

20th Annual
Undergraduate Student
Symposium



April 6 and 7, 2022

Alvin Sherman Library, Research, and Information Technology Center

NSU

Florida

Farquhar Honors College
**NOVA SOUTHEASTERN
UNIVERSITY**

Undergraduate Student Symposium 2022

The Undergraduate Student Symposium, sponsored by the Farquhar Honors College, presents student projects through presentations, papers, films, and poster displays. The event serves as a “showcase” demonstrating the outstanding scholarship of undergraduate students at NSU. The symposium is open to undergraduate students from all disciplines. Projects cover areas of student scholarship ranging from the experimental and the applied to the computational, theoretical, artistic, and literary. They are taken from class assignments and independent projects. Project presentations can represent any stage in a concept’s evolution, from proposal and literature review to fully completed and realized scholarly work. As in past symposia, the definition of scholarship will be sufficiently broad to include work presented in the biological and physical sciences, the social and behavioral sciences, computer science and engineering, mathematics, arts and humanities, nursing and health care, education, and business. This is the twentieth annual Undergraduate Student Symposium.

USS 2022 Keynote Speaker



Ken Dawson-Scully was born and educated as a neuroscientist in Canada where he received his PhD from the College of Medicine at the University of Toronto and moved to South Florida 14 years ago. He recently started his position at Nova Southeastern University as the Senior Vice-President of Research, Associate Provost, and Professor.

His NIH funded research program, now located at the NSU Palm Beach campus, investigates neurological modification through genetics and drug discovery to treat diseases such as stroke, migraine, and epilepsy. Over the past 14 years his lab has been using advanced techniques such as behavior, genetics, electrophysiology, and cellular bioimaging. He has been granted 3 patents and spun out 2 companies in the biotech sector leading to his successful National Science

Foundation i-Corps grant that accelerated over 50 companies towards success in South Florida.

Dr. Dawson-Scully has mentored 18 PhD students and over 40 undergraduates in his laboratory and he has also developed 2 research intensive undergraduate honors programs that has brought hundreds of students through the research and thesis process.

USS 2022 Student Speaker

Naziba Akther (Pronunciation: Nazeeba Akhter)



Naziba Akther is a fourth-year student at Nova Southeastern University's Halmos College of Arts and Sciences, where she is pursuing a dual degree in Biology and Mathematics with minors in Chemistry, Bioinformatics, Applied Statistics, Pre-health, and Honors Transdisciplinary studies.

She is currently serving as President's 64 member, Honors College Advocate, Senior Supplemental Instruction leader for Biochemistry, Senior Tutor for Math and Science, President of Tribeta National Biological Honors Society and Vice President for NSU Math Club. Additionally, she is also conducting research at NSU Oceanographic Center as well as the Department of Mathematics. Upon completion of her undergraduate studies, she intends to attend medical school.

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**20th Annual
Undergraduate Student Symposium**

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Abstract Proceedings

**Farquhar Honors College
Nova Southeastern University**

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Student Speaker: Naziba Akther Nuha

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A Computational Analysis of Structural Analogs of Colchicine as Potential Microtubule Polymerization Inhibitors

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Abstract

Microtubules are structures important for cell survival and cell function. They are responsible for the formation of the cytoskeleton and mitotic spindles, they aid in cell movement, intracellular transport, amongs other functions. Microtubules are composed of the tubulin protein made of alpha-beta dimer proteins. During polymerization tubulin proteins experience phases of dynamic instability, characterized by microtubule growth and shrinkage at varying rates. Microtubule growth can be inhibited by compounds such as colchicine, a known microtubule destabilizing agent, that binds to tubulin inhibiting microtubule polymerization. Colchicine has limited clinical use due to its toxicity and low solubility. In this study we investigated one hundred eleven compounds that had a similar structure to colchicine. We used AutoDock Vina to computationally dock each compound, including colchicine, to tubulin in the same binding site as colchicine. Autodock was able to replicate the crystal structure of colchicine with a binding energy of -10.9 kcal/mol. Results showed that the binding energies of compounds with the 10% highest binding affinity were between -9 kcal/mol and -7.9 kcal/mol. We also used computational methods to determine that all top 10% drugs have high solubility in comparison to colchicine. The solubility of these drugs and binding affinity to the microtubule indicates the potential of these drugs as inhibitors of microtubule polymerization, which will be further explored through laboratory experiments.

A Mathematical and Ergonomic Analysis of Fundamental Laparoscopic Surgery Tools and Techniques

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Abstract

Laparoscopic surgery is a means to perform procedures in a minimally invasive manner. For surgeons, this requires further training due to increased complexity and fatigue. The goal of these experiments was to study the ergonomics of laparoscopic tools and the physical and cognitive requirements of the Fundamentals of Laparoscopic Surgery (FLS) tasks.

Surface electromyography (sEMG) was used to measure muscle fatigue on the left and right trapezius and electroencephalogram (EEG) was used to record brain waves of the participants. The percent maximum voluntary contraction (%MVC) concept was used to measure fatigue levels. Mean power spectral density was used to categorize the five different brain waves. There were two tasks in the experiment: peg transfer and suturing.

EEG results showed no significant difference in brainwave activity between the two tasks, but a difference was observed in trapezius muscle activation.

A novel TCR clustering method for SARS-COV-2 epitopes

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Abstract

T-cell epitopes are peptides generated from antigens that are presented by MHC class I and class II molecules to T-cells. These epitopes are usually identified by T-cell receptors (TCRs) of CD4 T-cells which then causes transformation of CD4 T-cells to helper or regulatory T cells. In this project, we look at the different TCR sequences of the same length that are activated by two different epitopes for the SARS-COV-2. Building on previous work using Principal component analysis to analyze twenty different physiochemical properties of amino acids, we convert the amino acids in the TCR sequences to numerical strings. We then use four distances methods (Cosine, Cityblock, Euclidean and Correlation) on these strings, and cluster the TCRs in order to compare the dendrogram outputs and see which method does a better job of grouping together like TCRs activated by each epitope. Results are compared to standard matrices such as BLOSUM, PAM, and Gonnet. We thus present a novel TCR clustering technique that will be less computationally strenuous and more cost-effective compared to traditional methods and can be easily utilized by the scientific community to learn more about TCR repertoire sequencing.

A preliminary survey of dog-in-prison programs across the US

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Abstract

The molecular effects of canine-human bonding have not been well-studied, but both species are deeply driven to seek out prosocial interactions. We therefore expect to see quantitative changes in both physiological biomarkers (e.g. cell-level phenotypes linked to psychiatric disease) and animal behavior on both sides of the ancient (>15,000 year old) symbiosis between dogs and humans when dogs and people form interspecies dyads. A compelling context for studying this involves "dog-in-prison" programs, in which incarcerated humans help to train canines for future lives as companionship or service animals. Notably, both the incarcerated humans and orphaned/stray dogs within such programs have been deprived of otherwise ubiquitous opportunities to bond with their own kind. We predict that dog-human dyads will therefore show pronounced benefits of interspecies bonding that can be measured at physiological and behavioral levels. If so, this will bolster support for programs that pair animal and human rehabilitation, and thus enhance the welfare of both ourselves and our best (canine) friends. Here we describe, as the first step toward these aims, a survey of the prevalence and diversity of dog-in-prison programs within the US.

An episodic study of hospital charges for hospital admissions and readmissions in 2017 in the United States for degenerative nerve systems disorders (DRG = 056)

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Abstract

Understanding hospital charges upon admission as well as readmissions is critical for value-based care. The extant literature focuses on patient-specific, disease-specific, and hospital-specific factors to explain the variance in hospital charges across the United States. Studies have mainly examined hospital charges upon admissions but there has been lack of empirical research on examining hospital charges upon readmissions. This has resulted in ambiguity in understanding the primary determinants of hospital charges upon readmissions. To address this gap, the federal agency AHRQ developed the HCUP hospital readmissions database that produces nationally representative information about hospital readmissions. This study utilizes the AHRQ 2017 hospital admissions and the readmissions database to explain the variance in hospital charges for readmissions under the specific diagnostic group—the degenerative nerve system disorders (DRG = 056).

Patient demographics, diagnostic characteristics, and in-patient care variables were considered for the neurodegenerative disorders. Correlation and regression analyses of the continuous variables within available data were employed, and results were captured into potential explanations for variance in hospital charges. Both significant and non-significant results were utilized in the narrative to serve as a basis for the correction of prevailing knowledge.

The data analysis reveals that patient demographics (age, gender, income) and in-patient care variables (number of diagnoses, number of procedures, and length of stay) appeared to be the primary determinants of hospital charges for readmissions. Diagnostic characteristics such as the risk of mortality, the severity of illness, and the primary expected payer had no significance.

Analysis of Errors in ECGs Data Captured by Patients Using At-Home Device Compared to Qualified Healthcare Professionals

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Abstract

Cardiovascular Diseases (CVDs) are a leading cause of death worldwide, accounting for 17.3 million deaths per year. General at-home care has been proven to improve patient outcomes and decrease hospitalization rates. The purpose of this presentation is to present preliminary results from a research study comparing the electrocardiograms (ECG) readability from patients and their caregivers, who conducted at-home ECGs in the experimental group, versus data on ECG readability from patients living in assisted living, nursing home facilities, and routine office visits, where a qualified healthcare professional takes the ECG readings as the control group. This research study will also evaluate the accuracy level in ECG data during the first (Y1) and second year (Y2) of this study where an earlier device model (12-lead internal + two external leads) was used, compared with a newer device model (12-lead internal + three external leads) used in the third (Y3) and fourth year (Y4). With the growth of modern healthcare technology, it is now possible for patients to be more proactive in monitoring their CVD by conducting at-home ECGs with real-time feedback from their cardiologist to identify any abnormalities. At-home medical-grade ECGs can lead to early identification of heart arrhythmias and decreased hospitalization frequencies, resulting in lower costs, decreased stress; all of which increase the overall quality of life for the patient and their care givers. Results from this study will support the need for effective coaching and training of patients and their caregivers in using at-home ECG.

Benefits of STEM Mentorship: Introducing Microbiology Research to High School Students

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Abstract

Bacteria Unearthed is an NSU initiative to bring together high school and college students to participate in *Tiny Earth*: an international consortia of researchers searching for novel microorganisms and antibiotics to combat antibiotic drug resistance. Our group developed a STEM mentor program as a catalyst for students to significantly increase academic performance. The program allows high schoolers to become part of the global research community. These high school students enrolled in their microbiology classes are supported by undergraduate students who have experience working with *Tiny Earth*. Through this experiential learning, it is expected that there will be improvements in organizational, leadership, academic, and personal growth skills in a mutually beneficial relationship. Survey results of the high school microbiology classes have shown that mentors are a valuable asset to the classroom as they directly engage students in the content and have a positive effect on students' interests in STEM careers as well as a positive impact on students' perception of science disciplines. Mentoring relationships additionally provide mentors with increased self-awareness, self-regulation, motivation, empathy, and social skills. As we work together, we will conduct additional surveys to determine gains made by high school students and college mentors.

Bilinguals Demonstrate Stronger Inhibitory Response Bias in Tasks of Executive Function

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Abstract

From switching from one task to another or quickly memorizing a number to call, people use executive function daily. Executive function is thought to be controlled by frontal lobe inhibitory processes. Reportedly, people who speak more than one language also use the same frontal lobe processes to switch between languages. It is therefore believed that these inhibitory processes are more prominent in bilinguals because of the experience of controlling multiple languages. To test this theory, bilinguals and monolinguals were compared on executive function tasks. Participants were matched on demographic variables and fluid intelligence. To examine inhibition, participants were tested with a Go/No-Go task, in which they either had to respond or inhibit a button press. Working memory was assessed with an *n*-back task. Participants had to determine if the stimulus presented was the same as the one presented *n* positions before. A Switch task was administered to examine shifting abilities. Participants responded to target stimulus dimensions. All executive functions tasks were presented using non-verbal stimuli in both auditory and visual modalities. Brainwave activity and behavioral responses were recorded during task performance. Bilinguals exhibited stronger inhibition in behavioral responses and neural activity [measured by the N2/P3 component of the event related potential (ERP)]. On the Switch task, bilinguals had a stronger N2 ERP than monolinguals, but their performance was weaker. Working memory performance favored monolinguals, but neural activity was similar between groups.

Bioremediation of Algae-based Water Treatment: Analysis of Algae Adsorption of Heavy Metals Based on Ion Size and Covalent Indices

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Abstract

A previous published study completed at Nova Southeastern University determined that *Neochloris alveolaris* and *Neochloris minuta* algal strains which were grown in nitrogen-rich (+N) and nitrogen-depleted (-N) environments biosorbed Pb^{2+} , Cd^{2+} , Zn^{2+} , Cu^{2+} , and Ni^{2+} at varying concentrations. These algae biosorbed each metal differently based on their biomass composition (carbohydrates, fats, and lipids) and the type of hard or soft metal acids available, according to the Pearson theory of Hard Soft Acid Base (HSAB) definition. Given these promising findings, this study aimed to further analyze and determine the effect of hard acid ionic metal sizes by using Cr^{+6} , Al^{3+} , Mo^{+6} , and Co^{+2} on the biosorption capacities of the same *Neochloris alveolaris* and *Neochloris minuta* algal strains. The biosorption capacities (q_{max}) and adsorption efficiencies were determined through the usage of Langmuir and Temkin adsorption isotherms. The maximum metal biosorption capacities of *Neochloris alveolaris* and *Neochloris minuta* were 129.87 ppm for Al^{3+} , 29.91 ppm for Co^{2+} , 5.95 ppm for Mo^{6+} , and 0.59 ppm for Cr^{6+} . The maximum biosorption capacities of the selected hard acid metals were indicative of an association with the metals' respective ionic size and covalent indices.

Can Statins Mitigate Adverse Effects of Hormone Replacement Therapy in Women?

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Abstract

Heart disease is the leading cause of death for women in the United States. One possible overlooked risk factor for heart disease in women is hormone replacement therapy(HRT). HRT is most often used to treat certain kinds of breast cancer that depend on sex hormones to grow or to supplement estrogen to women over 60 or who have had a hysterectomy. HRT has been found to increase levels of C-reactive protein(CRP), which is the bio-inflammatory marker that best predicts cardiovascular risk. Statin therapy has been found to decrease levels of C-reactive protein. Currently, CRP is not taken into consideration when prescribing HRT. The aim of this research was to determine whether it would be beneficial to prescribe statin therapy in conjunction with HRT in women. For this study, a meta-analysis of data was performed on independent, peer-reviewed, primary research articles that focused on HRT, CRP, and statins. Results showed that HRT caused an increase in CRP levels, and that statin use significantly decreased CRP levels. Findings could have implications for the implementation of statin therapy in conjunction with HRT to reduce cardiovascular risk.

Caribbean Reef-Building Coral-Symbiodiniaceae Network: Identifying Symbioses Critical for System Stability in a Changing Climate

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Abstract

Coral reef bleaching events across the globe are increasing following intensifying marine heatwaves and higher ocean temperatures. The frequency and intensity of bleaching events are expected to rise over the next 100 years. An increase in coral mortality has been observed in the Caribbean between 1970-2012. Our objective is to produce a network of all Caribbean hermatypic coral-Symbiodiniaceae associations and analyze it in the context of increased temperatures and coral bleaching events. The available scientific literature was explored and inspected to evaluate whether these papers included relevant data for building the network, including the coral host, host depth, sample location, symbiont ITS2 phylotype, symbiont transmission mode, and coral host reproductive mode. This search was centered around reef-building Caribbean corals that were missing symbiont association data or had little data available. Pertinent data was used to build the data library of coral-symbiont associations required for analysis by a graduate student at NSU. This collected data and data from samples collected in the field will be used to create the Caribbean coral-symbiont network in R. This network will be significant to establish which coral-symbiont associations are crucial for network stability and increase conservation focus in areas of high vulnerability.

Comparative Study of Homocoupling Reactions to Create 2,2'-bipyridine Adducts

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Abstract

The project focuses on investigating the synthesis of 2,2'-bipyridine adducts for potential use as ligands in novel organometallic ruthenium complexes. The bipyridine building blocks, based on their excellent bidentate ligands with complexing abilities, will be incorporated into ruthenium complexes in a collaborative project, increasing the photosensitivity of these complexes, and opening the doors for many applications, ranging from synthetic photovoltaics to anti-cancer activity.

The aim of this study was to optimize the preparation of the 2,2'-bipyridine adducts. Prior studies conducted in our lab have compared several homo and cross coupling reactions. It was determined that homocoupling offers a more efficient route, providing greater yield as well as the desired symmetrical bipyridine adducts of 6,6'-(1H-pyrazol-1-yl)-2,2'-bipyridine, 2,2'-bipyridine-3,3'-diol, 4,4'-dimethyl-2,2'-bipyridine, and 5,5'-dimethyl-2,2'-bipyridine. Comparative analysis between 2-bromo-6-(1H-pyrazol-1-yl) pyridine, 2-bromo-3-hydroxypyridine, 2-bromo-4-methylpyridine, and 2-bromo-5-methylpyridine allowed observation of the effects of different electron donating substituents on the synthesis of 2,2'-bipyridine adducts. Additionally, the effects of two different palladium-based catalysts on each substrate were compared: tetrakis(triphenylphosphine) palladium (0) and bis(triphenylphosphine) palladium (II) chloride.

The procedure was conducted under an inert, moisture-free environment. The reaction chamber was assembled in a glovebox protecting the air-sensitive catalysts and substrates and was then moved onto a Schlenk-line assembly under inert argon atmosphere. Reaction times varied from 12 to 72 hours based on the starting substrate and the reaction progress was monitored with thin layer chromatography. Final products were isolated and purified via acidic extraction, and if needed recrystallization. Compound characterization was carried out utilizing NMR and FT-IR.

COVID-19 Vaccine Hesitancy in Pregnant Women from Marginalized Communities

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Abstract

Vaccination is known to be one of the most successful public health measures currently available that decreases numbers of mortality and morbidity of various diseases across the globe. Despite the success that has been found in controlling infectious disease through herd immunity from vaccinations, there is a rising problem especially prevalent among developed countries of a voluntarily under vaccinated population that do not believe these methods are safe or successful.

This delay in acceptance or refusal of vaccines despite availability of services is known as vaccine hesitancy. The COVID-19 pandemic sparked vaccine hesitancy throughout the United States, with an overabundance of vaccines and greater populations of people with added mistrust, general vaccine hesitancy related to the misinformation spread both among media and political groups as it became a political issue with many protests occurring at mandatory vaccinations for travel or work. Under the category of the unvaccinated population of the United States is pregnant women. In this review, we will define vaccine hesitancy as it pertains to the COVID-19 vaccine and the attitudes of pregnant women among marginalized populations. We will look at the potential determinants of the increase in vaccine hesitancy among marginalized populations especially among highly developed nations. Then, we will look at how this may be combated with methods that have been proven effective in combating vaccine hesitancy.

Deficits in Gait Biomechanics in Runners on A University Team: Implications for Preventative Sport Healthcare

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Abstract

Sport healthcare providers in team-based settings conduct functional testing to identify injury risk. Results are used in team-based injury prevention programs. This process is different than care for a patient once they become injured. Gait analyses are a functional test for runners. Therefore, we aimed to describe the bilateral running biomechanics in a university cross country team with emphasis on variables linked to running-related injury (RRI). Twenty-seven male (n=10) and female (n=17) distance runners (age, 18-23yrs; height, $1.82\pm 0.57\text{m}$; mass, $58.4\pm 6.8\text{ kg}$) from a single university team participated in this descriptive study. Gait was assessed during a treadmill run at a self-selected steady-state pace with a 10-camera motion capture system. Vicon Nexus software enabled calculation of maximum values ($^{\circ}$) of bilateral midstance hip adduction (HADD), contralateral pelvis drop (CPD), rearfoot eversion (REV), ankle dorsiflexion (AKD) and knee flexion (KFLEX); and initial contact AKD and KFLEX. Data were explored relative to previous research findings linking these selected biomechanics to RRI in university runners. HADD (Lt. $10.5\pm 3.8^{\circ}$, Rt. $11.2\pm 5.2^{\circ}$) and CPD (Lt. $-7.1\pm 2.8^{\circ}$, Rt. $-6.0\pm 2.1^{\circ}$) at midstance were considered excessive as compared to 9.0° and -5.0° , respectively. All KFLEX [(midstance Rt. $40.1\pm 7.3^{\circ}$, Lt. $39.1\pm 6.3^{\circ}$) (initial contact Rt. $14.5\pm 5.6^{\circ}$, Lt. $13.7\pm 5.4^{\circ}$)], AKD [midstance Rt. $24.1\pm 4.5^{\circ}$, Lt. $24.1\pm 5.7^{\circ}$) (initial contact Rt. $3.5\pm 6.0^{\circ}$, Lt. $3.4\pm 5.8^{\circ}$) and REV (midstance Rt. $5.0\pm 4.0^{\circ}$, Lt. $4.4\pm 3.9^{\circ}$) were within normal limits. Results indicate sport healthcare providers in similar settings may expect to implement injury prevention programs to target dynamic frontal plane pelvis and hip control.

Determinants of hospital charges for hospital admissions and readmissions in 2017 in the United States for Bronchitis and Asthma with complications and comorbidities (DRG = 202)

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Abstract

Understanding hospital charges in the U.S. healthcare system is vital for value-based care, recovery, and socio-economic wellbeing of the public. Hospital charges vary across hospitals regionally as well as nationally. As per the clinical history of hospital in-patient care, there are several determinants of hospital charges that are specific to the patient, disease, hospital, or the chargemaster. Empirical research on hospital in-patient care has bolstered the extant knowledge on the factors that determine the healthcare cost and utilization, but research is limited on how hospital readmissions impact hospital charges. The Agency for Healthcare Research and Quality (AHRQ) has developed a nationally representative HCUP database for hospital charges in general and readmissions. We utilize the 2017 HCUP database for both hospital admissions and readmissions to determine the hospital charges for the patient's diagnosed with Bronchitis and Asthma (DRG = 202). The findings of this study are significant for enhancing the overall effectiveness of the U.S. healthcare system and patient's long-term care and recovery.

The HCUP database provides 78,304 records for patients diagnosed with Bronchitis and Asthma. Specifically, this study utilizes HCUP National Inpatient Sample (NIS) and the National Readmission Database (NRD) to examine how variables such as age, gender, income, risk of mortality, severity of illness, primary expected payer, number of diagnoses, number of procedures, and length of stay impacts the hospital admission charges in in general as well as readmissions for Bronchitis and Asthma (DRG=202). The linear regression analysis method was used to examine the correlation between the variables of interest in this study.

The NRD data findings indicate that primary expected payer, number of diagnoses, and length of stay are significant determinants of increase in hospital readmission charges. Similarly, NIS data findings highlight that In-patient care variables such as income, primary expected payer, number of diagnoses, and length of stay) are significant determinants of hospital charges in general. Specifically, for the patient's diagnosed with Bronchitis and Asthma (DRG=202), the results show that number of diagnoses, primary expected payer, and length of stay are significant determinants of increase in hospital charges for readmissions.

Effect of Gamma Irradiation on Vitamin D Stability in Salmon

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Abstract

Salmon and other finfish are one of the major dietary sources of vitamin D. However, the presence of pathogenic bacteria, such as *vibrio* sp and *listeria* sp, can lead to foodborne illnesses. In 2015, 18% of foodborne illnesses were attributed to finfish. Gamma irradiation can serve as an effective tool to minimize bioburden and thereby decrease the risk of foodborne illnesses. While gamma irradiation has been used on other types of food, including chicken and crustaceans, its effects on fresh finfish has not been studied. This project examines the effect of low dose gamma irradiation on the stability of vitamin D in salmon. Samples of fish were irradiated at different dosages in the chilled and frozen state (0-4 kGy). Vitamin D extraction was performed after saponifying the fish samples and the vitamin D concentration was analyzed via LC/MS. Vitamin D₂, vitamin D₃ and (25OH)-vitamin D₃ were quantified using a deuterated internal standard. The amount of vitamin D in irradiated samples was compared to controls to assess whether low dose gamma irradiation causes a significant change in vitamin D concentration.

Effect of periodontitis on inducing late onset Alzheimer's Disease (LOAD) pathology in mice

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Abstract

The body of this abstract sample template contains important instructions that **MUST** be followed. Note the formatting above, including bold, spacing, and underlining. Your abstract (which is a summary of your project) goes here and should be no longer than 250 words. This document is single spaced and formatted in 12-point Times New Roman font. Your faculty sponsor must review and approve this abstract *before* submission. It should be uploaded along with your application using the appropriate naming convention (ProjectTitle.doc). Additionally, the body of the abstract must be aligned with the left margin, like this paragraph is.

Alzheimer's disease is the most common form of dementia; affecting approximately 50 million people worldwide. Recent evidence indicates poor dental hygiene may accelerate Alzheimer's degeneration. Experimenters used a mouse model of periodontitis induced by *P. gingivalis* and investigated the implications of poor dental health on Alzheimer's Disease and neuroinflammation, as well as memory skills, in relation to aging, gender, and condition. All the mice in the model were the same age, and a total of 8 mice with Alzheimer's Disease and 8 mice who had Alzheimer's Disease with inflammation with an equivalent number of males and females were utilized. Experimenters evaluated mice using a Y-maze, Elevated Zero Maze, and Open Field Test. For the EZM, there was a significant effect of gender on the time spent in Open Arms, a significant effect of condition on the number of Head Dips into Open Arms, and a significant interaction effect between gender and condition for the number of Entries into Open Arms. For the Y-Maze, there was a significant interaction effect of gender and treatment effects for the time immobile in the Y Maze and another significant interaction effect for gender and treatment effects on Y Maze Spontaneous Alternations. This study demonstrated that there is a sex dependent nature for mice with gingivitis on the progression of Alzheimer's Disease. The results of this experiment can help researchers work towards strategies to prevent the onset of Alzheimer's Disease and reduce its progression such as improving dental health.

Effect of β -lactamase expression and varying metabolism on the Inoculum Effect

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Abstract

Infections with antibiotic resistant bacteria pose a substantial challenge to the field of medicine. Accordingly, it is of the utmost importance that we understand the mechanisms by which bacteria resist antibiotics towards the development of novel drugs and treatment paradigms. One mechanism by which a population of bacteria can resist an antibiotic is the inoculum effect (IE). During IE, the initial density of the population determines the efficacy of the antibiotic; highly dense populations of bacteria require more antibiotics to kill the population as compared to less dense populations. One mechanism that has been proposed to explain IE is the collective degradation of antibiotics. For bacteria that express antibiotic degrading enzymes, such as β -lactamases, a higher density would allow a population to work together to degrade the antibiotic more effectively than a lower density population. However, this likely depends upon the amount of enzyme produced. While producing more enzymes would result in faster collective degradation, it would also reduce growth owing to increased energy devotion to antibiotic-degradation. In contrast, while producing less antibiotic degrading enzyme would make the population more susceptible to antibiotics, it would also allow for increased growth, which may allow for increased collective degradation. While plausible, this has yet to be explored. Accordingly, we used β -lactamase expressing *Escherichia coli* to investigate trade-offs between enzyme production, growth, and IE. We found that changing the rate of β -lactamase production coupled with altering nitrogen source abundance altered the severity of IE, which coincided with changes in growth rate. Moreover, we found that β -lactamase production was more important than growth rate; although growth rate increases with less production, reducing β -lactamase production makes the population increasing susceptibility to antibiotics. Our results may have implications in the use of β -lactam antibiotics in the clinic to treat infection of high density.

Effects of Water Hyacinth Management on Fish Populations

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Abstract

Invasive water hyacinth (*Eichhornia crassipes*) creates significant economic and ecological problems in Florida. Removal of this invader cost an estimated \$4.19 million in the 2020 fiscal year. Water hyacinth has also been shown to alter water quality and chemistry and reduce fish populations. Current management strategies involve manual removal and the application of herbicide. New methods, including biological control, are being investigated to improve the efficiency of current management methods. Questions about the effects of these novel management strategies have emerged, including the response of fish populations to the new treatments. To answer these questions, we set up mesocosms in collaboration with the USDA Invasive Plant Research Lab and stocked them with locally caught Eastern Mosquitofish (*Gambusia holbrooki*). The mesocosms were sampled at least four times per year from 2020 to 2022, using minnow traps to assess fish populations. Treatments included control mesocosms without water hyacinth, an unmanaged mesocosm with water hyacinth, and mesocosms managed via biological and chemical control. Insecticide was used to isolate the effects of biological control. Our results suggest fish populations were highest when water hyacinth was not present. We also found populations were intermediate in the managed mesocosms with a moderate density of water hyacinth. Populations were lowest with a high density of water hyacinth and no management. However, as long as management is conducted, fish populations continue to thrive in the presence of invasive water hyacinth, although to a lesser degree than in un-invaded habitats.

Elucidating the Function of 3L1W, a Functionally Unknown Enzyme from *Enterococcus faecalis* V583.

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Abstract

As of February 2022, there were 4057 protein structures with unknown functions in the Protein Data Bank. In all biological organisms there are a variety of enzymes that speed up key biochemical pathways. Despite having a known sequence and structure, many enzymes remain uncharacterized. One relevant enzyme identified is 3L1W, whose function has yet to be elucidated. The P.O.I. was isolated and imaged via X-ray crystallography from the vancomycin resistant strain *E. faecalis* V583.

The purpose of this research was to provide an accurate characterization of 3L1W and its substrates, thus directing our approach of combining *in silico* and *in vitro* techniques. Protein visualization and structural alignments were conducted via PyMOL, BLAST, and Pfam, while structural alignments and ligand docking utilized Dali and PyRX software. We predicted the function of the protein and identify its most promising substrates. Confirmation of the enzyme's function can be developed through protein transformation, expression, and purification protocols. 3L1W was transformed and expressed in *E. coli* cells and isolated. The activity of 3L1W was measured for the substrate 4-nitrophenyl acetate, and enzyme kinetic hydrolase data was obtained. Based on 3L1W's hydrolase activity and the function of its homologs, a topoisomerase assay was performed. Together these tools can help identify future wet lab experiments to conduct, as well as continue to elucidate further the function of unknown proteins. Additionally, understanding the function of 3L1W has large implications on better understanding the human GI tract and human antibiotic resistance.

Emotional Resilience of the Covid-19 Pandemic on a College Campus

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Abstract

The perceptions of people during the Covid-19 pandemic cannot always be true. This is due to a life of uncertainty and for many people, fear. Since the pandemic has been around for about two years, this is an excellent opportunity to see how this pandemic has impacted people's mental health. A way that this information can be recorded is with The Emotional Resilience scale of the Covid-19 Pandemic on a College Campus. Emotional resilience was measured in 1704 American university students, staff, and faculty in October to November 2021 of the Covid-19 pandemic. This was a transitional period for people in South Florida since it was a time where people are were trying to figure out the new normal. The Emotional Resilience scale measured Chaos in the home, both before and during the pandemic (as measured by Matheny et al.,1995), fear of Covid-19 (as measured by Ahorsu et al., 2020), and loss of health and money, defined in the present study as emotional resilience or ER are predicted by family size, income, and relations (larger, richer, better), sleep quality (better), internet access (better), and less nonessential phone use. The least resilient use their phone too much, have poorer internet access, sleep poorly, have less family, less income, and don't get along. Practical implications for this are to have university community members be trained in better phone use health, better hardware and software guidelines, better sleep practices, and family enrichment ideas.

Endoparasite Community of Common Wood-Warblers (Family Parulidae) in Southeast Florida

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Abstract

Wood-warblers are small insectivorous passerine birds in the family Parulidae. They are among the first migratory birds in North America to begin their southward migration during the early autumn months and southeast Florida serves as a wintering ground. Although wood-warblers are common and widespread, knowledge of their endoparasite community composition is severely underrepresented in current literature. Carcasses were opportunistically collected from wildlife rescue centers in southeast Florida. The digestive tract of 90 birds representing 5 common wood-warbler species were examined for endoparasites: Common Yellowthroats (*Geothlypis trichas*), Ovenbirds (*Seiurus aurocapilla*), Black-and-White Warblers (*Mniotilta varia*), Palm Warblers (*Setophaga palmarum*), and American Redstarts (*Setophaga ruticilla*). Phyla Nematoda, Cestoda, and Digenea were found, and nematodes were the most prevalent endoparasite taxa. However, within each species, less than 50% of the surveyed specimens contained endoparasites: 15.8% of Common Yellowthroats, 46.7% of Ovenbirds, 6.7% of Black-and-White Warblers, 18.7% of Palm Warblers and 8.0% of American Redstarts. Within each individual bird that contained parasites, only one parasite taxa was present. The greater average mass of the species tended to correlate with a higher percentage of samples containing parasites. Two digeneans from subfamily Opisthorchiinae were detected in ovenbirds, cestodes in the genus *Mesocestoides* from American redstarts, and three nematode species (likely *Dispharynx* sp. as well as two unidentified taxa) from ovenbirds, black and white warblers, palm warblers, and American redstarts. Excluding the digenean species, the parasites observed are cosmopolitan in North American birds, although this was the first study documenting their presence in warblers.

Evaluation of MDM2 Regulation on AURKB Expression in Lung Cancer

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Abstract

Objective. This study was conducted to analyze the molecular mechanism of the MDM2 regulation on AURKB in lung cancer cells. **Background.** Lung cancer is the leading cause of cancer death within the United States, with the 5-year survival rate at about 22%, indicating the need to develop different drugs and treatment strategies. This study focuses on understanding the mechanisms linking MDM2 and AURKB to develop new treatment strategies against lung cancer. **Methods.** The H446 cells were treated with RG7388 (2 μ M), an MDM2 inhibitor, and Barasertib (50 nM), an AURKB inhibitor, including a combination of the two drugs for 24 hrs. After treatments, the cells were lysed, and western blots were performed for detecting the MDM2, AURKB, FOXO3a, AKT, p-AKT, and β -actin expression levels. The H460 and HCC827 cells are treated in the same manner with the drugs. **Results.** The H446 cells treated with RG7388 and exhibited downregulation of MDM2 and AURKB protein levels. In addition, the levels of p-AKT expression were also found to be in downregulation after RG7388 treatment. **Conclusion.** The collected data suggests that MDM2 inhibition by RG7388 leads to the down-regulation of AURKB expression. Also, downregulating AURKB can lead to the onset of cell cycle arrest and resultant cell death. Additional experimentation will be conducted using H460 and HCC827 cells to further evaluate the impact of RG7388 treatment on lung cancer cells. **Grants.** This study was funded by the PFRDG grant 334877 and the financial support from the Royal Dames of Cancer Research Inc., Ft. Lauderdale, Florida.

Examining the impact of mind wandering on task performance: Does Task Difficulty Matter?

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Abstract

Mind wandering is a phenomenon in which an individual's thoughts drift from the current task to a task unrelated thought (TUT). It is known to be affected by various factors such as state of mind, neuroticism, and boredom which may differ for each individual. Task difficulty appears to impact mind wandering rates, such that mind wandering increases on tasks with lower difficulty (Seli et al., 2018). However, prior work has not examined how emotionally valenced mind wandering impact task performance at different levels of task difficulty. Mind wandering typically predicts poorer ongoing task performance (McVay & Kane, 2010) and negatively valenced mind wandering appears to be more consistently associate with poorer task performance (Banks et al. 2016; Goller et al., 2020). The current study analyzed the impact of emotionally valenced mind wandering on working memory task performance at two levels of difficulty. One hundred and fifty subjects completed the n-back working memory task with 1-back and 2-back difficulty levels. The results replicate previous findings that neutral and positive task unrelated thoughts (TUTs) are not uniquely related to negative performance on the easy task. Only negative TUTs predicted decreased accuracy for the easy level of the working memory task (1-back). However, during the more difficult task (2-back), both negative and neutral TUTs predicted decreased accuracy on task performance. Critically, negatively valenced emotion was correlated with decreased accuracy for both tasks, irrespective of the difficulty level, which may indicate emotional valence plays a crucial role in the understanding of mind wandering.

Exploring the Prevalence of Carpal Tunnel Syndrome (CTS) Symptoms in College Students

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Abstract

Carpal tunnel syndrome (CTS) causes functional impairments and is prevalent in occupations involving repetitive hand movements. Given the extensive use of electronic devices for coursework, college students may be at risk for CTS. The purpose of this study was twofold: to examine the symptomology of CTS in college students, and to determine treatment strategies used by occupational therapists (OT) who treat college students with CTS. We developed and administered a 17-question College Student CTS Experiences Survey for students. Participants were recruited via flyers posted on a university campus. Inclusion criteria for responding included being a college student experiencing pain, tingling, numbness or weakness in the hands or wrists. Surveys were completed anonymously through a link provided in the participation letter. Two experienced OTs were recruited to participate in a six question interview through Zoom. Of 49 completed surveys, 37 were by undergraduates and 12 were by graduates. 29 (59%) respondents experienced pain, 24 (48%) tingling and weakness, and 21(42%) numbness. 77% of respondents experienced symptoms but only 2% of respondents had been diagnosed with CTS. Common causes of symptoms were phone use, keyboarding and writing. The OTs stated that they commonly treat college students for CTS symptoms and they believed that leisure activities contributed to these symptoms. They discovered that teaching proper posture, ergonomic exercises and verbal communication were effective in treating CTS and can be used to reduce the risks. Results indicate that CTS in college students may go under diagnosed due to not seeking treatment.

Firearm-related injuries rates from 2014 to 2017 among Floridian children

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Abstract

Purpose: To assess the prevalence of firearm-related injuries among pediatric patients in Florida by age, race, and ethnicity.

Method: The dataset from the Florida's Agency for Health Care Administration from 2014-2017 was utilized for this analysis as well as the Florida Community Health Assessment and Resource Tool Set. The study included ambulatory ED-visits of Floridian patients (aged ≤ 19 years) who had firearm-related Principal Diagnosis coded using the International Classification of Diseases. Patients who reported race as White or Black and Ethnicity as Hispanic or non-Hispanics were included. Patients' county was categorized into 11 regions defined by Florida Local Health Council Districts. Statistical analyses were conducted using SAS 9.4 ®. Firearm-related rates were calculated per 10,000 population, for each region by race and ethnicity and separately by age-groups.

Results: The rates of ED-visits for firearm-related injuries per 10,000 population were highest in the 15 to 19 age-group for non-Hispanic in regions 11- Miami-Dade/Monroe (11.3614), region 4 - Baker, Clay, Duval, Flagler, Nassau, St. Johns, and Volusia (6.6919) and region 6 - Hardee, Highlands, Hillsborough, Manatee and Polk (6.0385). Similarly, among blacks, the highest rates were found in regions 11 (15.7997), region 4 (15.2113) and region 6 (12.6228).

Conclusions: The largest prevalence of firearm related injuries occurred among non- Hispanic and black children in regions with the three latest cities by population in Florida (Jacksonville, Miami and Tampa).

Gadra's Allegory

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Abstract

“Gadra’s Allegory” is a silent (with no dialogue, but music is utilized) short film that follows a modern day ‘prisoner’ who exemplifies how their society is chained to the screens that surrounds them. The film shows their journey from a repetitive, thoughtless, and disillusioned way of life, to a majestic awakening to the nature of reality. This film is based on and inspired by Plato’s “Allegory of the Cave,”; though the main character of the film is based off the chained prisoner of the allegory, this alternate version shows another path to their own enlightenment and expresses their own internal path to insight and knowledge in the modern era. The short film relies completely on the visual aspect of the film’s storytelling, this way the audience takes part in the film as they experience the main character’s routine in their repetitive daily life surrounded by screens. The film attempts to remind the audience that Plato’s message remains relevant in today’s technology-dependent world. From shadows portrayed onto the wall of the cave, to phone screens lighting up people’s faces, this film holds a new, modern meaning to enlightenment. This film is directed by Bianca Vucetich. Other crew members and actors include Chloe Rousseau, Gabe Garrison, Kristen Jean-Baptiste, Suraj Majethia, Treycy Romeus, Jahna Schutt-Shirley, Victoria Scullion, Arthur Thomas, and Athalie Thomas.

Great Plains Midcontinental Loess Deposits Following Prehistoric Megadroughts and Climate-Change Related Ecosystem Collapse in the Badlands

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Abstract

Understanding effects of prehistoric extreme climate events on the environment is necessary to help predict effects of modern global climate change. Research shows prehistoric megadroughts caused the collapse of North American grassland ecosystems, allowing wind to erode soils and fined-grained sediment. Timing, severity, and regional extent of these megadroughts remain controversial, but research indicates at least three megadrought periods on the North American midcontinent over the last 20,000 years. Evidence for prehistoric megadroughts is preserved in dune fields and loess deposits throughout the North American Great Plains, including our field area in the Badlands of South Dakota. Loess, composed of very fine sand and silt, forms important midcontinental agricultural deposits in Nebraska and Iowa. The goal of this study is to determine whether fine-grained Badlands sediments are a source of the midcontinental loess. In this study, we analyzed particle size distribution and geochemical composition of sediments from the Badlands and compared these results to loess composition in southern Nebraska and Iowa. Results show compositional similarities between dune sands and river deposits from the Badlands and the midcontinental loess. Results support the hypothesis that links Badlands dune formation with midcontinent loess formation, implying widespread ecological collapse in the past and the potential for another collapse in the future. We believe these climate disasters are linked to global climate events such as the last glacial maximum, medieval climate anomaly, and the Little Ice Age. Reactivation phenomenon could trigger the onset of catastrophic climate-related events across the Great Plains.

**HA HA HA...Good One!...Not you Hmongs.
Laughter, White Privilege, and “Othering” in Medical Cultures**

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Halmos College of Arts and Sciences

Abstract

The response to alternative medical approaches of underprivileged and underrepresented groups detailed by Anne Fadiman differ from the hegemonic alternative approaches exemplified by Norman Cousins. In *The Spirit Catches You and You Fall Down*, Fadiman describes the inadequate efforts made by healthcare professionals to communicate with the Lee family who did not understand English and had significantly different medicinal practices from Western biomedical practices. Rather than being met with respect and attentiveness, these medical professionals viewed this family as “difficult” and “stupid.” In comparison to the various mistreated groups of minorities, the Hmong are a minority within the minority due to their unfamiliar culture to American physicians and proud refusal to assimilate to American practices. This treatment contrasts that of Cousins, who popularized laugh therapy with the book *Anatomy of an Illness*, in which he documented his recovery from a degenerative collagen disease. He had a trusting, well-established relationship with a physician who gave him freedom to experiment not just with laugh therapy but also with ascorbic acid. Many have argued that laughter therapy was accepted because of laughter’s already positive portrayal in American culture. However, the more alternative approach was his use of unconventional and potentially hazardous doses of ascorbic acid, despite the lack of research into its effectiveness. This was acceptable because of his chemical makeup as a white American man. Cousins’ white privilege gave him free rein to experiment with a dangerous ill-researched medical approach unlike the prejudiced treatment of the Hmong represented in Fadiman’s book.

Heavy Metal Contaminants in the Sciaenids from Lake Sabine

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Abstract

Lake Sabine is a shallow, estuarine lake situated on the border between Texas and Louisiana with outflow to the Gulf of Mexico. The Louisiana side is a protected natural area while the Texas side is susceptible to pollution from several commercial industries as well as maintenance dredging. This study determined the concentrations of metal(loids) within commercially and economically important fish tissues and compared them intra- and inter-specifically using known diets and a range of sizes. Specimens were collected from Lake Sabine from April through October 2018 from four sciaenid fishes: Atlantic Croaker *Micropogonias undulatus*, Red Drum *Sciaenops ocellatus*, Black Drum *Pogonias cromis*, and Spotted Seatrout *Cynoscion nebulosus*. Skeletal muscle and liver tissues were tested for 16 metal(loids) using inductively coupled plasma mass spectrometry (ICP-MS). When comparing metal concentrations within liver tissue among the species, there was a statistically significant difference for arsenic ($P=0.002$), cadmium ($P=0.009$), cobalt ($P=0.02$), chromium ($P=0.01$), copper ($P=0.01$), iron ($P=0.006$), lead (Pb; $P=0.0009$), selenium (Se; $P=0.008$), tin ($P=0.002$), vanadium (V; $P=0.0006$), and zinc ($P=0.02$). Total mercury was significantly different ($P=0.02$) among muscle samples for the four species. In addition, there was a positive correlation between fish length and concentration for Pb in *M. undulatus* liver tissue, and *C. nebulosus* was positively correlated between fish length and concentration for Se in liver tissue and V in muscle tissue. Due to Lake Sabine's economically important recreational fishery, it is important to investigate the different environmental impacts to preserve a sustainable fishery and address human health concerns.

How Non-profit Organizations Can Create a Hybrid Social Media Strategy Using Paid and Organic Posts

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Abstract

The emergence of social media has changed the methods and approaches for communication between health agencies and their community. As such, non-profit organizations must learn to use social media to better promote their mission. Organizations can engage and capture the attention of their online target audience via paid posts. Broward Regional Health Planning Council (BRHPC), a non-profit organization, provides an analysis of how integrating social media tools has increased its social media presence. BRHPC already had an online presence on the social media sites Facebook, Twitter, Instagram, and LinkedIn. To increase the number of people in BRHPC's intended audience who see and interact with BRHPC's content, it proceeded with a hybrid approach of paid posts and organic posts. Paid posts were shared on Facebook, Instagram, and LinkedIn between February 2021 and January 2022, with a budget of \$3,000. The performance of posts was evaluated using key performance indicators: engagement, reach, and impressions. During this timeframe, BRHPC's engagement was 5,663, which refers to the unique visitors that have interacted with BRHPC's social media pages through by liking, commenting, or sharing a post. Furthermore, BRHPC had a total of 254,868 reach, which refers to the number of persons who have viewed an individual post, and 478,016 impressions, which is the number of times content has entered a person's screen. After utilizing this hybrid strategy, BRHPC has seen great success in increasing its key performance indicators. Other non-profit organizations may consider incorporating this strategy to advance their platform in their online community.

How the Molecular Vibrations of Water may Prevent Skin Cancer

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Abstract

Studies have shown that when DNA absorbs ultraviolet light it can become structurally damaged leading to a mutation and possibly skin cancer. However, exposing skin to sunlight rarely leads to a mutation. This indicates that after the ultraviolet light is absorbed by the DNA the energy from the light can either cause a structural change to the DNA (a mutation) or be dissipated in a way that does not damage the DNA. Absorption of ultraviolet light causes molecular vibrations in DNA and these vibrations are what likely leads to structural changes in the DNA. One way the structural changes could be avoided is by vibrational energy transfer from DNA to nearby water molecules. To investigate this potential mechanism, molecular dynamics simulations and electronic structure calculations have been performed on model systems for DNA base pairs. These calculations have given insight into if vibrational energy transfer between DNA and nearby water molecules is feasible, which in turn has provided a greater understanding of a potential mechanism by which skin cancer is avoided.

Human mtDNA Copy Number Quantification

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Abstract

Our social worlds and physical health are profoundly intertwined, but we have limited tools for studying these important connections. Within the recent psychiatric literature, changes in mitochondrial DNA copy number (mtDNAcn) have been linked to a variety of socially influenced mental illnesses such as major depression. In principle, this biomarker may therefore also be responsive to more subtle changes in our social environments, including life events that attenuate stress.

This poster outlines plans for a novel molecular study of how interspecies social bonding impacts human cells. Specifically, we propose to use quantitative PCR to measure the abundances of (single copy) mitochondrial genes alongside (single copy) nuclear control loci over the course of social bond development in humans adopting shelter animals. This approach will reveal whether mitochondrial DNA levels are modulated when the focal humans instantiate a 15,000-year-old co-evolved mutualism with domesticated dogs. While other outcomes are possible, we predict on the basis of recent psychiatric studies that bonding will result in declining stress, mtDNA concentrations, and mtDNA polymorphism (aka “heteroplasmy”).

I can hear you, I just can't remember you: deconstructing the sensory and cognitive components of hearing loss

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Abstract

Hearing loss is commonly thought of as solely a sensory, not cognitive, problem. According to the effortfulness effect, however, those with presbycusis are burdened with an increased attentional cost for auditory processing, taxing the central executive such that working memory is impaired. The excess strain placed on the central executive to decode sensory noise ultimately impairs one's capacity to attend to and consolidate memories, compromising retention. We hypothesize that the presence of white noise during encoding will mimic the effect of hearing loss sustained in older adults and will impair the retrieval of auditory information in those with normal hearing. Participants were instructed to complete an auditory working memory load task in which they heard five to-be-remembered words, followed by a distractor task before they had to recall the list of words. White noise was presented either during encoding of the words, during retrieval of the words, during both encoding and retrieval, or not at all. We also measured working memory capacity. We hypothesized that when noise was presented during encoding, participants would recall significantly fewer words and that working memory capacity would predict performance. Our results suggest that noise adds strain to working memory and that hearing loss can be interpreted as a cognitive issue in addition to a perceptual one.

Gulf War Illness is a chronic multi-symptomatic disorder that roughly affects about 32% of deployed veterans from the 1991 Persian Gulf War¹. The symptoms are medically unexplained, ranging across cognitive deficits, fatigue, gastrointestinal problems and musculoskeletal pains. Research indicates that the nerve agent sarin plays a major role in the cause of GWI. The Khamisiyah ammunition storage that stored chemical warfare agents such as cyclosarin and sarin was demolished during the Gulf War, releasing these toxins into the atmosphere affecting deployed troops. Sarin is an organophosphate that irreversibly binds and inhibits the enzyme acetylcholinesterase (AChE). AChE inhibition induces a build-up of acetylcholine, disrupting signals between nerves and muscles, which in high doses leads to asphyxiation. Little is known about low dose exposure and alternate targets. Knowing that chemical agents tend to interact with multiple protein sites, we look to identify other sarin targets to better understand the extent in which sarin affects GWI. To do this we followed a reverse screening approach where the ligand sarin is computational docked to a library of protein targets.

Implications of COVID-19 for Education and Research in Healthcare and STEM: Analysis of Global Case Studies

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Abstract

The novel coronavirus, SARS-CoV-2 has posed a major threat to global education and research in STEM and healthcare. Social distancing guidelines were initially recommended to refrain from face-to-face operations for preventing the transmission of the virus. As schools and higher academic institutions implemented multifarious methods to effectively transition to remote/online or hybrid educational formats, the Coronavirus Infectious Disease 2019 (COVID-19) pandemic introduced further hurdles and necessitated designing, adopting, as well as evaluating the efficacy of new instructional approaches, especially for disciplines that require active, experiential learning such as healthcare and STEM. These effects are accentuated in less developed/developing nations or underprivileged communities where access to technology and reliable internet connection can be a challenge, making it difficult to attain education virtually. Nevertheless, the pandemic has propelled remarkable innovations in education centering around these subjects. Additionally, COVID-19 has disrupted research and training in STEM and healthcare. With recurrent waves of the viral infection worldwide, fostering projects towards virology research, vaccine development, and healthcare management have become crucial. Continuing both laboratory and clinical research has also become onerous, with a decrease in the supply of resources and laboratory staff members. This comprehensive literature review encapsulates notable case studies highlighting global impacts of COVID-19 on education and research in healthcare and STEM, and presents strategies implemented to mitigate the adverse effects of the pandemic faced by these sectors in underdeveloped as well as developed countries. The analysis would help improve the content, delivery, and efficacy of research and education in healthcare and STEM.

Induction of Necroptosis in MCF-7 Breast Cancer Cells Through Caspase- Independent Mechanisms Following SAHA Treatment

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Abstract

Currently, many anti-cancer drugs are known to induce programmed cell death (apoptosis) through activation of intrinsic or extrinsic pathways. However, many types of cancer cells have acquired resistance to apoptosis-mediated cell death. Therefore, simultaneous induction of other forms of cell death in addition to apoptosis of cancer cells is becoming an attractive strategy. For this purpose, we initially explored the role of XIAP in caspase-dependent and caspase-independent mechanisms of cell death. Our western blot data revealed that RIPK3 and MLKL levels were significantly elevated in MCF-7 cells following SAHA treatment. During induction of SAHA-induced cell death, the XIAP levels were also found to be elevated in MCF-7 cells. Based on our experimental results, we are able to demonstrate that treatment with HDAC inhibitor SAHA induced cell death through RIPK3 and MLKL mediated necroptosis pathway in MCF-7 cells. Our results suggest that MCF-7 cells maybe switching to necroptosis mediate the cell death pathway due to the inhibition of caspases by increased levels of XIAP. Upregulation of XIAP has been previously reported to suppress apoptosis by blocking caspase-mediated cascade. So far, our results have suggested that SAHA could induce necroptosis in MCF-7 breast cancer cells through the elevation of XIAP, RIPK3, and MLKL. (Research supported by the Royal Dames of Cancer Research Inc. Ft. Lauderdale FL)

Inter-limb Kinetic Asymmetries Differ Between Concentric and Eccentric Phases of the Vertical Jump

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Abstract

Inter-limb asymmetries during the vertical jump (VJ) have been used to identify injury risk and performance deficits with >10% being a threshold. Force, or kinetic asymmetries have typically been studied for the concentric (propulsive) phase of the VJ while eccentric (loading) phase analyses are limited. The purpose of this study was to determine if there were differences in inter-limb asymmetry (%) in impulse (force * time) and peak force between VJ eccentric and concentric phases. Results may inform coaches and sport healthcare providers. Participants were 60 highly skilled males (age, 22.7±1.1yrs.; height, 186.4±6.8cm; mass, 103±21.2kg) undergoing training for the National Football League draft. They performed VJ on dual uniaxial force plates allowing for calculation of concentric impulse (CON-IMP), eccentric braking impulse (ECC-IMP), concentric peak force (CON-PF) and eccentric peak force (ECC-PF). Paired t-tests were used to reduce the data, $p \leq .05$. ECC-IMP asymmetry (12.4±9.6%) was significantly greater than CON-IMP asymmetry (6.7±6.1%), $t_{59}=3.94$, $p < .001$. On average, ECC-IMP asymmetry was 5.6% greater than CON-IMP (95% CI [8.5, 2.8]). ECC-PF asymmetry (10.3±7.8%) was significantly greater than CON-PF (4.3±4.1%), $t_{59}=5.92$, $p < .001$. On average ECC-PF was 6.0% greater than CON-PF (95% CI [8.1, 4.0]). Kinetic asymmetries were greater in the eccentric phase and were >10% in this group; these would go unnoticed if only examining the concentric phase. The eccentric phase may pose increased challenge to achieve symmetry when muscles are lengthening during contraction. Results indicate the necessity of including eccentric kinetics in their VJ analyses to enhance injury prevention and monitoring, and to improve performance.

Investigating Polymer Metal Chelation via Atomic Absorption Spectroscopy

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Abstract

Heavy metal contaminants in water are known to disrupt ecological systems and cause detrimental biophysical and physiological effects in living systems. Prominent metallic environmental contaminants include lead, cadmium, and zinc. Removing heavy metal contaminants is essential to enhance water quality and reduce heavy metal toxicity. Chelating polymers that contain functional groups such as carboxyls and amines, offer an inexpensive and efficient way to remove metals from solution. The purpose of our study is to develop a protocol to quantify metal binding efficiency of various polymers via Atomic Absorption Spectroscopy (AAS). Alginate and Chitosan, two bio derived polymers with known chelating properties, were employed to develop a methodology for quantifying metal extraction. To analyze the metal chelating properties, the polymers were combined with solutions of varying concentrations of metal contaminants (Pb, Cd, Zn) and the metal concentration of the remaining solution was quantified by AAS. A second methodology was evaluated where the polymer was placed in a semi permeable membrane which permits the metal ions to pass into the membrane and absorb to the polymer. Comparison of the two methods allows for the development of a protocol that efficiently monitors metal contaminants in water and ecological systems. The ultimate goal is to utilize this protocol to study metal binding properties of novel polymers synthesized in our research lab.

Investigating the Bouba-Kiki Phenomenon in Impression Formation

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Abstract

Humans associate sounds and symbols in non-arbitrary ways. One example of this phenomenon is the Bouba/Kiki effect: the nonword “Bouba” is associated with rounder shapes, whereas “Kiki” is associated with sharper shapes. Although many studies have been done on the Bouba-Kiki effect, it has not been studied in the context of personality judgments and impression formation. Study 1 used a between-subjects design to test the Bouba/Kiki effect in this domain. A person named “Bouba” was rated as more moral than a person named “Kiki”, whereas “Kiki” was rated as more sociable, however no significant difference was found for competence ratings. Study 2 used a within-subjects design to test if this effect replicated using common American names. There were no significant differences in ratings of round- and sharp-sounding names, suggesting that personality inferences made based on real names are dependent on more than just phonics. Lastly, Study 3 used a within-subjects design to test if the Bouba/Kiki effect observed in Study 1 would replicate with other nonwords similar to “Bouba” and “Kiki”. However, there were no significant differences in ratings between round- and sharp-sounding names. This research is the first to examine the effects of the phonics of names on impression formation, and suggests that a Bouba/Kiki effect in this domain can happen, but is restricted to the stimuli used in Study 1. This raises questions about the generalizability of prior research, which has generally only used “Bouba” and “Kiki” as stimuli, rather than a variety round- and sharp-sounding nonwords.

Investigating the specific phosphorylation sites of the human mineralocorticoid receptor using phospho-mapping

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Abstract

The purpose of this project is to confirm the specific sites where G protein receptor kinase 5 (GRK-5)-mediated phosphorylation of the mineralocorticoid receptor (MR) of aldosterone occurs. The significance of the study stems from prior findings indicating that e-cigarette vapors induce lung inflammation and tissue destruction. While research has typically focused on the effects of tobacco use, the detrimental influence of e-cigarette vapors, which accumulate in the airway epithelium, must also be identified. This may include desensitization of the beta2-adrenergic receptor (β 2AR), a protective receptor against airway inflammation and fibrosis and the only AR subtype expressed in human bronchial cells. Osteopontin (OPN), a pro-inflammatory and pro-fibrotic cytokine, is known to oppose cardiac β 2AR's antifibrotic signaling, and therefore may provoke β 2AR desensitization in bronchial cells.

Additionally, it is known that aldosterone contributes to OPN upregulation, which could result in the downregulation of β 2AR. Aldosterone's MR is phosphorylated and inhibited by GRK-5, potentially at Ser 601 and Ser 843 residues, which provides protection against aldosterone-induced adverse effects. Hence, the phosphorylation by GRK-5 on the MR is a primary focus of our study, as this mechanism suppresses MR function.

The study involves isolating the MR from a human tissue sample by co-immunoprecipitation, digesting the MR with trypsin protease, purifying the resulting peptide fragments through liquid chromatography, and characterizing the peptide fragments by MALDI-TOF mass spectrometry to determine the protein's phosphorylation sites. Phospho-mapping of the fragments will confirm if GRK-5 phosphorylates the MR at the expected Ser 601 and Ser 843 residues.

Measuring the Effect of Methionine Deprivation in Genome Methylation of CCP Genes within the Prolaris Molecular Score along Prostate Cancer Cell Lines

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Abstract

Impairment of physiological metabolism is the trademark of various cancers and cancer cells as a component of their mechanism which ultimately bolsters survival. While normal cells are highly regulated and follow a sophisticated mechanism of cellular metabolism to achieve their goals of survival, cancer cells take the dysregulated path for survival, ultimately robbing the overall vital energies of the entire organism. Unfortunately, only a limited number of uniform ways exist that permit for a complete cure of various presentations of cancers. The PC3 cell line has been reported to be dependent upon exogenous pools of methionine, whereas the DU-145 cell line is partially independent. DU-145 satisfies its methionine requirements through the conversion of cysteine and homocysteine through a complex methionine recycling pathway. PC-3 and DU-145 cell lines were separately transfected with the Methionine Gamma Lyase Deaminase (Mgld) plasmid gene constructs and were expected to express the Mgld protein either within the cytoplasm or the nucleus. Essentially, this would degrade the endogenous methionine pools by availing gamma elimination and deamination. As a result, this leads us to question is what global metabolic effects would the Mgld have on the whole genome DNA methylation of any cancer cells? We sequenced the promoter and gene methylation and evaluated the differences of various transfectants. The primary focus was on the key enzymes that make up the Prolaris Molecular Score, specifically the 31-cell cycle progression (CCP) genes found within the tumor which are availed as indicators that measures the rate of prostate cancer tumor growth.

Metanalysis of Genome Editing Using Crispr/Cas9 technology towards HIV-1 treatment

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Biomedical Informatics Thread

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Health Informatics

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Abstract

Genome editing, also called gene editing is a new branch of research that aims to explore means to modify genes of living organisms. Genome editing appears to have a promising future for researchers as it will further help to understand the gene function and develop ways to treat genetic or acquired diseases. Moreover, gene editing such as CRISPR/Cas9 technology can aid in manipulating the genome sequence, thereby, advancing treatments that will improve patients' life span and quality of life. CRISPR/Cas9 technology supports three main mechanisms for genome editing, including plasmids-based methods, the direct intracellular distribution of the Cas9 mRNA, and the direct delivery of the Cas9 protein. By conducting a metanalysis, on published studies utilizing the principles of CRISPR/Cas9 technology, this poster will highlight how gene/genome editing can provide advances and advantages towards the understanding of Human Immunodeficiency Virus (HIV). Specifically, this genome editing metanalysis will focus on research studies related to the CCR5 receptor that can be genetically altered and can provide great contributions towards possible disease management solutions or "cures". However, knowing the benefits and disadvantages is vital to balance the factors of gene-editing technology. Additionally, this poster will conclude with an overview of how research can benefit from the emergence of CRISPR/Cas9 technology as augmentation of various beneficial applications in the fields of science, medicine, agriculture, pharmaceuticals, etc.

Minimal k -Blockers of 123-Avoiding Permutation Matrices

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Abstract

We investigate $n \times n$ $(0, 1)$ -matrices A that avoid σ_k , where σ_k is the permutation $\{1, 2, \dots, k\}$, and we focus on 123-avoiding permutations. A k -blocker of 123-avoiding permutation matrices is a set of positions in an $n \times n$ matrix that intersect each 123-avoiding permutation matrix at least k times. The Hankel cyclic decomposition implies that each k -blockers must have cardinality at least kn . The dimensions of the k -blockers of all permutation matrices are determined by Fulkerson's generalization of the Frobenius-Kőnig theorem: any $r \times s$ submatrix is a k -blocker of all permutation matrices if $r + s = n + k$. We investigate the properties of these minimal blockers as elements are shifted certain horizontal Hankel-cyclic distances. We have found minimal blockers in shapes not given by Fulkerson's result, and we explore and characterize these minimal k -blockers.

Molecular Biomarkers of PTSD: A Case for Measuring Psychotherapy Efficacy and mtDNA CN Involvement

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Abstract

Post Traumatic Stress Disorder (PTSD) is a psychiatric disorder that occurs in individuals who witness or experience a traumatic event. Many PTSD treatments have a focus on direct alterations of emotion and thought responses due to trauma. Some of the leading psychotherapy treatments for PTSD include Cognitive Behavioral Therapy (CBT), Cognitive Processing Therapy (CPT), and Prolonged Exposure (PE). Eye Movement Desensitization and Realization (EMDR) Therapy has greater focus on altering memory storage in the brain. EMDR differs from other psychotherapies in that the reprocessing of trauma engages both hemispheres of the brain via bilateral stimulation. EMDR along with other psychotherapies typically evaluate therapy success with subjective measures of progress rather than objective. We know associated biomarkers with PTSD have been found to have potential objective clinical applications in assessing psychotherapy effectiveness. These biomarkers include salivary cortisol levels, GABA plasma levels, and many more. Mitochondrial DNA CN is an emerging subject of focus in the exploration of the pathophysiology of many psychological diseases, like Major Depressive Disorder (MDD) and Anxiety Disorders. Here, we propose the measurement of mtDNA in human saliva samples as a dynamic, non-invasive, and quantitative biometric for assessing EMDR's efficacy in modulating physiological response to trauma.

Phage Hunters: The Discovery of Two Novel Bacteriophages That Infect *Gordonia rubripertincta*

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Abstract

Antibiotic resistance is a global healthcare concern because it poses a threat to effectively treating bacterial infections and the need for alternative therapeutics are urgently required. Phage therapy, which uses viruses to treat bacterial infections, is a promising alternative to conventional antibiotics. Phages have also been widely used in the food industry to prevent microbial growth on certain foods and are currently being explored as a method for bioremediation of oil spills and wastewater treatment. Although phages are ubiquitous in nature, many have yet to be discovered. Through the SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) program at NSU, our goal was to discover new phages that infect the bacteria *Gordonia rubripertincta*, a gram

positive soil bacteria that can breakdown hydrocarbons and is an opportunistic pathogen in catheter infections. Direct and enriched isolation protocols of soil samples from the South Florida region resulted in the discovery of two novel phages, Genamy16 and NovaSharks, that were able to infect *G. rubripertincta*. DNA was extracted from each phage to characterize their genomes. Sequencing data revealed that Genamy16 and NovaSharks contain circularly permuted genome ends with a total genome length of 65,574 and 65,274 base pairs, respectively. Both phages belong to the cluster DV. The genomes were annotated using GeneMark, NCBI BLAST, Glimmer, Phamerator, and HHPred. Collectively, our results provide evidence that Genamy16 and NovaSharks are two novel phages that infect *G. rubripertincta*. These phages will be included in the SEA-PHAGES database and can possibly be used for bioremediation.

Physiological Mechanisms of Pregnancy: How the Kidneys and the Renin-Angiotensin System Protect the Fetus

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Abstract

Physiological changes concurrent with pregnancy include plasma volume expansion with increased sodium retention to enable normal development of the fetus. Expansion of plasma volume and sodium reabsorption are adaptive mechanisms that occur in response to the altered physiological state of pregnancy. These adaptations are mediated by the renin-angiotensin system (RAS) and its primary hormone, angiotensin (Ang) II, acting on the kidney. The role of Ang II in the kidney also involves stimulation of aldosterone release from the adrenal gland, which promotes sodium retention by the kidney. Ang II activates its two main receptors in the kidneys: AT1 and AT2. The AT1 receptor regulates sodium retention rates as well as blood pressure, while the AT2 receptor generally opposes AT1 actions. The aim of this study is to evaluate the role of the RAS in the kidneys of pregnant rats that enables a successful pregnancy. It is of interest to determine if the adaptive mechanisms during pregnancy involve altered expression of AT1 and AT2 receptors. Kidney AT1 and AT2 receptors are measured using radioligand binding assays. Receptor expression is measured in three regions of the kidney and the adrenal gland in both pregnant and nonpregnant rats. We hypothesize that increased AT1 and AT2 receptor expression is associated with increased sodium and water retention rates as well as blood flow in the kidney. The information gained from this study can lead to development of drugs that can benefit pregnant women who have physiological barriers interrupting the renal adaptations necessary for normal fetal development.

Raising Awareness about Recognizing Pediatric Obstructive Sleep Apnea Associated with Down Syndrome: Developing a Health Education Program

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Abstract

Down syndrome (DS) is the most prevalent chromosomal disorder in which an extra copy of chromosome-21 disrupts the development of intellectual abilities. Unique physical manifestations places children with DS at high risk for obstructive sleep apnea (OSA) in which repeated blockages of the upper airway cause difficulty breathing during sleep. 80% of children with DS are afflicted with OSA compared to only 2-5% of the general pediatric population. OSA increases incidences of nocturnal sudden cardiac arrest by 2.57-fold compared to the general population. Common signs of OSA include snoring, restlessness during sleep, night waking, and daytime tiredness. Manifestations of OSA, such as cognitive impairment and cardiovascular disease, are common in the DS population; however, this often obscures the diagnosis. During May 2021, focus group discussions were facilitated with caregivers from the Gold Coast Down Syndrome Organization to assess current understandings about the severity of OSA. A series of interviews were conducted with pediatric healthcare providers to understand OSA education strategies. By synthesizing the qualitative data from this study, an evidence-based health promotion program was developed to improve communication of OSA signs between healthcare providers and caregivers. This public health project has been supported by the Sudden Cardiac-death Awareness Research Foundation and Special Olympics. The purpose of this study is to educate caregivers and health professionals to proactively screen for OSA in children with DS. Effective health communication may mitigate risk factors associated with pediatric OSA through tailored health plans for children living with DS.

Re-discovery of Microatolls in the Galápagos Islands, Ecuador

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Abstract

Microatolls are coral colonies with a signature ring-like shape. They form in shallow water where depth limits vertical growth, allowing them to be utilized as indicators of current and past sea level. Additional contributors to their formation include accumulation of sediment on the colonies which smothers corallites in the center of the structure, overgrowth by algae, and upper surface abrasion by bioeroding organisms. Microatolls occur at numerous locations in the Indo-West Pacific, however, they are reported at only two known locations in the tropical eastern Pacific: Caño Island, Costa Rica and the Galápagos Islands, Ecuador. More than 50 *Porites lobata* microatolls were observed in a small embayment on the northern coast of Champion Island. These colonies exhibited irregular microatoll morphology, with a more elongated, scallop-shaped boundary than the typical rounded form. Colony sizes ranged from 0.2m² to more than 3.0m². Upper surface depressions were covered in sediment and filamentous algae, surrounded by an outer ring of living tissue. The shallowest living portions of colonies were centered at Mean Lower Low Water (MLLW), consistent with other reports of these formations. A resident colony of sea lions (*Zalophus wollebaeki*) in this embayment may be responsible for a novel contribution to microatoll formation. Abrasion by passing sea lions and the opportunistic placement of damselfish (*Stegastes* spp.) algal lawns may further limit vertical coral growth. Unlike other shorelines in the Archipelago, the embayment at Champion Island provides the critical combination of shallow depth, sedimentation stress, and biotic disturbances to form these distinctive coral structures.

Skill Football Players Outperform and “Outforce” Big-Skill and Big Players in the Vertical Jump

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Health and Human Performance

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Abstract

Vertical jump (VJ) performance is critical for football players. Position demands vary and may influence VJ loading (eccentric) and propulsion (concentric) forces. Examining forces in addition to jump height (JH) informs training programs. We aimed to determine differences in VJ performance [reactive strength (RSI_{mod}, m/s); JH (cm)] and peak concentric (CON-PF) and eccentric (ECC-PF) forces between position groups. Sixty football players (age, 22.7±1.1yrs; ht, 186.4±6.8cm; mass, 103.6±21.2kg) representing three position groups, Skill, Big-Skill and Big, performed VJ on dual uniaxial force plates. ForceDecks software allowed for calculation of the dependent variables. ECC-PF and CON-PF were normalized to body mass (N/kg). Between group differences were determined with ANOVAs, $p \leq .05$, and Turkey HSDs, as necessary. CON-PF was different between groups ($F_{(2,59)}=10.9$, $p<.001$) with Skill (29.0±2.2N/kg) greater than Big-Skill (27.3±2.1N/kg) and Big (25.5±2.3N/kg). Big-Skill were not different than Big. ECC-PF was different between groups ($F_{(2,59)}=6.2$, $p=.004$) with Skill (24.3±2.9N/kg) greater than Big (20.8±2.0N/kg). Big-Skill (22.7±3.2N/kg) was not different than Skill or Big. RSI_{mod} was different between groups ($F_{(2,59)}=12.7$, $p<.001$) with Skill (0.72±0.13m/s) higher than Big-Skill (0.65±0.14m/s), and Big (0.49±0.09m/s) higher than Big. JH was significantly different between groups, ($F_{(2,59)}=4.5$, $p=0.15$). Skill (55.5±7.8cm) jumped higher than Big (46.5±10.9cm). Big-Skill (53.1±8.0cm) was not different from Skill and Big. Results indicate Skill players, who are lighter mass perform better on VJ as indicated by higher JH and RSI_{mod}. They may achieve this by producing greater forces per kilogram of body mass than other positions. Mass may be a limiting factor in peak force production.

Skill Position Football Players Have Greater Vertical Jump Kinetic Asymmetry But Better Performance Than Big Skill and Big Position Players

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Health and Human Performance

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Abstract

The vertical jump (VJ) assesses lower limb power and is tested in players entering the National Football League's (NFL) draft. Limb asymmetry of $\geq 10\%$ has been linked to injury and poor performance. Assessing VJ performance and kinetic asymmetry by player position may guide group-based training programs. We sought to determine if VJ performance and kinetic asymmetries were different between football position groups, Skill Players (SP), Big Skill Players (BS), and Big Players (BP). Sixty participants (age, 22.7 \pm 1.1 yrs; \pm ht, 186.4 \pm 6.8 cm; mass, 103.6 \pm 21.2 kg) training for the NFL draft performed VJ on dual uniaxial force plates. Performance variables of reactive strength (RSI-mod) and jump height (JH), and right-left asymmetries (%) for concentric impulse (CON-IMP), eccentric braking impulse (ECC-IMP), eccentric peak force (ECC-FORCE), and take-off force (TO-FORCE) were compared using ANOVA, $p < .05$ and Tukey HSD, as necessary. RSI-mod was different between groups, $F(2,59) = 12.69$, $p < .001$ with BP (0.5 \pm 0.09 m/s) having lower reactive strength than SP (0.7 \pm 0.1 m/s) and BSP (0.6 \pm 0.1 m/s). SP was not different than BSP, $p > .05$. JH was different between groups, $F(2,59) = 4.52$, $p = 0.15$ with SP (55.5 \pm 7.8 cm) jumping higher than BP (46.5 \pm 10.9 cm). BSP (53.1 \pm 8.0 cm) was not different from BP, $p > .05$. ECC-IMP asymmetry was different between groups, $F(2,59) = 4.74$, $p = 0.12$ with SP (15.9 \pm 11.1%) having greater asymmetry than BSP (8.9 \pm 6.5%). BP (8.4 \pm 5.7%) was not different from SP or BSP, $p > .05$. While SP had larger asymmetries in CON-IMP, ECC-FORCE and TO-FORCE, they were not significantly different than BSP or BP, $p > .05$. Results indicate SP perform well on VJ despite kinetic asymmetries. However, this group may be at greater injury risk.

Social Vulnerability and Adult Obesity in the State of Florida

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Abstract

Introduction: Socioeconomic and racial disparities are prevalent regarding obesity rates, where race, income, and education are predictors of obesity. Social vulnerability, or a community's ability to respond to stressors on health, may be one explanation for these disparities. The purpose of this study is to examine the associations between social vulnerability and obesity among Florida counties. **Methods:** We conducted an ecological cross-sectional study among 67 Florida counties. To measure county-level social vulnerability, we utilized the CDC Social Vulnerability Index (SVI), which is composed of four themes. County-level adult obesity prevalence in 2017 was obtained from the UWPHI's County Health Rankings. For each county, we dichotomized the four SVI themes and obesity prevalence by the median. We used logistic regression to examine associations between each SVI theme and obesity prevalence among Florida counties. **Results:** We found that Florida counties with higher values for the socioeconomic status theme (OR: 12.15, 95% CI: 1.97-74.94), the household composition and disability theme (OR: 11.19, 95% CI: 2.07-60.39), and the housing type and transportation theme (OR: 7.64, 95% CI: 1.07-54.52) were associated with a higher obesity prevalence. However, we found Florida counties with higher values for the minority and language theme, had a lower obesity prevalence (OR: 0.04, 95% CI: 0.01-0.41). **Discussion:** Our results indicate that county-level social vulnerability may influence obesity prevalence among Florida counties. Identifying socially vulnerable populations may be helpful for contextualizing resource allocation and the implementation of interventions to address obesity within Florida counties.

Structural Identification of Secondary Metabolites From Bacteria

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Abstract

Chronic misuse and abuse of antibiotics over the last century has led to an end of the golden age of antibiotics. However, we could turn to bacteria to find a solution to the current antibiotic resistance crisis. Bacteria are engaged in an endless arms race against each other, and humans can use the compounds bacteria produce as antibiotics. Our team isolated bacteria from local soil samples and aimed to identify and characterize these microbes. The two bacterial strains we were able to identify were *Pseudomonas fulva* and *Plesiomonas shigelloides*. *P. fulva* is an aerobic proteobacterium which produces secondary metabolites such as indole, a tryptophan derivative that has been found to be effective as a cancer therapy agent. *P. shigelloides* is a facultatively anaerobic proteobacteria which has shown to produce secondary metabolites such as Thiopeptide, a class of peptide antimicrobials produced by bacteria, and Betalactone. The bacteria of interest had their 16S ribosomal DNA sequenced, and the genus was determined using NCBI's BLAST tool. To determine the secondary metabolites, the genomes were analyzed using Anti-SMASH (a secondary metabolite database). Previous work had only been able to identify the class of drugs produced, We are working to determine the structure of the compound. Using a combination of spectroscopy and chromatography techniques, we plan to compare our drug variant to drugs used in medicine.

Substantiation and Validation of the Benefits of CUREs in STEM using a Combination of Self-Reported Gains and Alignment with Learning Objectives

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Abstract

The implementation of the Biochemistry Authentic Scientific Inquiry Lab (BASIL) Course-based Undergraduate Research Experience (CURE) is an important resource that grants students the opportunity to develop research experience while working to earn their bachelor's degree. Pre and post Participant Perception Indicator (PPI) surveys were made available to students to measure student improvement after taking the course. Growth in knowledge, experience, and confidence (KEC) was measured by comparing the pre-semester and post-semester PPI survey data. In addition to the self-reported data, the student learning objective mastery quantitatively using Anticipated Learning Outcomes (ALOs) designed specifically for the BASIL CURE curriculum. Likert scale-based analysis is employed to evaluate the level of content mastery student responses demonstrate. Assignment questions were designed to correspond to the most critical learning objectives. The COVID-19 pandemic caused a shift to online learning halfway through the Winter semester and undergraduate universities transitioned to a fully online curriculum. This affected those students taking the course remotely because they were unable to complete the biochemical experiments associated with the BASIL course curriculum. Recently, students have returned to in-person learning and results between semesters have reflected an increase in KEC in biochemical and computational ALOs. Overall, significant growth and improvement was reported by the participants of the course, and analysis shows greater mastery of bioinformatic ALOs during remote learning. The student's mastery of wet-lab ALOs coincided with our findings that lab courses need enhanced strategies to teach critical STEM lab-research skills in an online setting. Novel assessment and instruction strategies targeted to learning mastery gaps identified as part of this work will pave the way for wider CURE adoption. Ultimately, this serves as a platform to expose every undergraduate student to vital STEM research experiences.

Survival and Development of Zebra Longwing, *Heliconius charithonia*, on Native and Non-native Passion Vines, *Passiflora* sp., in South Florida

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Abstract

Zebra longwing butterflies (*Heliconius charithonia*) are distributed throughout Central and South America, and the southernmost regions of the United States, including Florida. These heliconian butterflies not only consume nectar, but are also known to feed on pollen, resulting in a longer lifespan than most butterflies. In their larval stage, *H. charithonia* feed exclusively on *Passiflora* spp, however preferred host species for *H. charithonia* eggs and overall larval performance across Passion vine species is not well documented. We examined these criteria of zebra longwings from egg to adulthood on two native passion vines to Florida, corky stem (*Passiflora suberosa*) and maypop (*Passiflora incarnata*), and two non-native species, bluecrown (*Passiflora caerulea*) and possum (*Passiflora edulis*). Plants were left outside and separated by species for three days to allow egg laying by the zebra longwings to occur. All eggs on each passion vine species were then counted, and plants were moved into species specific chambers to study larval survival and development. Percent survival from egg to larvae, larvae to chrysalis, chrysalis to adult, and egg to adult were determined, as well as forewing length and sex of adults for each *Passiflora* sp. Results indicated potential incompatibility between *H. charithonia* larvae and *Passiflora caerulea*. The native *Passiflora suberosa* was preferred by *H. charithonia* for egg laying and also resulted in the greatest larval survival rate.

Synthesis of Chelating Polymers via RAFT for Metal Extraction

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Abstract

Heavy metal contamination in drinking water is known to cause damage to multiple organs and is one of the major causes of cancer. The presence of heavy metals in water has the ability to cause life-threatening conditions. The purpose of our study is to synthesize metal binding polymers and to determine their efficiency at extracting heavy metals from contaminated water. Poly pentafluorophenyl acrylate (PPFPA) was synthesized via the employment of reversible addition-fragmentation chain transfer (RAFT) polymerization using pentafluorophenyl acrylate (PFPA) as the monomer to create linear and hyperbranched polymers. RAFT polymerization allows control over molecular weight and the molecular architecture of PPFPA. Qualitative data obtained from H-NMR and F-NMR was utilized to assess monomer purity, polymer conversion, and confirm the structure of the final polymer. PPFPA is a modular polymer that is capable of being functionalized with metal binding groups. PPFPA polymers were reacted with different metal binding group nucleophiles to functionalize the polymer. A selection of mono-, bi- and tridentate metal binding groups was synthesized to functionalize PPFPA for the extraction of heavy metals from contaminated water. Effective functionalization of the final polymers was confirmed by NMR spectroscopy.

The Effect of Fluorinated Substitution of Meso Phenyl Porphyrins on Porphyrin Basicity

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Abstract

The purpose of this study was to determine the effects of fluorinated substitution of meso phenyl porphyrins on porphyrin basicity. The protonation of meso-Tetra(2,3,4-trifluoromethylphenyl) porphyrin (TF) and meso-Tetra(pentafluorophenyl) porphyrin (PF) will be studied through UV vis spectroscopy. Protonation is achieved by titration of each porphyrin in toluene with trifluoroacetic acid (TFA). The presence of a wavelength shift from the free base Soret to the protonated Soret will indicate the formation of a dication. The data from the UV spectra will be used to calculate the pK_a values associated with each porphyrin. Based on the results, the average pK_a for TF upon protonation was 2.07, while the average pK_a for PF was 1.36 over four trials. A greater acidic value for PF was indicated from these results. In addition, a significant increase in the amount of acid added was noted during the protonation of PF when compared to the amount of acid needed for TF. This could indicate a correlation between the fluorinated position in the porphyrin and the formation of dication.

The Effects of Herbal Products in Cartilage Healing and Reducing the Progression of Osteoarthritis

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Abstract

Treatment for osteoarthritis (OA) is primarily aimed at symptom management and is generally limited with emphasis placed on therapy and drugs such as NSAIDs, opioids, and acetaminophen. However, these drugs pose health risks for long-term use including contraindications, gastrointestinal, and cardiovascular issues. Thus, this systematic review of literature was conducted to evaluate the impact of the herbal products, turmeric and ginger, on reducing the progression of OA when utilized on both a short-term and long-term basis. After evaluating the content of several scholarly journals, it was found that turmeric and ginger can aid in symptom management of OA and promote cartilage regeneration, with turmeric extract providing the most evidence-based results. Turmeric decreases the amount of pain and stiffness from OA and can restore cartilage by subduing the master pro-inflammatory transcription factor NF- κ B signaling tracts in chondrocytes. Ginger lowers the number of inflammatory cytokines caused by OA through similar mechanisms, and it also significantly lessens the production of NO and PGE₂ in cartilage tissue, stimulating cartilage recovery. Upon the completion of more studies that assess the prime-dosage and long-term effects of these herbs, the beneficial implications of these herbs, especially turmeric, could be confirmed for medical use.

The Halls of Power

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Abstract

“The Halls of Power” is a documentary short film about the life and work of Elijah Manley, a young politician and activist in South Florida. The main story focuses on Elijah Manley’s life and political activism as the youngest person to ever run for the Florida State Legislature. The second storyline will follow other young activists and organizers within the community. The goal of the documentary is to inform the audience about this activist and demonstrate how one can get involved in politics. We hope to encourage the young demographic to be more engaged with their local politics. Because politics can truly shape culture and society, this film is a call to action for young people to organize within their communities, be involved, and be concerned about issues that can potentially affect their future. This short film will be a combination of the narrative and rhetorical modes of documentary filmmaking. This film is partially inspired by the documentary *Knock Down the House (2019)*, due to the relevance and timeliness of the political themes within the film.

The Impact of Post-Traumatic Stress on Symptom Presentation of Women With Gulf War Illness

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Abstract

Gulf War Illness (GWI) is a multi-symptomatic disorder characterized by fatigue, muscle pain, cognitive problems, gastrointestinal issues, etc. affecting an estimated 30% of the ~750,000 returning military Veterans of the 1990–1991 Persian Gulf War. Female Veterans deployed to combat in this war report medical symptoms, involving cognition and respiratory troubles, at twice the rate compared to non-deployed female Veterans of the same era. The heterogeneity of GWI symptom presentation complicates diagnosis as well as the identification of effective treatments. This is exacerbated by the presence of comorbidities which may be alleviated by defining subgroups of the illness, such as an obvious gender stratification. Our aim is to determine if women with GWI can be further subdivided into distinct subgroups based on post-traumatic stress disorder (PTSD) symptom presentation. This study looked at 35 Veterans diagnosed with GWI and compared them with 35 healthy sedentary controls. Based on the distinct differences found in PTSD symptomology regarding all health and trauma symptoms, two subgroups stratified based on the severity of PTSD symptoms were derived within female GWI Veterans. Hierarchical regression models displayed the comorbid effects of GWI and PTSD, both having measurable impacts on physical and social outcomes of poor health ($\Delta R^2 = 0.08 - 0.672$), with notable differences in mental and emotional measures. Overall, in women with GWI and PTSD, a cut point analysis indicated supported the understanding that comorbid symptoms of GWI and PTSD subsequently result in poorer health outcomes, along with establishing the possibility of varied clinical presentations.

The Teacher

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Abstract

“The Teacher” is a short film about a professor who gets harassed by one of his former students. The film is directed by Amari Russell. Another crew member/actor includes Adam Deross.

The Universal Mass Function and its Applicability to Organic Molecules

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Abstract

The ability to predict the yield when synthesizing an organic molecule is a challenging issue in organic chemistry and a major obstacle when planning a multi-step organic synthesis. To choose the most time, money, and waste efficient way it will be beneficial to be able to predict the yield of the product. The Universal Mass Function (UMF) states that cosmic objects on all scales are in direct relation to each other. It shows that massive objects are much rarer than objects with lower masses. The following research aims to examine if the UMF theory is applicable to the field of organic chemistry, specifically to the ability of predicting the yield of a reaction. The primary reaction chosen for this research to examine that assumption was the substitution reaction of alcohol to different derivatives of alkyl halides in a protic environment. For that reaction, we expect to get the opposite results from that which support the UMF due to what is widely known from the reactivity of the molecules. Our primary results supported the UMF theory; we received a higher yield from the alkyl halide derivative that weighed less although we expected to get less from that derivative based on the reactivity of the molecules. Ratification of the Universal Mass Function on small-scale molecules is significant since in addition to helping overcome a major problem in the field of organic chemistry it would make a huge impact on the pharmaceutical industry by enabling the prediction of the most efficient drug synthesis.

Touch Sensitivity in College-Aged Adults

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Abstract

The present study aims to identify what factors influence pain perception. Previous studies have focused on the differences in pain tolerance between genders, but this difference could be due to differences in physiology. The COMT rs4680 single nucleotide polymorphism (SNP) has been implicated in stress and pain perception (Serrano et al., 2019, Hill et al., 2018). G/G/ allele carriers perform better under stressful conditions and perceive less pain relative to the A/- allele carriers. Here we examined how gender, body size, and genetic makeup influences pain intensity, pain threshold, and pain tolerance. Participants will be asked to passively drool into a test tube to gain a saliva sample for genetic analysis. Following this, participants will be administered the Pain Anxiety Symptom Scale (PASS-20) and State-Trait Anxiety Inventory (STAI) to measure anxiety. Participants will then undergo the Cold Pressor Test to measure pain intensity (maximum level of discomfort experienced while holding a single hand in ice water), pain threshold (time from immersion in ice water at which participants indicate feeling discomfort), and pain tolerance (time at which hand is removed from the ice water). We hypothesized that pain sensitivity will be higher in females, larger individuals, and A/- allele carriers.

Tree Canopy Biodiversity in an Urban Forestry Setting on Nova Southeastern University's Main Campus

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Abstract

Nova Southeastern University's (NSU) 314-acre main campus has many lush green spaces comprised of native, landscape, and educational garden areas. Understanding the biodiversity of the canopy and the overall composition of native and invasive species is important for measuring ecological health of the urban ecosystem, and to guide responsible grounds management practices. As the environment and landscape at NSU develops, it is important to keep records of these environmental changes over time. The purpose of the research is to investigate the biodiversity of the campus' green spaces and document the native species on campus. 10 zones were randomly selected from a previously generated map of campus that divided the campus into 39 zones for the purpose of documenting landscape hurricane preparedness. Within each of the 5 zones photos of the leaves and bark, as well as coordinates of each of the individual trees were documented. The resulting sample set of data can be applied in future studies looking at how biodiversity has changed over the years for the university. This could also create a blueprint for future biodiversity studies as NSU's infrastructure continues to develop. On a larger scale data will serve as a baseline for future studies and allow for comparisons to other schools participating in the Tree Campus Higher Education Program.

Understanding the Origin of Mutations using *Ab Initio* Molecular Dynamics

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Abstract

Proton transfer within DNA base pairs is a possible origin for mutations which can ultimately lead to cancer. To better understand this potential source of mutations we have modeled this process using *Ab Initio* molecular dynamics simulations of model systems for DNA base pairs in water. These simulations have provided insight into how often and when proton transfer occurs in these systems while also highlighting the relationship between the likelihood of a proton transfer event and the way the water molecules are coordinated around the model system for DNA. This in turn has allowed for a greater understanding of potential mechanisms that can lead to mutations and the role of nearby water molecules in facilitating or preventing these mechanisms.

Understanding the tradeoff between ATP metabolism and growth in *E.coli*

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Abstract

The inoculum effect (IE) is a phenomenon in which the minimal inhibitory concentration (MIC) of an antibiotic increases with the density of a bacterial population. IE has been observed for nearly all antibiotics, and has been shown to decrease antibiotic efficacy, prolong the recovery period and increase mortality rates. Despite its ubiquity in the clinic, a mechanism to explain IE for bacteria that expresses antibiotic resistant elements, such as β -lactamases, has yet to be identified. Interesting enough, recent work has shown that interactions between growth rate and metabolism, as determined through ATP production, affect IE for bacteria that lack a genetically encoded resistance mechanism. While interactions between growth and metabolism could explain IE for β -lactamase producing bacteria, this has yet to be explored. Therefore, this study was predominantly focused on understanding the relationship between ATP, growth rate and IE produced by bacteria that express β -lactamase. We found that different ratios of carbon and nitrogen sources affected ATP production and growth directly which would also alter the strength of IE. Additionally, our results suggest a unique tipping point determined by ATP and growth rate where the strength of IE grows considerably. Overall, our results may help us develop novel approaches to treating bacterial infections in the clinic with future patients.

Using social media to educate and increase awareness about the harmful effects of tobacco and its relationship with Covid-19

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Abstract

Tobacco use is the leading cause of deaths, diseases, and health care costs in our society. The Area Health Education Center (AHEC) Program at Nova Southeastern University launched a pilot social media campaign in June 2021 to encourage widespread distribution of information on the harmful effects of tobacco use across multiple social media platforms (Facebook, Instagram, Twitter, and LinkedIn). This initiative is student driven and faculty supported. Its goals are to increase social consciousness about the harmful effects of tobacco use through the widespread sharing of messaging and to motivate tobacco users to seek readily available cessation services provided through the AHEC Program. One of the topics of the campaign was Tobacco and Covid-19. Six messages and a video were developed to be disseminated across Facebook, Instagram, Twitter, and LinkedIn. To evaluate the performance of the social media posts, two key performance indicators were used, engaged users, which are unique visitors that have engaged with the posts (liking, commenting, sharing) and impressions, which are unique users that have viewed the posts. The social media messages were posted on the Everglades Area Health Education center social media platforms and links of the messages were shared with more than 60 organizations. From October to December 2021, the total number of engagements was 464 and the total number of impressions was 8,668 on the Tobacco and Covid-19 posts. Implementing a powerful social media campaign in tobacco cessation is vital to increase education, and awareness of the harmful effects of tobacco.

Who Stressed The Dogs Out: A Case for Studying Mitochondrial DNA as a Novel Biomarker for Stress in Canines

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Abstract

Canines transiting through animal shelters experience extreme stress that is subsequently ameliorated by adoption into loving (human) homes. These transitions provide exceptional opportunities to study links between social stress and physiological processes, and to develop biomarkers for stress and social bonding with applications in both animal welfare and human health. Here, we propose a novel approach to the study of shelter-related stress in dogs, and of stress reversals following adoption. Specifically, we will quantify mtDNA dynamics in buccal swabs sampled during shelter intakes of canines at the Broward County animal shelter, as well as samples collected after these animals' adoptions by Broward County residents.

mtDNA dynamics are emerging within the human psychiatric literature as a novel tool for studying mental illness and social stress. Despite their rich potential for studying other social mammals, our proposed methods remain virtually untested in other species (e.g., dogs). We will therefore compare measured mtDNA dynamics to better-established biomarkers associated with mammalian stress and/or social bonding (e.g., cortisol and oxytocin). Finally, we will test the relationship between each measured biomarker and behavioral assessments of the focal animals that quantify inter-individual variation in stress levels over time. Because mtDNA dynamics unfold within compartmentalized tissues and are also less subject to pleiotropy than circulating hormones, we predict mtDNA dynamics will comprise a more sensitive, robust, and cost-effective method for characterizing stress and stress attenuation than existing methods.

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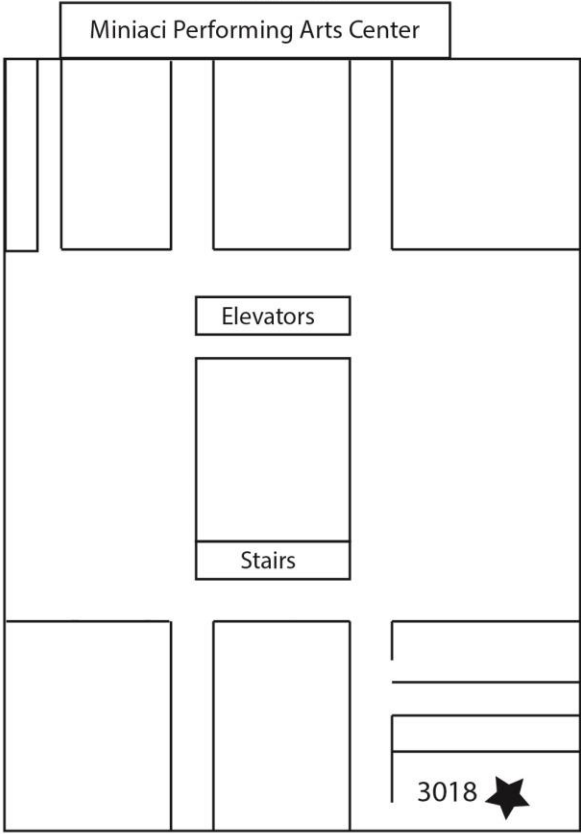
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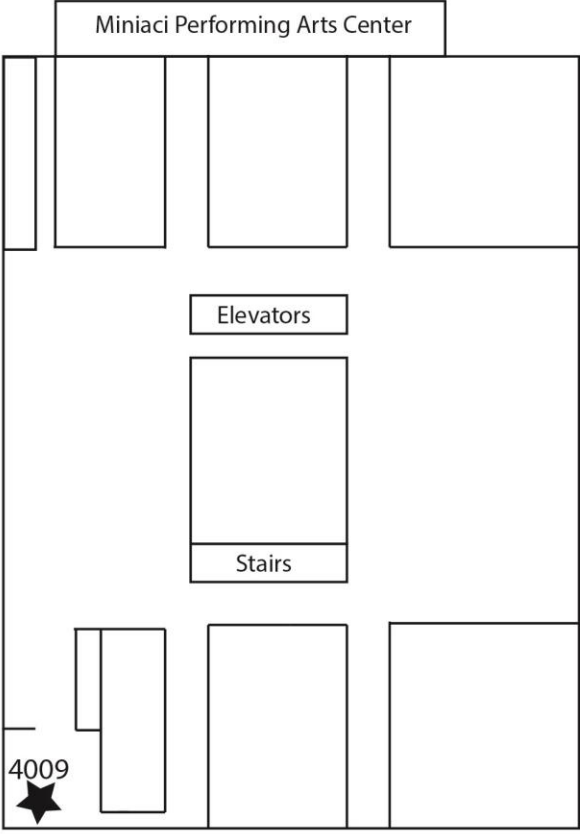
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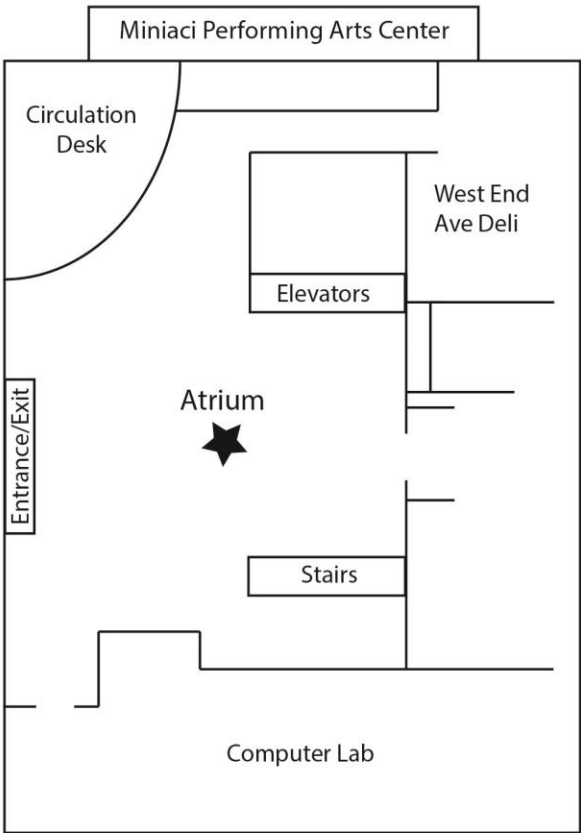
3rd Floor



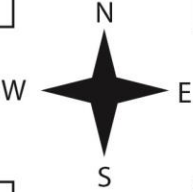
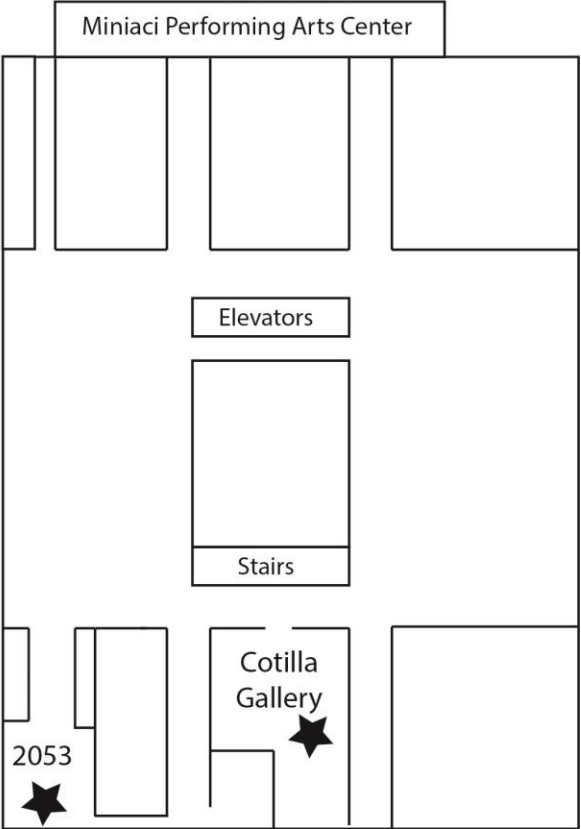
4th Floor



1st Floor



2nd Floor



UNDERGRADUATE STUDENT SYMPOSIUM
2022 Program Schedule

DATE AND TIME	EVENT AND LOCATION		
April 6, 2022 12:00pm-1:00pm	Welcome and Introduction Andrea Nevins, Ph.D., M.F.A. Dean, Farquhar Honors College Keynote Speaker Ken Dawson-Scully, Ph.D.	Cotilla Gallery	Alvin Sherman Library
April 6, 2022 5:00pm-7:00pm	Film Festival Reception	Honors Great Room (4th Floor)	Alvin Sherman Library
April 7, 2022 10:00am-12:30pm*	Poster Presentations	First Floor Atrium	Alvin Sherman Library
April 7, 2022 12:00pm-1:00pm*	Oral Presentations	Room 2053	Alvin Sherman Library
	Oral Presentations	Room 3018	Alvin Sherman Library
	Oral Presentations	Room 4009	Alvin Sherman Library
April 7, 2022 4:00-5:00 p.m.	Closing Ceremony	Performance Theatre	Don Taft University Center

*See separate detailed schedule for poster easel numbers, specific film showing times, and oral presentation room assignments.