinga Muniania, Cedric

SEASONAL VARIATION AND POTENTIAL ROLES OF DARK SEPTATE FUNGI IN AN ARID GRASSLAND

The high temperatures and long extended drought periods in arid ecosystems promote the colonization of diverse microenvironments by dominant communities of dark septate fungi (DSF). DSF contribute to soil nutrient cycling, soil stabilization, and plant survival under stressful conditions, but the roles of individual DSF and their diversity are still poorly understood. We collected soil and isolated fungi from different microenvironments in an arid grassland near Moab, UT. The biocrust fungi were isolated from and below lichen-, moss-, and cyanobacteria-dominated biocrusts, and rhizosphere soils were collected from two plants: the exotic invasive Bromus tectorum and the native Pleuraphis jamesii. Fungi were isolated using a serial dilution technique and identified using ITS rRNA sequencing. Seasonal variation of DSF was evaluated using culture-based approaches and compared with fungal community profiles from Illumina sequencing. Our imaging pigment analysis revealed that DSF were more abundant in biocrusts compared to the plant rhizosphere and showed differences in colonization rates by season for belowground samples, with an increase during the summer months. Trends seen in culture data were confirmed with the analysis of Illumina data, which showed an increase in abundance of dark septate fungi (e.g., Alternaria and Phoma) in the rhizosphere and below biocrust soils during the summer months. From the 813 fungi isolated, Pleosporales was the dominant order in both biocrust and rhizosphere soil. The most dominant DSF genera included Alternaria, Preussia, Cladosporium, Phoma, and unknown Pleosporales. Seed germination experiments using dominant taxa were conducted in corn to determine their potential roles on plant growth. Cladosporium and Alternaria in particular, showed growth promoting ability, stimulating root production and stem elongation. The variation in abundance and colonization of DSF reflect adaptations to summer environmental conditions, as well as potential plant demand when heat and drought conditions are high. Funding Acknowledgement: Los Alamos National Laboratory, Department Of Energy and National Science Fund

Nickerson, Randahl

GENE EXPRESSION OF CORN EARWORM IN RESPONSE TO INFECTION BY SERRATIA MARCESCENS

The corn earworm, Helicoverpa zea, is a common crop pest that causes huge economic losses in agriculture. This insect is susceptible to infection by several different types of pathogens. In this study we examined the effect of common pathogenic bacterial strains on the growth, survival and gene expression of the insect larvae. Serratia marcescens causes mortality of many insects including the corn earworm H. zea. Helicoverpa zea caterpillars were allowed to feed on diets that were treated S. marcescens or a control diet. The caterpillars' growth and mortality rates were measured. We observed a decrease in weight, difference in time to pupation, and higher mortality in caterpillars in the bacterial treatments compared to the caterpillars that fed on control diet. We also found significant differences in the expression of genes involved in metabolism, digestion, and immune system. The analysis of the specific gene regulation that occurs in the caterpillars in response to these pathogens gave insight into the defense mechanisms used by H. zea during bacterial infection. Funding Acknowledgement: National Science Foundation

Norris, Deonti

APPLICATION OF MULTIPLE PHARMACEUTICAL PRODUCTS ON TERRESTRIAL PLANTS

Increased use of pharmaceuticals and personal care products (PPCPs), and their subsequent disposal into sewer systems, has produced high levels of PPCP in the environment. Wastewater treatment plants can spread these PPCPs to major bodies of water through discharged effluent and to agricultural lands using biosolid application. Previous research have shown that when applied singularly, chemicals such as caffeine, acetaminophen, and aspirin (including some of their derivatives) have the potential to significantly impact terrestrial plants. All three are found together in wastewater effluent and yet, no known research investigates the growth effects of these PPCPs acting in combination on terrestrial plants. Therefore, the focus of my study was to apply these chemicals simultaneously to Arabidopsis thaliana as well as on Zea mays L. (Sweet Corn) and measure the effects on growth parameters such as germination and root growth. Both germination and root growth experiments for Arabidopsis were conducted using standard agar media, supplemented with low/sub ppm level of each PPCP when appropriate. Plants used for root growth experiments were first grown on agar media without PPCPs and transferred to experimental plates with chemicals after a pre-determined size. Corn seed germination experiments were conducted in soil, and root lengths for corn will be conducted in a similar manner as Arabidopsis. The weight of roots in adult corn plants will also be measured. All plants are grown in an environmental chamber with standard temperature and humidity. Preliminary results suggest that caffeine, acetaminophen, and aspirin applied at as low as 1 ppm significantly delayed germination of Arabidopsis. When these chemicals were applied at as low as 0.5 ppm, they significantly reduced root growth. Data were analyzed using a Multi ANOVA statistical test. Similar results for germination were obtained in sweet corn, which encourage further investigation. Although additional experiments are on-going, both preliminary results indicate the potential for these PPCPs to negatively affect terrestrial plants at concentrations lower than what were previously reported when they were tested singularly. My study will contribute towards a better understanding of the potential impacts of having these PPCPs in the environment, including potential threats to crop production. Mentor: Catherine W. M. Chan, Departments of Biological Sciences and Chemistry, University of Wisconsin-Whitewater, Whitewater, WI.
Funding Acknowledgement: UW-Whitewater Undergraduate Research Program

Olanrewaju, Adeyemi
DETECTION OF THERMOPHILIC FUNGI IN CORN-BASED FOOD PRODUCTS AND DETERMINATION OF THEIR OGT
Thermophilic fungi can grow at high temperatures between 450C to 550C and represent an important component of the microbial community in soils. The diversity and distribution of these fungi in corn-derived food products and their potential role in mycotoxin production have not been studied. Based on previous studies, we hypothesized that thermophile spores might be present in corn-based food products and corn bins due to their high abundance in corn after harvest. Thermophilic fungi in corn-based food products were isolated using serial dilutions. Dilutions were plated on corn meal agar (CMA) and Emerson yeast starch agar (EYSA) and incubated at 450C for 1 week. Fungal identification was carried out using microscopy and DNA sequencing. Fungi were isolated from % of the corn-based food products tested. A total number of 46 cultures from various products were isolated. Sequencing showed that the different corn-based food products are colonized by thermophilic fungi including Rhizomucor, Thermomyces langinosus, Talaromyces, Rhizopus microsporus, Aspergillus fumigatus and Aspergillus waksmanni. Optimal growth temperature experiments were conducted to determine the temperature at which thermophilic fungi grows best and also to differentiate the isolates into thermotolerants and thermophilic fungi. These results indicated the presence of thermophiles in corn products which may have significant implications on human health. Funding Acknowledgement: Department of Biological Sciences, Western Illinois University

Ortega-Gomez, Valeria
INVESTIGATING COOPERATIVITY BETWEEN THE ZBTB18 TRANSCRIPTIONAL REPRESSOR AND PRB TUMOR SUPPRESSOR
The decision to adopt a specific fate is a fundamental property of cells during animal development that involves the coordinated suppression of genetic programs to limit division and activation of genetic programs to promote differentiation. Both processes of proliferation and differentiation are disrupted in malignant human cancer. The ZBTB18 gene encodes a transcriptional repressor that is known to regulate neural progenitor proliferation, neural differentiation and neuronal migration in the developing mouse brain (Baubet et al., 2013; Hirai et al., 2012). The goal of this project is to test the hypothesis that ZBTB18 cooperates with the pRB tumor suppressor to regulate genetic programs that ensure proper neural progenitor proliferation and differentiation and suppress brain tumor oncogenesis. Our lab has recently shown that somatic inactivation of the pRB tumor suppressor leads to highly proliferative brain tumors in adult fish with features of primitive neuroectodermal tumors (Solin et al., 2015). The tumors appear to originate from proliferative zones where ZBTB18 is expressed in normal brain. Transcriptome analysis of pRB-defective tumors shows the level of ZBTB18 gene expression is down >10 fold. Together these data support the hypothesis that ZBTB18 cooperates with pRB to regulate neural progenitor proliferation and suppress tumor formation. Our hypothesis predicts that mutations that disrupt ZBTB18 function will enhance the pRB mutant phenotype, leading to increased numbers of proliferating cells in the brain of pRB rb1/rb1 homozygous mutants. To test our hypothesis, we will target mutations to ZBTB18 gene zbtb18 in rb1/rb1 mutant zebrafish embryos using CRISPR/Cas9 genome editing. The number of proliferating cells will be measured in larval brain tissue sections of targeted animals and compared to the number in non-targeted pRB rb1/rb1 homozygous mutants. These studies will provide insight into the mechanism by which pRB suppresses tumorigenesis through control of gene expression programs that limit proliferation and promote neural differentiation. Funding Acknowledgement: National Science Foundation, IINSPIRE-LSAMP, The Roy J. Carver Foundation

Ortiz, Yvette
CRUDE OIL FRACTION SEPARATION AND ISOLATION OF SULFUR IMPURITIES USING ILMENITE AS A FILTER MEDIA
Crude oil is a value resource used in nearly every economic market. One of the nuisance impurities found in crude oil is sulfur and sulfur containing compounds. Currently sulfur is removed from crude oil by hydrodesulphurization. This process uses a transition metal catalyst and hydrogen gas at high temperature and pressure to convert all the sulfur and sulfur containing compounds to hydrogen sulfide. The hydrogen sulfide, after many steps, is converted to either elemental sulfur or sulfuric acid. This process is highly efficient and well-studied. The goal of this study is not to replace the industrial scale removal, but instead formulate a benchtop method which will allow for the rapid separation of the crude oil fractions and isolate the sulfur and sulfur containing compounds. Preliminary results will be discussed. Funding Acknowledgement: CAS-UGR

Ortiz, Lorenzo
EFFECTS OF SCD137 ON T CELL PROLIFERATION IN NOD MICE
Type 1 Diabetes is an autoimmune disease in which T cells destroy pancreatic islet cells, resulting in severe hyperglycemia and ketoacidosis. We previously showed that a T regulatory cell (Treg) secreted protein, soluble CD137, can limit this autoimmune response. The mechanisms of the sCD137 effect, are, however, still unclear. We investigated the kinetics of the effect of sCD137 on T cell IL-2 production in CD4 and CD8 T cell subsets by adding sCD137 at different times in vitro. In CD4 and CD8 T cells, sCD137 added at start of cell culture showed suppressive effect of IL-2 production, but not when added at 24 and 48 hours to CD4 T cells or 48 hours to CD8 T cells. The effector memory T cell subset from CD4 or CD8 T cells was most significantly suppressed by sCD137 compared with naïve and central memory T cells. These results indicate that sCD137 acts within the first 24hrs of T cell activation to reduce IL-2 production and T cell proliferation; and has the most significant suppressive effect on the effector memory T cell subset. Funding Acknowledgement: Summer Undergraduate Research Program (SURF), Ridgway Lab

Oyebefun, Josiah

PSEUDOMONAS AERUGINOSA BIOFILM FORMATION AND GROWTH ON ARABIDOPSIS ROOTS

Bacterial biofilms are simply a cluster of individual microbial cells that make up a multicellular "structure" with unique physiological properties. Pseudomonas aeruginosa is an aerobic, gram-negative bacterium that can infect a range of plant and animal hosts and exists prolifically in the environment. It is an opportunistic pathogen that is a leading cause of hospital-born infections (approximately 51,000 per year according to the Centers for Disease Control and Prevention). There are many strains of this bacterium available, including the clinical isolate PA14 and the environmental isolate PA01, which are being used in this study. PA01 was first discovered in 1882 and is widely available for research purposes. PA14 is a later strain that has become a common pathogen in medical facilities because it is highly antibiotic resistant. Both strains are able to infect a range of biological hosts, including the plant Arabidopsis thaliana. While the pathogenicity of P. aeruginosa is well documented, current treatments for limiting or even preventing infection are not sufficient or available. In order to begin development of a potential vaccine for P. aeruginosa infections, we used the A. thaliana root as an easy to acquire biological surface for growing biofilms. PA01 and PA14 were heat-killed and introduced to roots before inoculation with the corresponding live bacterium. Two positive-control groups and a negative-control group were also included. Inoculated roots were transferred to sterile agar microscope slides to ensure the root was the only source of nutrients for the bacteria. Roots were imaged regularly for three days. Biofilm growth was measured using ImageJ and compared between treatments. We have observed that PA01 vaccination of the A. thaliana root significantly reduces the formation and growth of biofilm on the root's surface. On the other hand, PA14 vaccination of the root does not significantly reduce the formation and growth of biofilm on the root's surface. In addition, biofilm formation and growth occur at different rates for PA01 mock vaccinated roots and PA14 mock vaccinated roots with PA14 being the slower strain. Funding Acknowledgement: National Institute for General Medical Science (NIGMS) (5P20GM103427), National Science Foundation (NSF) NSF–EPSCoR-EPS-1004094

Padgett, Robert

ANTIBIOTIC RESISTANCE IN BEEF CATTLE: THE EFFECTS OF QUARANTINE, CULLING AND NEW LEGISLATION

Antibiotic resistance is a global health concern that involves animals as well as humans. In zoonotic diseases such as influenza or salmonella, which are not generally fatal to humans, antibiotic resistance can provide a reservoir of antibiotic resistant genes from which other pathogenic bacteria can gain resistance through horizontal gene transfer. Reducing antibiotic resistance in bovine infections is a key part of any plan to slow resistance in human diseases. Because bovine infections can transfer to humans through food or the environment, antibiotic resistance (ABR) can transfer to other pathogenic bacteria which leads to diseases in humans that are much more difficult and expensive to treat. Efforts to reduce ABR can be expensive. Beef cattle farmers commonly use quarantining and culling of infected cattle to reduce spread of disease. We constructed a mathematical model in order to find the most ideal combination of quarantining and culling that reduces the number of beef cattle with antibiotic resistance at the time of maturity. Another way of reducing antibiotic resistance is by limiting antibiotic exposure. Starting in 2017, new legislation will restrict the use of antibiotics in cattle feed to veterinary prescription. To compare the impact of this legislation with current practices, we hypothesize changes in parameter values and use stochastic differential equations to simulate the dynamics of antibiotic resistance among beef cattle populations between both current and predicted situations. Results of the model under current practices show that culling rates have a negligible effect, but quarantine rates of 0.5-1 per week lead to a decreased antibiotic resistance rate. We find that under the new legislation the proportion of cattle with antibiotic resistance at slaughter decreases by a statistically significant amount; while the proportion of sellable cattle at the time of slaughter remains approximately the same. Funding Acknowledgement: National Science Foundation (DMS1263374), the Office of the President of ASU, and the Office of the Provost at ASU

Perez, David

BIOREMEDIATION ANALYSIS OF WATER POLLUTANTS AND PATHOGENS WITHIN HOUSEHOLD WATER IN RURAL S. INDIA

Unsafe drinking water is recognized as a leading factor in diarrheal diseases, responsible for about 5 million annual deaths globally, six hundred thousand deaths alone coming from India. An international field study was fashioned to document the techniques used by an the Indian Social Service Institute in Southern India to construct, develop, assemble and distribute bio-sand filters (BSFs), a cost-effective water filtration system, for at home use. The field study used BSFs to combat microbiological contaminants in household water by using a mass of organic and inorganic charged compounds that create an environment used to remediate contaminated water. More importantly, this study assessed the logistics and efficiency of BSFs in Pudukkotai, Tamil Nadu. The three month study created concrete BSFs and filled them with sand and gravel from the surrounding environment to create a naturally occurring filtration system. Laboratory analyses were performed in five day increments on water samples using indicator strips that tested for pH, NO_3^-, NO_2^-, PO_4^{-3}, alkalinity and water hardness. An increase or decrease in nutrient levels over time from this analysis would indicate the growth or decay of a microbiological community within the BSF. Water analysis did not indicate a growth of a biological layer, called Shmutzdecke, which indicates the method used for assembly of a BSF must be configured for greater efficacy. The study is on-going and once an effective system of configuration is produced this BSF project is expected to construct and distribute 50 filters within the year for the villages located within Pudukkottai. Funding Acknowledgement: Gilman Scholarship

Pickens, Damien

HETEROTROPHIC BACTERIA THAT COLONIZE CYANOBACTERIA MICROCYSTIS AERUGINOSA

Microcystis aeruginosa is a freshwater species of cyanobacteria. They form massive blooms that can cause fish kills and kill surrounding aquatic vegetation. To help gain insight as to how these blooms form and why they form such massive colonies, a study of the bacteria that colonize the algae was performed. Samples were taken from Lake Champlain and Shelburne pond in west-central Vermont. Bacteria were cultured from the water and identified using PCR analysis. To measure the amount of cyanobacteria in the colonies, a chlorophyll analysis was done using methanol and spectrometer. From this research it can be concluded that bacterial strain Flavobacterium can make M. aeruginosa form masses of cells. Furthermore, we speculated that it was M.aeruginosa in a colonial form that gets trapped in the gill rakers of fish and allows Flavobacterium to grow, causing bacterial cold-water disease. This disease causes necrosis of the afflicted fish's tissue, causing the fish to slowly deteriorate. From this research, future studies may be conducted into how to slow growth of Microcystis aeruginosa or possibly how to prevent fish from acquiring bacterial cold-water disease. Research was conducted at University of Vermont in Burlington, Vermont. Funding Acknowledgement: National Science Foundation (DBI-1358838)

Prieto-Uzcategui, David

NITRATE CONCENTRATION IN CORAL REEF WATERS; ROATAN, HONDURAS

Coral reefs have been challenged by environmental changes over the past few decades. These challenges include hurricanes, El Nino events, and acidification of the ocean waters. Nitrogen is an essential element for sea life proliferation as it is incorporated in genetic material. (soluble NO_3^-) Nitrate and (soluble NO_2^-) are the predominant forms of nitrogen in benthic waters and their concentration is directly related to the health of sea life including corals. The overall objectives of this research were two-fold: a.) to measure total nitrogen concentrations on the Roatan island coral reef; and b.) determine if there were any statistically relevant difference in nitrogen concentrations between the water immediately above healthy coral vs. diseased coral. There are several accepted, standardized methods for measuring either nitrate concentration, nitrite concentration, or the cumulative concentration of both species. We are interested in comparing these methods on the water samples in Roatan and our analysis with these various methods in ongoing. Here we report results using the complexing dye brucine (EPA method 352.1) which is specific for the nitrate anion and produces an intense yellow color which can be quantified via visible absorption spectroscopy. Water samples were obtained by the Midland College scuba diving team at 5 different locations along the Roatan, Honduras island coral reef. At each of these locations, samples were acquired in the water column directly above Orbicilla (formerly Montestrea) Annularis corals for both healthy coral specimens and diseased coral specimens. Our results with brucine show that the nitrate concentrations in these waters were all 1.0 ppm or less. Corroborating results from A&B Laboratories (Houston, Texas), using a different analytical method, show that nitrate + nitrite (total N) concentrations for all samples were less than 0.04 ppm. Although we see slight, but consistent, differences in nitrate concentrations between healthy and diseased coral, these differences are within the experimental error of the brucine method spectroscopy experiment. We have seen evidence of possible false positive readings for this method presumably caused by another unknown species in the Roatan water samples as well as some unexpected precipitates developed while following the established protocol. Funding Acknowledgement: UT-LSAMP Senior Alliance

Rahal, Christine

LOOKING FOR NOVEL INTERACTING PARTNERS WITH MISMATCH REPAIR PROTEINS MLH1 AND MSH2

The DNA mismatch repair (MMR) pathway prevents accumulation of mutations caused by mismatched bases during DNA replication. Studying the interactions between the proteins that facilitate this repair can lead to a better understanding of how defects in MMR lead to cancer. Using yeast as a model organism, our laboratory has recently defined a previously uncharacterized interaction between two MMR proteins, Exonuclease 1 (Exo1) and Msh2. On Exo1, we found two Msh2 interacting sites with a conserved amino acid motif that we defined as a SHIP box (Msh2 interacting peptide). The interaction site between Exo1 and another MMR protein, Mlh1, has been previously defined as the MIP box (Mlh1 interacting peptide). We hypothesized that other proteins that have the SHIP or MIP box motifs may interact with Msh2 or Mlh1, respectively, and could potentially play a role in MMR. Using bioinformatics techniques, we have found SHIP and MIP boxes in a number of other proteins. One of these proteins, Rad5, does not have any known roles in MMR but contains both the SHIP box and MIP box motifs. Using a yeast two hybrid system, I have confirmed a novel interaction between Rad5 and Msh2 as well as an interaction between Rad5 and Mlh1. Follow-up experiments to determine the impact of mutating the Rad5 MIP or SHIP boxes on MMR-related binding are currently underway. These experiments along with expansion of my analysis to other SHIP box proteins will lead to a better understanding of MMR and the underlying causes of cancer. Funding Acknowledgement: NIH

Reid, Anthony

CONSTRUCTION AND STRUCTURAL ANALYSIS OF STEEL LOAD FRAME AND HYDRAULIC LOADING SYSTEM

The goal of this project is to construct an apparatus that consist of a steel load frame which embodies hydraulic loading cylinders and two igneous rocks. The interface between the two rocks represent a fault and the hydraulic loading cylinders generate forces in shear and normal stress which represents the forces felt by tectonic plates during an earthquake. Technological advances enable us to create an apparatus in which we can apply millions of pounds of force in normal and shear stress. This apparatus will be able to simulate a laboratory earthquake and aims to provide a deeper analysis in the mechanics, predictions, micro level vibrations, and material testing of earthquakes. Some of the questions that served as motivation for this research is if one can predict an earthquake before it happens, is it possible to create an earthquake on earths surface, and how does one test new materials in earthquake conditions. The apparatus under construction is the largest in the world which seeks to yield ground breaking discoveries in earthquakes studies. The results from the apparatus may enhance early warning detection systems, simulate hydro-fracking, and test new materials as foundations of structures. Through the use of a finite element analysis program, Mastan, a model representing the steel load frame was created in order to predict the deflection of the apparatus after a force is applied. Data of displacement was recorded through Eddy current sensors which were placed on the perimeter of the apparatus. A MATLAB software was used to plot the data acquired and compare it to the finite element analysis prediction. Funding Acknowledgement: LSAMP, CSTEP, McNair, Cornell University

Replogle, Adriane

HARMONOGRAPHS

The purpose of this research was to explore the Lissajous mathematical curves associated with music and the construction of a Harmonograph. Students at Lincoln University are re-creating an 1800's model of a harmonograph created by Hugh Blackburn. The harmonograph can be used as an instrument to illustrate the physics of music. Harmonographs have associated mathematical and musical components that are analyzed in this research. This exploratory research expounds on additional attributes and characteristics of the harmonograph, along with a report of the recreated harmonograph. This recreation of the harmonograph was inspired by the Foucault pendulum located in museums nationwide and the National Museum of Mathematics in New York. Students at Lincoln University hope to provide an exploratory exhibit for visitors to Lincoln University's campus. This project will provide educators with an opportunity to show student's physics and mathematics in a real context. Funding Acknowledgement: Department of Energy- MSIPP - Consortium for Advanced Manufacturing

Reyes, Hector

OPTIMAL PORTFOLIO USING GENETIC ALGORITHM

Investing in the stock market is one classic way of generating money. The main goal of someone who invests in the stock market is to maximize his profit and minimize his risk. Selecting an optimal portfolio is the most important step in someone's quest to maximize profit and minimize risk. A portfolio is a grouping of stocks. Optimizing a portfolio is one hard task in financial investment decisions. The toughest part is distributing the amount of money to invest in each stock of a portfolio, while maximizing profit and minimizing risk. This project applied the method of a genetic algorithm in order to select an optimal portfolio. A genetic algorithm generates solutions to optimization problems using techniques inspired by natural evolution. A five stock, five years portfolio was utilized in this project in order to demonstrate the efficiency of a genetic algorithm. The most important steps of this method were the fitness function and the crossover. The fitness function is a mathematical formula that determined the effectiveness of the portfolio distribution; it returned a value for each portfolio distribution and the higher the value the better the distribution. The fitness function allowed us to rank and sort the generated distributions. Then, the crossover was performed in order to see how the genetic algorithm converges towards the optimal solution. Look at the crossover as reproduction. The best portfolio distributions, according to the fitness function, were used for the crossover in order to generate even better distributions. Crossover was executed a couple of times by generating new generations of distributions, until the best distribution was produced. The best distribution produced a twenty five percent average return and its computing time was eleven minutes. The genetic algorithm was written as a code in Python and it confirmed its efficiency. Funding Acknowledgement: National Science Foundation

Rice, Jameshia

NANOCELLULOSE-BASED AEROGEL MATERIALS

Aerogel is a type of lightweight porous monolithic block, with high porosity and surface to volume ratio but, are normally brittle due to being created by using silica based materials. If the aerogel was prepared from natural polymers it can have a higher mechanical strength and flexibility. Nanocellulose could also produce promising aerogels due to its high strength, low density, biodegradability and general biocompatibility. So, an aerogel created from nanocellulose will be as well. Inside of our lab we had used nanocrystalline cellulose prepared from hardwood and wheat straw to conduct the aerogel preparation experiments. Cellulose nanocrystal hydrogels were prepared by cellulose nanocrystal suspensions of varied concentrations by weight. The nanocellulose solutions were put under refrigeration for more than 24 hours to allow gelation. The frozen solution should be thawed at room temperature, followed by immersion into ethanol for coagulation to form nanocellulose hydrogel. Nanocellulose aerogels were prepared through freeze drying of nanocellulose hydrogels for 24 h. The aerogels were easy to compress and bend, which shows flexible and compressible properties. Porosity and BET condition of the aerogels were tested by N2 adsorption and desorption. The aerogel shows monolithic structure and light weight property, with large surface to volume ratio and high porosity. No results have been reached but, we anticipate at the end of this year long project, we will produce two new types of aerogel with unique properties. We will synthesize a novel nanocellulose-Fe3O4 composite aerogel with magnetic and conductive properties. The composite aerogel should have high inorganic nanoparticle loading capacity, greater surface to volume ratio, good flexibility, and biocompatibility. At the same time, the nanocellulose frame could provide more active sites for inorganic nanoparticles to deposit and will be better for preparing small particle size composite aerogels. We will also produce nanocellulose–graphene composite aerogels with high porosity, large surface to volume ratio and better conductivity. In conclusion, aerogels created from our nanocellulose composite will not only have more mechanical strength but these aerogels are expected to be more flexible, have better conductivity, better liquid absorption capacity as well as a number of other abilities as well. Funding Acknowledgement: Washington State University, the Center for Bioplastics and Biocomposites, and the National Science Foundation

Rocha, Erica

LEARNING HOW TO BE A CONSERVATIONIST IN 8 WEEKS

There is an immense lack of diversity in the field of conservation which can exclude a variety of individuals that may be interested in contributing to this field of study. Diversity is essential in the ever changing and challenging field of science in order to have a variety of perspectives. The Doris Duke Conservation Scholars Program, is a two year undergraduate research internship, whose goal is to diversify environmental conservation through inclusion and discussion. The first summer is intended to expose a group of 20 scholars, from different backgrounds across the U.S., to conservation by developing our research and fieldwork skills through interestbased projects. Throughout the summer we visited and conducted research at UC reserves including Big Creek in Big Sur, Sagehen Reserve in Berkeley, White Mountains Research Station in Bishop, Yosemite National Park, and Swanton Ranch in Davenport. One of my research projects includes the study of plant biodiversity along elevation gradients of the Subalpine ecosystems in the White Mountains. Mountains are unique in that climate and vegetation changes from elevation to elevation. This allows us to study the effects of temperature change on plant communities. If we understand how climate change effects plants, we can learn to manage and protect plant species and the ecosystems they are a part of. I focused on the change of plant species richness and total plant abundance along elevations. This was done by using transects to sample total plant abundance and species richness from 5 dolomite sites with Southfacing slopes ranging in elevation. The results show that both plant abundance and species richness increases along the elevational gradient of the White Mountains. This suggests that climate change is causing more favorable conditions for plants to flourish in higher elevations. If the environment in lower elevations becomes less favorable, then more plants may shift upslope affecting the range and distribution of plants. Funding Acknowledgement: Doris Duke Charitable Foundation and University of California Santa Cruz

Rodriguez, Miguel

INCORPORATING STREAMING VIDEO TO IMPROVE TRACKING STUDENT USE OF SERVICES

The Collegiate Science and Technology Entry Program (CSTEP) at Onondaga Community College has been developing a system to automate tracking the use of support services by students. Some of the issues with accurately tracking student use of services include students forgetting to sign in. Development of the use of facial recognition software to track students began in previous years; however, the system required the students to activate the tracking or image capture themselves. To eliminate data tracking errors associated with forgetting to sign in, incorporating streaming video activated by computerized facial detection was proposed and developed. Continuing to use the Computer Visions System Toolbox in MatLab, the computerized analysis of live video was incorporated; facial recognition for student identification was activated by automated facial detection. MatLab tools for facial detection were used to enable the facial tracking mode. The tracking mode was enabled with a minimum of ten points. Once a human face was detected, a screenshot was captured and saved as a raw image. Capturing and creating an image file initiated code to resize the image and crop out nonessential features (the shirt or wall around the student) to help minimize the size of the image undergoing feature extraction. The cropped, resized image was submitted for processing. This automation of the student sign-in process improved tracking data for CSTEP by capturing data just from students walking in front of a camera and included a timestamp for the student visits. Moreover, a student under crisis did not need to sign in and could be directed immediately to a counselor. The code still requires the student document the type of service they use. At this point, facial recognition automates the documentation of tracking the student and improves the data used to support funding for the program. We were able to capture data for those students that did not sign in. Although the program was very effective at detecting faces and automating the sign-in process, the refresh rate of the video during image capture in real-time may be freezing the program and forcing a manual restart. This is currently under investigation. Funding Acknowledgement: CNY Works, Synergy, Mercy Works, Upstate LSAMP, and Onondaga Community College

Rosenje, Ahmed

CATERPILLAR GENE EXPRESSION IN RELATION TO PLANT DEFENSES

The caterpillar Helicoverpa zea, causes tremendous economic crop damage. This caterpillar is a generalist feeder feeding on a wide range of crops. Our study focuses on the genes altered from feeding on different plant sources. We allowed 6th instar H. zea to feed on a wide range of dietary factors and plants such as tomato, corn and soybean. After 24 hours we harvested the caterpillars organs such as midgut, fat body, malpighian tubules, and salivary glands where total RNA purified for gene expression measurement with qPCR. The results showed that caterpillar digestive genes and detoxification gene were up-regulated. We conclude that caterpillar have compensatory up regulation of digestive and detoxification genes that likely aid in the caterpillars survival. Funding Acknowledgement: National Science Foundation

Russell, Regina

THE EFFECTS OF ALLIUM SATIVUM, CINNAMOMUM ZEYLANICUM, AND CUMINUM CYMINUM ON ENTEROCOCCUS FAECALIS

Traditionally antibiotics have been used to inhibit bacterial growth, but in recent times bacterial resistance to antibiotics has become an issue. For years spices have been used as preservatives, inhibiting bacterial growth and preventing food spoilage. The aim of this research is to investigate in vitro inhibitory effects of Garlic (Allium sativum), Cinnamon (Cinnamomum zeylanicum), and Cumin (Cuminum cyminum) on the growth of Enterococcus faecalis. Sterile discs were soaked in filtered, autoclaved extracts of each spice. The synergistic effects of the spices were also investigated using discs soaked in mixtures of the extracts. The soaked discs were placed at equal distance apart on Tryptic soy agar (TSA) Petri dishes inoculated with E. faecalis. Trimethoprim (5 mg) and Penicillin (10 IU) infused discs were used as positive controls and un-inoculated discs as negative controls. Six replicates of the treatments were prepared. Petri dishes were incubated for 24-48 hours at 37˚C after which the diameters of the zones of inhibition were recorded. Mean inhibition zones with diameters of 3.7 mm, 4.2 mm, 13.5 mm were observed for C. zeylanicum, A. sativum, and C. cyminum respectively. In the synergistic treatments, the zones of inhibition ranged from 4.3 mm for A. sativum/C. zeylanicum to 7.2 mm for A. sativum/C. zeylanicum/C. cyminum. These results suggest that it is possible to control the growth of bacteria using natural chemicals found in spices. Cumin used singly or in combination with garlic and cinnamon has the potential to control the growth of bacteria. Funding Acknowledgement: This research is supported through a grant from the National Science Foundation under the Louis Stokes Alliances for Minority Participation (LSAMP) Program, HRD-1304966, 2013 – 2016.

Sandor, Edward

TIME-FREQUENCY ANALYSIS OF SURFACE ELECTROMYOGRAPHY SIGNAL FROM RESTING LUMBAR MYOFASCIAL TISSUE

Ankylosing spondylitis (AS) often develops in early adulthood with progressive reduced spine mobility. Myofascial stiffness or tone is the stiffness of resting muscle and its alterations may be associated with lower back disorders. In our research, the passive resting stiffness of lower lumbar extensor myofascia in young subjects has been quantified concurrently with surface electromyography (sEMG). Our hypothesis is that greater lumbar myofascial stiffness in AS vs normal subjects is an intrinsic myofascial property and analyses of sEMG will help in determining its potential relations to variations in resting muscle tone. The focus of this study is to apply time-frequency analysis on surface electromyography (sEMG) signal in resting lumbar myofascial tissue. Related medical data has been collected from AS and normal subjects. Preliminary results of signal processing analysis are presented and discussed. Such quantitative studies may help identify AS disease in the earliest stage and enhance the clinical evaluation of this disease. Funding Acknowledgement: Illinois Space Grant Consortium, Bradley University Special Emphasis Grant

Sappy, Immaculate

SYNTHESIS OF 2′-C-METHYL PSEUDOURIDINES FOR THE INHIBITION OF HCV RNA-POLYMERASE

Synthesis of 2′-C-methyl pseudouridines for the inhibition of HCV RNA-Polymerase Immaculate Sappy[1], Joseph Nunnari[1], Amanda C. Bryant-Friedrich. Studies of the structure and function of Hepatitis C Virus (HCV) RNA-dependent RNA polymerase (RdRp) have broaden our understanding of HCV viral RNA replication and the mechanism of action of this RNA polymerase. These findings have encouraged the development of inhibitors of this target for antiviral therapy. Anti-HCV activity has been shown in-vivo with C-nucleosides containing a 2′-C-methyl (Me) substituent. The presence of the 2′-C-Me group prevents the chain elongation catalyzed by the RdRp NS5B. To further investigate this phenomenon, the synthesis of modified pseudouridines was performed using earlier developed strategies for the unmodified nucleoside. By coupling of the protected pyrimidine to a likewise protected 2′-C-methyl-D-ribono-lactone the C-nucleoside was formed. Subsequent reduction and ring closure generated alpha and/or beta- 2′-C-Me pseudouridines. Through the work presented here, this modified pseudouridine synthesis was optimized and will be utilized in the synthesis of other modifications of this naturally occurring nucleoside and evaluated for their antiviral activity. This will include conversion to substrates suitable for the monophosphate prodrug strategy. Funding Acknowledgement: University of Toledo College of Pharmacy and Pharmaceutical Sciences, University of Toledo Office of Research deArce grant, and National Science Foundation

Scheker, Katherine

SEX DIFFERENCES IN STATIN DRUG SIDE EFFECTS

Statins are the most widely prescribed drugs worldwide and reduce cardiovascular disease by lowering cholesterol levels. The major statin side-effect is myopathy (muscle damage). Females are more susceptible than males. To distinguish between effects of gonadal hormones and genetic sex (XX vs. XY), we used a novel mouse model (FCG) with four "sexes": XX mice with male gonads, XY mice with female gonads, XX female, and XY male. We found that XX female and XX male mice are more susceptible to statin myopathy than XY male and female mice. Here, we investigate the molecular mechanism. The XX sex chromosome complement confers greater susceptibility to statin-induced myopathy through effects of specific X chromosome genes. Our candidates are four genes that are expressed at higher levels in XX compared to XY cells, known as "X escapee genes". We isolated RNA from the muscle of FCG mice fed chow or statin diets and analyzed gene expression using RT-qPCR. In cultured C2C12 myoblasts, we transfected Kdm5c or control plasmid and examined effects on gene expression and on mitochondrial function using a Seahorse XF Extracellular Flux Analyzer. Statin drug induced the expression of one X escapee gene, Kdm5c, at higher levels in XX than XY mice. In cultured myoblasts, enhanced Kdm5c levels led to increased expression of Atrogin-1, a marker of muscle damage, and reduced mitochondrial respiration in response to statin treatment. Our results suggest that the X escapee gene Kdm5c may contribute to greater incidence of statin-induced myopathy in females. Funding Acknowledgement: SMC/UCLA SRI, NIH National Human Genome Research Institute

Scherer-Berry, Michal

A COMPUTATIONAL STUDY OF TRANSITION METAL CLUSTERS FOR DEHYDROGENATION CATALYSIS

Developing more reactive and selective catalysts for petrochemical refining and synthesis, specifically the dehydrogenation of propane to form propylene, is extremely important for the US and global economy. Studies have suggested that sub-nanometer transition metal (TM) clusters can be synthesized with superior properties to those of the bulk metal. The use of alloy clusters can potentially tune their catalytic properties for specific reactions. Using computational methods, the dehydrogenation reaction pathways of possible catalysts with propane can be tested; however, this can be very time consuming. By looking at possible simple descriptors of promising catalytic behavior, the time spent testing specific alloys can be greatly reduced. Using the Vienna AbInitio Simulation Package (VASP), we have found a possible correlation between the hydrogen binding energy of a four-atom TM cluster and its activation energy for the rate-limiting step of the propane dehydrogenation reaction. If such a correlation exists, the far less time consuming calculation of hydrogen binding energy could provide a clear indicator of catalytic activity. We have calculated the hydrogen binding energies for M4 (M = TM atom) as well as Pt4-x Mx alloy clusters, (x = 0-3) and have tried to understand how differences in these energies are related to properties of the clusters such as ionization energies, electron affinities, and cohesive energies. We have found that M4 clusters with high electron affinities and those with low ionization energies generally bind it more strongly. Funding Acknowledgement: Indiana Space Grant Consortium and Valparaiso University

Schiller, Kaleiah

INVESTIGATING THE USE OF INFRARED THERMOGRAPHY ON PIGLETS WITH PRRS

Since the late 1980s, Porcine Reproductive and Respiratory Syndrome (PRRS) has become a ravaging disease in the swine industry. Due to the virus's ability to mutate and spread, many measures have been explored to prevent and isolate the sweep of this disease. Detecting early clinical signs of illness is imperative to mitigating the spread of PRRS by sorting sick pigs from the presumably healthy population. This study investigates the use of IRT (Infrared Thermography) to sort ill pigs, and also to non-invasively determine core body temperature. IRT measures radiated temperatures, and therefore is a promising tool for identifying a positive viremia state in swine by indicating febrile signs via thermal images. In the current study, 28 Large White x Landrace and Duroc nursery pigs, 18-21 weeks old, were designated to one of three different groups: the Control (Con) group, low virulent strain of PRRS (B3), or high virulent strain of PRRS (B5). Piglets in group B3 were intramuscularly injected with a mild strain of PRRS (inoculum MN-184) and piglets in group B5 were injected with a more severe strain (OK-184). In the initial stages of the study 12 piglets were designated to the control group, 8 to B3 and 8 to B5. Once piglets were inoculated with the assigned strains, two pairs of 4 contact piglets from the control group were introduced to groups B3 and B5. For the remainder of the study ocular images of the left eye and microchip readings indicating core body temperature were recorded for data analysis. Temperatures recorded from the IRT photos proved to have a strong statistical correlation to that of the microchip temperatures, however had no statistically significant relationship between piglets that were positive for PRRS. These results indicate that ocular infrared thermography can be a viable means of collecting core body temperature, however cannot detect whether a pig is positive or negative for Porcine Reproductive and Respiratory Syndrome. Conclusively, further research is needed into completely understanding IRTs diagnostic capabilities. Funding Acknowledgement: University of Wisconsin- River Falls Undergraduate McNair Program

Silva, Martin

HONEYBEES AS BIOMONITORS OF METAL POLLUTION IN METROPOLITAN CHICAGO NEIGHBORHOODS

Introduction: Honeybees, Apis mellifera, are useful organism for biomonitoring at local scales due to their modest flying range and their foraging behavior, which brings them in close contact with fine particles that can be an important airborne source of metal pollution. This study reports an Apis biomonitoring study investigating metal levels in Chicago neighborhoods with differing socioeconomic characteristics and differing proximities to potential point sources of metal pollution such as coal-fired power plants, manufacturing, waste incineration, and transportation infrastructure. Methods: With the cooperation of Chicagoland beekeepers, Apis were collected from thirteen hives located in neighborhoods throughout the city and surrounding suburbs. Locations included a range of geographic areas, neighborhoods of differing socioeconomic status, and differing proximity to current or historic point sources. Bees were killed rapidly and humanely on dry ice, and the resulting samples were dried, ground, and dissolved via microwave assisted acid digestion using clean . Trace metal analysis including copper, zinc, cadmium and lead was performed by anodic stripping voltammetry. The digestion and ASV analysis were validated by means of digestion and analysis of a certified standard reference material, as well as through quality control samples including blanks, calibration checks and replicates. Results and Conclusions: Calibrations, including both external standards and standard additions, were linear with correlation coefficients above 0.995, and percent recoveries of metals from the standard reference material of 95%. Solution phase limits of detection were on the order of 0.6 to 3 ppb, which after accounting for sample preparation steps, coincides with 3-15 ppm metal in dried solid samples. While ASV analysis of neighborhood samples is complete, data analysis is ongoing. Initial data analysis shows detectible levels of Cu, Zn and Pb in all samples, but detectible levels of Cd in some samples. Further analysis of the data is required to determine quantitative concentrations of the metals in the samples. Quantitative results for neighborhood samples will be presented, and compared with each other and with literature values for trace metals in biomonitoring studies of other urban areas Funding Acknowledgement: Support of NSF-DUE award # 0757053 and of Roosevelt University Provost's Office 2016 Summer Grant Program are gratefully acknowledged.

Smith, Jesse

PRODUCTION OF ATG11CC2-3 BY LIGATION INDEPENDENT CLONING FOR CHARACTERIZATION OF THE ATG11 COMPLEX

Autophagy describes a process that occurs within eukaryotic cells in which cellular material is enclosed within a vesicle composed of a double phospholipid bilayer, known as an autophagosome, and transported for degradation. Autophagy is describe primarily in terms of the content being carried within the autophagosome. Bulk autophagy describes when a large amount of cellular content is transported for degradation. Selective autophagy, on the other hand, describes when specific material is targeted and then sent for degradation. Autophagy is regulated through over 35 autophagy related proteins (ATG) within yeast. ATG11, a scaffolding protein, is vital for selective autophagy. The goal of this research is to improve the understanding of ATG11 and its necessity for selective autophagy to be performed. An understanding of ATG11's function within yeast will provide insight into its homologs within humans and its linkage with various diseases. Funding Acknowledgement: Ronald E. McNair Scholars Program, Eastern Michigan University Honors College, Eastern Michigan University

Smith, Remi

IDENTIFYING NOVEL GLIA MARKERS IN THE ZEBRAFISH ENTERIC NERVOUS SYSTEM

The enteric nervous system (ENS) is the largest subdivision of the peripheral nervous system that functions to control the gastrointestinal tract. Enteric glia function in maintaining the intestinal barrier lining and supporting enteric neurons. We are interested in determining markers to identify glia in the larval zebrafish ENS. Preliminary studies suggest that the accepted zebrafish specific marker for glial fibrillary acidic protein (GFAP), the antibody zrf1, used to identify glia in other tissues may not be specific to glial cells in the gut but, may be labeling another cell type in the intestine smooth muscle. To identify antibodies more specific to glia in the gut, we are screening a panel of antibodies both to GFAP and other glial proteins. Our antibody screen also requires testing and modifying current immunohistochemical (IHC) protocols. IHC modifications we are testing include types of tissue fixative, length of tissue fixation and, whether sectioning or removal of the skin can achieve improved antibody accessibility and better staining of the tissue. Colourless, a mutant zebrafish line presumed to lack enteric glia will then be used to test for the specificity of glia markers after the establishment of the markers in wild type fish. Funding Acknowledgement: IINSPIRE LSAMP, National Science Foundation

Spinner, Chelse

DO HOST ORGANISMS ALTER FEEDING BEHAVIOR IN RESPONSE TO PARASITISM?

Many parasites and pathogens are known to alter host growth, development and reproduction. Parasites by definition damage host fitness, and often do so through the depletion of host resources critical for host longevity and reproductive success. Previous research has indicated that host organisms may be selective in their diets to balance and/or obtain nutrients as a way of countering the effects of parasitic attack. Moreover, it has been shown that Drosophila melanogaster can exhibit selective feeding on specific combinations of protein and carbohydrate concentrations in the diet in order to maximize their lifespan and reproduction. Using an experimental Drosophila fly - Macrocheles mite study system, we tested the compensatory feeding hypothesis, namely that hosts can mitigate the negative effects of parasitism by altering patterns of nutrient consumption. We evaluated the prediction that when infected hosts are given a diet low in protein, they should overconsume that resource, relative to uninfected controls, in order to maintain reproductive output. Overall, flies consumed more food with low protein concentration compared to high-protein food. Contrary to prediction, we found that parasitized flies consumed less food over all experimental diets. Possible reasons for these counterintuitive results are discussed. Funding Acknowledgement: University of Cincinnati Biological Sciences Department

Stallings, Roosevelt

INSPIRING AN INTEREST IN STEM

The purpose of this project was to summarize data provided by middle school participants in the annual Howard University middle school summer engineering camp 2015 – 2016. The point of the program was to inspire underrepresented students to take an interest in engineering and all STEM fields at an early age. One goal of the project was to ultimately encourage students to consider majoring in STEM as they as undergraduate students. This project is important because it exposed students to new areas that they may not have considered as a potential career. Data was obtained from pre and post online surveys using Google Forms. The pre-survey was administered to participants on day one of the camp while the post survey was administered on the final day of camp. A final result of the data showed that participants were able to "soak" up more information than was expected. Students in some cases were only attending because of parent involvement, but by the end of the camp shared that they were more interested in engineering after the camp because they could see a practical usage for the career. The results from this study could assist educators interested in establishing a new program for urban middle school students. Future work might include collecting data on the students as they re-enter the school system to determine how many and which students participated in STEM related extra-curricular activities. Funding Acknowledgement: Department of Energy - MSIPP - Consortium for Advanced Manufacturing

Starr, William

ANTIBIOTIC RESISTANCE OF PSEUDOMONAS AERUGINOSA FROM VARIOUS CYSTIC FIBROSIS PATIENTS

Cystic Fibrous (CF) patients produce dehydrated thick mucus in their lungs and lack the ability to clear this mucus due to mutations in the cystic fibrosis transmembrane conductance regulator gene (CFTR gene). The mucus provides an optimal environment for bacterial infections. It is reported that P. aeruginosa infects up to 50% of children and 80% of adults with CF. Once the infection has been acquired, eradication of P. aeruginosa from the CF lung is rare. P. aeruginosa is naturally resistant to many antibiotics and acquires antibiotic resistance during the infection process. This study aims to determine resistance profiles of P. aeruginosa clinical isolates from patients of various ages. Kirby-Bauer tests were performed on 54 isolates using six different antibiotics which represent three different antibiotic classes. To determine if resistance was due to genetic factors genomic DNA was extracted from the CF isolates and PCR was performed to verify the presence of eight antibiotic resistance genes. The results showed that all of the isolates had resistance to at least one of the six antibiotics; however, not all of isolates showed the presence antibiotic resistance genes by PCR. The study also found that isolates from younger patients were less resistant when compared to the older patients' isolates. By understanding antibiotic resistance of P. aeruginosa from CF patients regards to the mechanisms in which this resistance is acquired , treatment options for CF patients can be more specialized and targeted based on age, infection type, and susceptibility or resistance to certain antibiotics. Funding Acknowledgement: National Institutes of Health, Niblack Research Scholarship Fund, OK-LSAMP

Stephen, Juanita

DEFECT DETECTION OF A PIXEL OF DATA FROM INFRARED THERMOGRAPHY

The purpose of this project was to use three different procedures to detect defects in a pixel of data retrieved from the infrared thermography camera. Active thermography is important and is a widely used technique of nondestructive evaluation. This form of thermography is used in various industries including both aerospace and automotive. I chose to analyze two pixels using MATLAB, instead of using Thermoscope, a software provided by the camera manufacturer. Pixels were analyzed using a carbon reinforced polymer. I explored three ways to analyze the two pixels to show the defect in comparison to the sound data. The procedures for this experiment were developed by Steven Shepard. Shephard uses the logarithmic domain of the temperature and variation over time to reduce the noise in the graphs. A problem occurred during the study that limited final results. This approach requires an external heat stimulant to determine a defect in contrast to a defect free sample. However, due to the process of this technique, the heat diffused laterally and the signal of the data became fuzzy and difficult to analyze. One preliminary conclusion was to reduce the noise arising from the temperature variation of the surface of the sample over time, procedures must be refined and tested to determine the most accurate way to analyze the data and account for heat diffusion. Funding Acknowledgement: NCAT- REU, Department of Energy - MSIPP - Consortium for Advanced Manufacturing

Stokes, Diamond

EXAMINATION OF MINERAL MAKE-UPS VIA ENERGY DISPERSIVE X-RAY FLUORESCENCE SPECTROSCOPY

The sale and use of cosmetics is an enormous business throughout the world. The Federal Food, Drug, and Cosmetic Act (FD&C) gives authority of the U.S. Food and Drug Administration (FDA) to oversee the safety of food, drugs, and cosmetics. The FDA does not approve cosmetic products in the same way as it monitors food and food supplements. Thus, what can be included in a make-up is much less tightly controlled than what can be included in a food or food supplement. This study examines the components of thirty-eight powdered cosmetics including foundation and eye shadows that are sometimes referred to as mineral make-ups through the use of energy dispersive X-ray fluorescence spectroscopy (EDXRF) to determine what elements are present The response of the XRF instrument was evaluated by comparing the results from the EDXRF with certified values in two soil standards. With one of the standards, the percent error was less than 14% for iron, lead, titanium, manganese, zinc, strontium, and copper. In the makeup samples, the presence of the different elements was determined by analyzing the EDXRF spectra for each sample. Most samples contained titanium, and one eyeshadow sample had significantly more chromium than the other makeup samples. Future work will include the analysis of other elements in the samples. Funding Acknowledgement: Work reported in this abstract was supported by the National Institutes of Health Common Fund and Office of Scientific Workforce Diversity under three linked awards RL5GM1189XX, TL4GM1189XX, 1UL1GM1189XX, NRMN U54GM119023 and CEC U54GM119024 administered.

Sykes, Tredijah

IMPACT OF NEIGHBORHOOD DISORDER AMONGST AFRICAN AMERICAN WOMEN IN BALTIMORE

Background: Sex that is forced (threats, weapon, being hit/held down) by a male partner or non-partner disproportionately affects African American women. Particularly, the city of Baltimore has been named one of the top 10 most HIV impacted areas in the United States, which is why this project recruits women from Baltimore. Despite the vast research on forced sex and cortisol levels, no studies have examined potentially modifiable environmental characteristics as contributors to forced sex specifically or the effect of the stress-response resulting from a history of forced sex on HIV risk and STI infection, accounting for environmental factors. The purpose of this project is to examine the relationship between neighborhood disorders, such as high crime rate, level of noise in neighborhood, and safety in neighborhood, and cortisol awakening response and using this information to determine whether that relationship differs between African American women exposed and unexposed to forced sex. Methods: Participants were recruited from local STD clinics to screen for eligibility to participate in the study. If eligible, the participants took a survey about their sexual history and collected saliva samples, which were sent off to extract cortisol level data. Results: Regression analyses as well as scatterplots were created to show that there is no significant correlation between perceived neighborhood disorder and CAR levels, for either the exposed or unexposed groups. The second scatterplot proved that though visually there is a difference, there is no significant correlation between perceived neighborhood disorder and perceived stress level. Conclusions: Though this project contains only preliminary data, the data collected along with future collections, will contribute and provide more robust data results to the association between forced sex, stress, and environmental disorder. Funding Acknowledgement: Centers for Disease Control and Prevention and National Science Foundation

Tchienga, Hans
DIRECT H/D EXCHANGE OF SMALL MOLECULES USING NHC-AMIDATE PD(LL) CATALYST IN D2O AND METHODOLOGY
Deuterated drugs carry many advantages, such as slower rates of bond cleavage at the deuterated site when compared to hydrogen and lower adverse effects while maintaining the physical, biological properties of the drug and their affinity for their target. Additionally deuterated drugs can offer improved pharmacokinetic profile of the drug: the strength of the carbon-deuterium bond increases the lifetime of a drug, and decreases the concentration that gives half-maximal response. Multi-step synthesis is traditionally used to incorporate deuterium into a molecule. Here we explore a novel method, which consists in adding deuterium oxide directly to the molecule of interest using a catalyst such as NHC-Amidate Pd(II). Small molecules like, N-methylmorpholine, N,N-dimethylethanolamine, and dicyclohexylmethylamine were used as model systems for these experiments. O-methyl, N-methyl, C-methyl sites were targeted in those molecules. Our aim was to synthesize deuterated analogs of commercially available antidepressant drugs such as fluoxetine and desvenlafaxine. The incorporation of deuterium using the catalyst listed above did not deliver consistent results. New catalysts and conditions are under investigation. Funding Acknowledgement: Locker Institute and National Science Foundation

Torres-Cruz, Terry
DISCOVERY OF A NEW FUNGAL SPECIES
In this study we report on the discovery and characterization of a novel fungal species within Mucoromycotina, and its associated bacteria. Fungal isolates were obtained from the Duke Forest Free Air Carbon Enrichment Site using particle filtration and soil dilutions on PYG+ media at 25ºC. Morphological characteristics were described and a phylogenetic analysis was conducted using multiple genetic regions and genome sequencing of the fungus. Bacterial symbionts associated with the fungal mycelium were also analyzed using next generation sequencing and culturing. Metagenome data from the field site indicates the novel taxon is more abundant in lower soil horizons and responds favorably to long-term N fertilization. The most similar ITS sequences for the isolates belong to uncultured soil fungal sequences obtained from metagenomic analyses and an isolate from endophytic fungi in mosses. Light and electron microscopy showed dimorphism with abundant coenocytic hyphae in MEA media and the presence of yeast cells. Potential chlamydospores were also observed. Bacteria were observed on the hyphal surface using electron microscopy. Bacillus licheniformis and Stenotrophomonas were cultured from this fungus. Analysis of SSU and phylogenomic analysis using low coverage genome data indicates this new fungal species represents a novel lineage within Mucoromycotina. This discovery is important to understanding the evolution and ecology of early diverging terrestrial fungi. Funding Acknowledgement: Department of Energy, Los Alamos National Laboratory

Tunyi, Achombom (Jude)
USING COMPUTATIONAL TECHNIQUES AND SIMULATIONS TO ANALYZE M+(H2O)N CLUSTERS W/ I-TTM MODEL AND MB-MD
Aerosols, tiny particles including alkali metal ions that get suspended in the atmosphere when waves break and crash, can be detrimental to the climate, sunlight absorbance and even add to the pollution of Earth. Aerosols can be a result of volcanic eruptions, seawater particulates being released to the atmosphere or they can be man-made. It is crucial to understand how these metal-alkali ions hydrate with the water vapor present in the atmosphere on a molecular level to better understand atmospheric processes. This will allow us to better predict the result of aerosol activity such as decreased sunlight or increased groundwater pollution. After extensive literature review, I believe that on a molecular level metallic ion aerosols will have stronger interactions with increasing size as well as vibrational spectroscopy corresponding with experimental M+(H2O)n studies. Structures for the alkali metal ions and water clusters are made using the ion-Tholetype model (i-TTM) and many-body molecular dynamics, which performs more accurate quantum mechanical calculations by taking into account dispersion, repulsion, and electrostatic interactions. After the structures of the different isomers of the M+(H2O)n clusters were isolated, harmonic and anharmonic vibrational frequencies were calculated. These structures and frequencies were then compared to experimental results as a way of either validating or refining the model. If the molecular simulations and experimental analysis are in agreement, then potential energy surfaces can be created from the data. The findings suggest that the iTTM model is a good tool for predicting the interactions of the M+(H2O)n clusters and there are strong interactions between the alkali ions and the water clusters occurring in the atmosphere. Funding Acknowledgement: CAICE program UCSD, NSF

Upshaw, Chanell

ASPERIGILLUS FUMIGATUS GROWTH IN DIFFERENT NITROGEN SOURCES

Aspergillus fumigatus is a fungus that can cause invasive pulmonary infections in immunocompromised individuals. The asexual spores produced by the fungus are the infectious propagule. To cause invasive disease the asexual spores must begin germination and initiate hyphal growth. Knowledge on how the fungus controls nutrient uptake for its growth in the lungs, however, is still very limited. Germination of the conidia has two distinct stages. Initial triggering of germination is observed as swollen conidia while polarized growth is seen as hyphae extended outward from the spores. We have found that germination in the lungs early after infection is heterogeneous between A. fumigatus isolates. Previous reports have demonstrated that different nitrogen sources can alter Aspergillus spp. germination and growth. Thus, we hypothesize that A. fumigatus isolates have differential growth potentials on different nitrogen sources. To test this, we assessed the in vitro germination rate of both a highly virulent (CEA10) and moderately virulent (Af293) Aspergillus fumigatus isolate in the presence of different nitrogen sources. Preferred nitrogen sources, such as ammonium tartrate and glutamine, triggered the germination of both A. fumigatus isolates, but non-preferred nitrogen sources, such as nitrate, only triggered the growth of the highly virulent CEA10 isolate of A. fumigatus. Thus, our data suggests that highly virulent isolates of A. fumigatus are likely more able to adapt to the nutritional environment found in the mammalian lungs. Research was conducted at Dartmouth College as part of the ASURE summer research program. Funding Acknowledgement: Dartmouth Lung Biology Center for Molecular, Cellular, and Translational Research Grant P30-GM106934, the Center for Molecular, Cellular, and Translational Immunological Research grant P30-GM103415; CU is supported by the ASURE program at Dartmouth College.

Vargas Castillo, Amil

AN ASSESSMENT OF METHODOLOGIES FOR LOW-RESOLUTION FACIAL RECOGNITION

The Collegiate Science and Technology Entry Program (CSTEP) at Onondaga Community College provides student support services such as counseling and tutoring. To allocate resources, CSTEP tracks the students and the services they use. Limitations to accurately tracking student use of services include students forgetting to sign in or document the type of service used. Facial recognition is a widely used biometrics identification technique. CSTEP began development of the use of facial recognition software last year that included a student-activated image capture process. We were able to improve this by incorporating the use of streaming video. The video was continually analyzed to detect, track and identify students from captured facial images. In making this improvement, we found some captured images were of low resolution. The low quality of the image made it difficult for the program to extract sufficient data points to create a vector that uniquely identified a student. For images with a resolution less than 32x32 pixels, the performance was greatly degraded. We researched three methodologies to increase the accuracy of student identification in low-resolution images. The first is the class-specific kernel linear regression classification method (Chou, Huang and Yang). This method maps the low resolution original space into a feature space of higher dimensions which improves the application of linear regression. The second method proposes a reformulated data constraint that allows the analysis of the image to occur in the high resolution image space (Zou and Yuen). Working in the high resolution space provides a reconstructed high resolution image with both better visual quality and recognition performance. The third method (Lee, Park and Lee) utilizes an existing data set generated by high resolution training set images and then reconstructs the low resolution image based on the "ball" space or spherical decision boundary which contains descriptive data from the high resolution images. Because observations of the conditions to capture the typical images for CSTEP students included fair illumination and a range of resolutions for the low end of 32x32 to 64x64, an application of the third methodology was selected for development. Funding Acknowledgement: CNY Works, Synergy, Mercy Works, Upstate LSAMP, and Onondaga Community College

Venegas, Janel

PROMOTING SUCCESS IN FIRST-YEAR STUDENTS THROUGH ACTIVE LEARNING TECHNIQUES IN A SCIENCE CLASSROOM

One of the many positive additional outcomes of a first-year experience instructor course is the improved teaching skills in the first-year course as well as in other courses that they might teach. That was the case in a general education science course at Waubonsee Community College and Northern Illinois University. Using the knowledge, skills, and experience in a first year training course, instructors are able to transfer the same skills to a first year science class for freshmen. Application of active learning techniques to build personal validation, self-efficacy and reflection in large enrollment science class and small class sizes at community college will be described in this presentation. Ideas on how to engage first-year science students with a special emphasis on addressing important issues such as inclusivity and multicultural awareness will be covered in the case study application. Science course format that addresses different pedagogies will be discussed and essential information that helped promote effective classroom instruction and communication with a diverse student body will be highlighted. As a result of attending this poster, participants will become familiar with the research-based benefits of first-year experience faculty development for all faculty influence in science courses that they teach in a community college setting. Learn 3 ways to apply Joe Cuseo's Seven Points Promoting the Success of First-Year and First-Generation Students in a general education science classroom. Learn at least one avenue for assessment of the application of Joe Cuseo's Seven Points Promoting the Success of First-Year and First-Generation Students in a large, lecture-based, general education classroom.

Voorhis, Daphne

AUTOPHAGIC FLUX MEASUREMENTS USING ΔLC3B-EGFP-MCHERRY GBM CANCER CELLS

Glioblastoma (GBM) are tumors that arise from astrocytes of the brain. This is a brain cancer that is highly malignant with a poor prognosis. Treatments consist of surgery, chemotherapy and radiation. However, the average survival time is only 15 months. Further understanding and novel treatments are urgently needed. Cell metabolism is a promising therapeutic target. In particular, autophagy is a key process in cell survival or death. Molecular cloning techniques were used to construct U87 and U251 cell lines that stably express a tandem autophagy marker protein, LC3B attached to mCherry and eGFP. During late stages of autophagy, low pH quenches the green fluorescence, but the red fluorescence remains. To look into the different stages of autophagy we treated the cell lines with 30 or 60 uM chloroquine. This prohibits the late stages of autophagy. U251 cells do not exhibit green fluorescent puncta and with chloroquine treatment, they form vacuoles and die. U87 cells have both green and red puncta, indicating a typical pattern of autophagic flux. U87 cells do not form vacuoles upon chloroquine treatment, but they also die. There are currently seven on-going clinical trials using chloroquine, but the mechanism for how the cells die is still relatively unknown. Using p62 as another marker, we compared autophagic flux between untreated and irradiated engineered GBM cells. Comparisons of fluorescence patterns in a number of engineered GBM cells will likely lead to illumination of autophagic flux and mechanisms of cell death, which may eventually lead to new treatment options. Funding Acknowledgement: Northern Illinois University Research Rookies

Winfrey, Mercedes

MEASURING CO2 EMISSIONS AS A BASIS FOR UNDERSTANDING INDOOR AIR QUALITY AND ROOM VENTILATION

Washington State University (WSU) is collaborating to make Spokane, Washington a leader in smart city technologies. The Smart Cities Project will use smart sensor technology to provide better management of resources (such as energy and water) while also promoting health and well-being in the city. The Laboratory for Atmospheric Research at WSU is developing a sensor package for monitoring air quality for the Smart Cities Project, using various sensors to measure carbon dioxide, ozone, nitrogen dioxide, and particulate matter (particles from smoke and pollution). These sensors have been interfaced to a Raspberry Pi computer and are being mounted into a weather-proof 3-D printed container. As an initial test, we will measure the indoor air quality and ventilation rate with a cost-efficient CO2 sensor within a laboratory in the new PACCAR Environmental Technology Building at WSU. Carbon dioxide will be released into the lab periodically, and we will analyze the data on how the gas is disbursed within room.The rate at which the carbon dioxide dissipates in the lab will allow us to study the ventilation rate. The accuracy of the data from the sensor package will be compared to a more accurate and expensive LI-COR 820 Closed-Path CO2 sensors, which is currently being used in a national study of the indoor air quality of residential homes. Lastly, the various sensors will be mounted into the weather-proof container for eventual deployment on light posts in Spokane as part of the Smart Cities Project. Funding Acknowledgement: National Science Foundation

Wood, Melissa

ORTHO-PHOSPHATE CONCENTRATION IN CORAL REEF WATERS; ROATAN, HONDURAS

Coral reefs have been challenged by environmental changes over the past few decades. These challenges include hurricanes, El Nino events, and acidification of the ocean waters. Phosphorus is an essential element for sea life proliferation as it is incorporated in genetic material. (soluble PO4-3) Ortho-Phosphate is the predominant form of phosphorus in benthic waters and its concentration is directly related to the health of sea life including corals. The objectives of this research were two-fold: a.) to measure ortho-phosphate concentrations on the Roatan island coral reef; and b.) determine if there were any statistically relevant difference in ortho-phosphate concentrations between the water immediately above healthy coral vs. diseased coral. The most prolific and reliable measure of ortho-phosphate concentration is the molybdic acid/potassium antimonyl tartrate/ascorbic acid protocol which binds to soluble phosphate producing an intense blue color which can be quantified via visible absorption spectroscopy. Water samples were obtained by the Midland College scuba diving team at 5 different locations along the Roatan, Honduras island coral reef. At each of these locations, samples were acquired in the water column directly above Orbicilla (formerly Montestrea) Annularis corals for both healthy coral specimens and diseased coral specimens. Our results show that the ortho-phosphate concentrations in these waters were all less than 0.11 ppm. These results were corroborated by A&B Laboratories (Houston, Texas). Although we see slight differences in ortho-phosphate concentrations between healthy and diseased coral, these differences are close the detection limit of the experiment. Funding Acknowledgement: UT-LSAMP Senior Alliance

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