Nova Southeastern University

UNDERGRADUATE STUDENT SYMPOSIUM 2024

Farquhar Honors College
NOVA SOUTHEASTERN UNIVERSITY

NSU Florida

22nd Annual Undergraduate Student Symposium

April 3 – 4, 2024

Alvin Sherman Library, Research, and Information Technology Center

2024 Undergraduate Student Symposium

The Undergraduate Student Symposium (USS), sponsored by the Farquhar Honors College, presents student projects through poster displays, oral presentations, films, and digital projects. The event is 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 is 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.

Keynote Speaker

Jessica Brown, Ph.D.

Dr. Jessica Brown is an associate professor at Nova Southeastern University, specializing in analytical chemistry. She received her Ph.D. in chemistry at Florida International University. Her doctoral research focused on evaluating the odor profile of biological specimens from human subjects for identification purposes. In 2012, she accepted a postdoc with the United States Army Research Office, where she traveled to South Africa to explore the sensing capabilities of African elephants to explosive odors. In 2013, she began working as a chemical instrumentation specialist at Nova Southeastern University and was later hired as an assistant professor. While at NSU, Dr. Brown has supervised projects for over 20 undergraduate researchers on projects ranging from the identification of volatile biomarkers for periodontal disease to assessing the stability of vitamin D in fish after gamma irradiation.

2024 USS Logo Design Winner

Isabella Fiore

Isabella Fiore is a second-year student at Nova Southeastern University pursuing a degree in neuroscience and biology with minors in scientific diving, honors transdisciplinary studies, and pre-health. She has been working as a Student Researcher, Peer Leader, and Pre-Health Consultant. As a member of the Farquhar Honors College, Isabella can't wait to share her design and present at this year's Undergraduate Student Symposium!

2024 USS Steering Committee

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Abstract Proceedings

Farquhar Honors College
Nova Southeastern University

Keynote Speaker: Jessica Brown, Ph.D.

2024 Undergraduate Student Symposium Abstracts

A Comparative Analysis of SERPIND1 in a Genomic Lens in Sharks

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Abstract

This research investigates differences in wound healing between sharks and humans, focusing on key components in the healing pathway. Sharks are known for their remarkable lesion-healing capabilities. Genes such as SERPIND1 play crucial roles in tissue remodeling for sharks while playing a role in cancer metastasis and inflammation in humans. The SERPIND1 gene codes for plasminogen activator inhibitor 1 (PAI-1), which is involved in blood clotting. This clotting process is vital for repairing dermal wounds, sealing off the damaged area, and preventing further blood loss. Comparative genomic analysis reveals distinctions between human and shark SERPIND1 genes at different levels such as nucleotide, amino acids, and chromosomal levels. The use of programs like StringDB and Ensembl helped us investigate protein interactions with each variant of SERPIND1. This led us to a broader understanding of the transformative changes between these variants through an evolutionary perspective. We discovered that both the human and shark homologs exhibit partial synteny, as several proteins, including PI4Kaa and Snap29, are present in both species. We discovered one extra splice site in the human SERPIND1 gene. Moreover, the human SERPIND1 had 8 exons compared to 7 exons in the shark homolog. Understanding these genetic factors and their roles in blood clotting enhances our knowledge of shark physiology and provides valuable insights that may inform advancements in human wound-healing strategies, opening avenues for further research and potential applications in medical science.

A Comparison of the Impact of Colonial Heritage on the Development of Former Western and Soviet Union Colonies

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Abstract

How successful were countries colonized by the West in developing compared to countries colonized by the Soviet Union. This paper presented three hypotheses: Former Soviet colonies will be more economically developed than former Western colonies, Former Soviet colonies will be more politically developed than former Western colonies, Former Soviet colonies will be more socially developed than former Western colonies. These hypotheses are derived from the theory that the types of colonialism that the Soviet Union and Western countries practiced were different, meaning that Western European nations created colonies to extract resources from them, rather than to form permanent bonds. This is in direct contrast to the Soviet Union who colonized other nations to become one large nation, focusing more on combining culture and power. At this end of this paper, it is shown that there is no statistical support for former Soviet colonies being more economically developed, but there is strong statistical support for them being more politically developed, and moderate statistical support for them being more socially developed. This implies that the idea of the West always being superior to the east might be an unfounded assumption and supports the theory that former Soviet colonies are more developed than former Western colonies due to the type of colonialism they practiced.

A Quantitative Analysis of Sudoku Variant Puzzles

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Abstract

Sudoku is a globally popular number puzzle game whose appeal lies in its simplicity and capacity to challenge logical and analytical skills, transcending cultural barriers and finding applications in various fields. The game is believed to bring many benefits to the players, including stimulating the mind, as well as developing their ability to make decisions (Uniyal, 2022). This research delves into evolving preferences by analyzing publicly available data from Logic Masters Deutschland (LMD), a leading German organization dedicated to expanding Sudoku logic puzzles through competitions and events (www.logic-masters.de). The dataset comprises a wealth of puzzle-related information, including puzzle names, author details (names, counts of solved and published puzzles across five difficulty levels), publication dates, solved puzzle counts, earliest solved dates, difficulty ratings, observations, comments, and the presence of puzzle variants like Killer, Arrows, Thermo, German, Reban, and Kropki Pairs. The data is limited to be from January 2023 to August 2023 to ensure it captures current trends while allowing enough time for general community engagement. Regression analyses of various kinds were employed, exploring the impact of various independent variables on the number of solved puzzles, puzzle difficulty rating, and puzzle satisfaction rating. These analyses unveil significant relationships among variables, yielding predictive models for future puzzle outcomes. By quantifying measurable puzzle's success, the research sheds light on the intricate web of puzzle enthusiasts and their interaction with Sudoku and similar challenges.

A1 vs A2 Milk Variants and their Impact on Cysteine Metabolism in Autism-Spectrum Disorder

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Abstract

Dairy cow milk stands as a vital source of nutrients encompassing proteins, carbohydrates, fats, and micronutrients. This nutritional complexity is heightened by the choice between A1 and A2 milk types. This research probes the distinctions between A1 and A2 milk and their potential implications for cysteine metabolism within the context of autism spectrum disorder (ASD). This study focuses on BCM7, a bioactive opioid peptide exclusively released during digestion of A1 milk, and its impact on mitochondrial respiration of macrophage-like THP1 cells.

Using the Seahorse XF for mitochondrial assessment, oxygen consumption rate (OCR), extracellular acidification rate (ECAR), basal respiration, proton leak, maximal respiration, spare respiratory capacity, non-mitochondrial oxygen consumption, ATP production coupled respiration, and coupling efficiency were measured for PMA-treated THP1 cells as well as BCM7 treated THP1 cells.

Basal respiration increased in experimental cells by 8.52 pmol/min and ATP production coupled respiration by 4.35 pmol/min. However, the results revealed no significant change ($p < 0.05$) of BCM7 on THP1 cells. For example, mitochondrial respiration, non-mitochondrial oxygen consumption, and coupling efficiency showed only minimal changes. Maximal respiration and spare respiratory capacity decreased in the BCM7 treated cells by 23.4 pmol/min and 31.9 pmol/min respectively. In conclusion, the findings of this study indicate that BCM7 does not exert a significant influence on mitochondrial respiration in THP-1 cells under the conditions tested.

Alcohol Use Among High School Students in Select Florida School Districts, a Comparison of Pre-COVID and COVID Years, (2019, 2021)

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Abstract

Background: The widespread concern about alcohol use among high school students underscores the urgent need for effective prevention and education programs. Comparing underage drinking statistics before and during the COVID-19 pandemic is essential for understanding patterns of behavior during this unique time period. This knowledge can potentially illuminate changes in risk factors and guide targeted interventions to protect the well-being of adolescents in the post-pandemic era.

Methods: The Youth Risk Behavior Survey (YRBS) data was used to analyze alcohol use behaviors in six Florida counties. We used student responses to examine alcohol-use initiation and whether they were currently drinking at the time of the survey. Results were stratified by county. Paired samples t-test determined differences in initiation of drinking alcohol before age 13 and current alcohol use.

Results: On average 17.25% of students were currently drinking alcohol in 2021. This was a 3.22% decrease from 2019, however, differences were observed by county, with some showing increases and others showing decreases in these behaviors. There was a significant average increase in alcohol-use initiation before the age of 13 in the same time period.

Conclusion: Although less students recently drank alcohol, there were more first time drinkers during the pandemic. This could be because students were home during lockdown and possibly having more access. The prevalence of alcohol-use among high school students in Florida emphasizes the importance of tailoring interventions to the population as well as taking into account the exceptional changes that the pandemic presented.

An Approach to Using X-Ray Crystallography to Understand Peptidomimetics

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Abstract

Peptidomimetics can fold into a variety of well-defined shapes. The goal of this project is to understand shape selection in a beta peptide foldamer with an alpha amino acid cap. This research represents interdisciplinary collaboration between KAIST, a research university in South Korea, and NSU. We solved the single crystal x-ray structure and found that the crystals of this molecule were orthorhombic in $P2_12_12$ with unit cell dimensions a=22.655(6), b=30.008(8), c=18.271(5) and a unit cell volume of 12421.2 $Å^3$ (Z=8). We observed a total of 6 intermolecular hydrogen bonds within the beta peptide foldamer. Each of these hydrogen bonds make 12-membered rings within the structure, even including the alpha amino acid cap. These hydrogen bonds create a helical shape as they pull the ith carbonyl oxygen and the $i + 3^{rd}$ amid hydrogen together. This research demonstrates that it is possible to add a highly soluble alpha amino acid cap without changing the secondary structure of the beta peptidomimetic.

Assessing Cardiologists' User Experience with Electronic Medical Records and Generative Artificial Intelligence Visualization

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Abstract

Cardiovascular Diseases (CVDs) are a leading cause of death worldwide, accounting for 17.3 million deaths per year. Artificial intelligence has gained prominence in recent years, and there is a significant interest in exploring how artificial intelligence can improve patient outcomes and decrease hospitalization rates. This study will identify the most critical values that cardiologists consider when evaluating patients' charts, including factors such as medical history, diagnostic results, and current medications. Additionally, the study explores cardiologists' attitudes towards the integration of AI-generated imagery based on these critical values to enhance the efficiency and quality of patient care. A comprehensive survey will be distributed to certified cardiologists, inquiring about the importance of various patient chart values, such as age, past medical history, and ECG findings (e.g., rhythm, QT interval). The survey will also assess cardiologists' openness to utilizing AI-generated imagery that encapsulates the most critical values for a succinct and informative overview of the patient's medical record. The study will analyze the survey responses to rank the values in importance as perceived by cardiologists. Also, it will evaluate the level of interest and potential concerns among cardiologists regarding AI-generated imagery in clinical practice. The findings of this study will provide insights into the key factors that cardiologists prioritize when reviewing patient charts, which can inform the development of more targeted and efficient diagnostic tools. Furthermore, the study will gauge the readiness of cardiology professionals to embrace AI technologies that could revolutionize patient record management and decision-making processes in cardiac care.

Assessing Sociodemographic Impact on Mental Health Experience in University Students

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Abstract

The COVID-19 pandemic helped shift mental health conversations from taboo to embraced among younger generations. With this shift, young people may be more willing to report on their mental health status, aiding professionals in understanding the relationship between mental health and overall health status. Research supports that factors vary among youth mental health experiences, but gaps in knowledge on the extent sociodemographic factors contribute still exists. This study investigates associations between the mental health experiences (MHE) and sociodemographic factors among college students. This knowledge can inform how to craft mental health programs to suit the needs of diverse university student demographics. A mixed-methods approach will examine data from a 2023 study on mental health literacy in a university community. MHE variables include previous/current personal experience with mental illness, exposure to a family or peer with mental illness, and/or previous experience seeking help from health professionals. Descriptives will report MHE by type and total number (0-3). Correlation analysis will determine relationships between MHE and sociodemographic variables, while independent t-tests will determine differences in the number of MHE according to the demographic factors. Any associations found would suggest specific sociodemographic groups have higher rates of mental health experience than other individuals in the category. Although future studies may be necessary to further confirm an association between sociodemographics and MHE, this study hopes to shed light on factors related to mental health experiences and the needs for support in university students.

Assessing the Impacts of Social Media in Educating Individuals on the Importance of Influenza Prevention

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Abstract

Social media serves as a powerful tool for organizations to spread information to the public. This research, conducted in collaboration with Broward Regional Health Planning Council (BRHPC), a non-profit organization that has an online presence on Facebook, Instagram, X, and LinkedIn, investigates the benefits of using social media as a platform to educate and raise awareness regarding the importance of influenza vaccines among individuals and communities.

In the realm of public health, individuals must understand the importance of influenza vaccinations, as a way to prevent the spread of the seasonal flu and minimize its impacts on different communities. A total of five flu-related posts were created and shared. Free posts were shared on BRHPC's Instagram, LinkedIn, and X totaling 15 posts reaching 585 individuals. Boosting the same posts on Facebook, with $623.84 extended the reach to 15,759 individuals. As social media continues to grow as a primary source of information for many individuals, it is crucial to recognize its potential to spread accurate and essential information regarding vaccination. The research adopted a mixed-method approach, which combined quantitative analysis based on engagement metrics and media platforms, as well as qualitative insights through post engagements. This study aims to provide valuable insights into the effectiveness of social media platforms as educational tools, by evaluating reach, engagement, and perception of influenza-related content. These findings will allow for new strategies for the use of social media campaigns to not only promote influenza vaccination, but other essential information to enhance overall community health.

Assessment of Brain Function and Soccer Penalty Kick Performance in Collegiate Soccer Players

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Abstract

BACKGROUND: The purpose of this research study is to assess National Collegiate Athletic Association (NCAA) men's and women's soccer players brain function while taking penalty kicks wearing an electroencephalogram (EEG) band and a heart rate monitor. An EEG is a device used to assess brain activity and will record four types of brain wave activities: alpha, beta, theta, and delta. Heart rate data provides additional insight during strenuous activity. Minimal research exists on EEG and soccer penalty kicks, but multiple published studies discuss high activity in the beta wave along with a low heart rate indicating a focused but relaxed state. METHODS: NCAA Division II soccer players included in this study will use the EEG device and heart rate monitor before testing begins. Measuring the heart rate provides further insight into stress the player is experiencing during the penalty kick. Each penalty kick will be from the same distance throughout the experiment, but the shot location and order in where the participants kick will be randomized. Each participant will take approximately 5-10 repetitions to each shot location. Data from the EEG are stored in the Wave Recorder app and the heart rate data will be stored in the E4 Realtime app. Data will be analyzed using hierarchical linear modeling. ANTICIPATED RESULTS: Results from this study will reveal beta waves as the most prominent during assessment, as they are incorporated in problem solving or performing mentally challenging tasks. Gamma waves may also be prominent during cognitive function and heart rate data will reveal relaxed athletes prior to the penalty shot. Additionally, some correlation may exist between experienced players versus less experienced taking players.

Assessment of Wearable Vert Technology in Collegiate Volleyball Athletes

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Abstract

The purpose of this research study is to assess the use of the VERT device with (NCAA Division II Volleyball players. The VERT is a wearable and portable device that measures multiple variables including workload, jump height, frequency, intensity, and impact. Previous research indicates accurate data overall on jump performance which can then be applied to player work loads and injury risk. NCAA Division II Volleyball players included in this study will use the VERT device for one collegiate volleyball season, including practices and games. A typical season includes between 4-5 practices in a week and 1-3 games per week. Each device will be calibrated and fitted to each player before the season begins, and then utilized throughout the season. The VERT will allow participants to practice and play as they normally would to ensure accurate results. Data from the VERT are stored in the MyVERT mobile application to show player loads during practices and games and better evaluate player performance and potential injury risk. Upon completion of the season VERT data will be analyzed using hierarchical linear modeling to review multiple variables. Based on previous research, it is anticipated that the research conducted will reveal outside and opposite side hitters have the greatest workload, jump frequency, intensity, and landing impact and setters will have the greatest volume of jumps. After gathering the data, this will be beneficial for the future research to implement training programs and better prevent injury risk.

Bees and BVOCs: Characterization of Scents from Flowers and what Bees Leave Behind

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Abstract

Insect pollinators, such as bees, are an essential component to their ecosystem and surrounding plant life. Flowers emit odors, also known as biological volatile organic compounds (BVOCs), to attract bees to themselves during pollination. Additionally, when bees visit flowers, they are known to leave "scent marks" to communicate with other hive members which flowers to select or avoid for pollination. While BVOCs have been identified for many flowering species, there has not been extensive work analyzing odors from flowers that are popular with bee pollinators, such as *Bidens alba* (Spanish Needle). Furthermore, studies have not explored which odors are scent marks from bees. In this work, we characterized the BVOCs of a Spanish Needle, which is considered the third-most common source of nectar for pollinators in Florida, before and after they were visited by bees. BVOCs were extracted from flowers using solid phase microextraction (SPME) and gas chromatography-mass spectrometry (GC-MS) and identified by comparing the mass spectral data of the extracted odors to the NIST mass spectral library. Odors from unvisited and visited flowers were compared to identify the deterrent and attractive "scent marks" left by bees.

Burst Size Determination of a Newly Discovered *Yersinia pestis* Bacteriophage

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Abstract

The escalating global resistance to antibiotics has called for innovative alternatives to combat bacterial infections. Bacteriophages, viruses that can specifically target and destroy antibiotic-resistant bacteria, have emerged as a promising potential solution in phage therapy. This research focuses on a newly discovered phage capable of infecting *Yersinia pestis*, the causative agent of the bubonic plague, through the lytic cycle. In the lytic cycle, bacteriophages infect and replicate within bacterial cells, causing the cells to burst and release newly formed phages. Specifically, this study aims to characterize this recently discovered phage, utilizing experiments to determine its burst size, which indicates the number of progeny phages released after bacterial lysis. Through a series of experiments, including a one-step growth curve, we aim to monitor the replication of both the bacterium and the phage over time. The one-step growth curve for the bacteria alone serves as a baseline, and subsequent curves with bacteriophages provide information about the phage's impact on the bacterial replication cycle. In addition, a plate reader will be utilized to measure optical density at specific intervals for continuous data that will allow us to determine when lysis occurs. These combined methods serve as a crucial step in quantifying the burst size of the identified phage and evaluating its therapeutic potential against antibiotic-resistance bacteria.

Changes in Neuromuscular Function Across a Competitive Collegiate Cross-Country Season

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Abstract

Resistance training strengthens neural adaptations that aid in improving neuromuscular functions such as the rate of force development (RFD) and power execution during an explosive task like a countermovement jump (CMJ). Distance runners do not engage in heavy resistance training and the effects of endurance running on neuromuscular functions are less known but may provide crucial biomarkers for monitoring performance and injury. The purpose of this intervention study was to evaluate changes in neuromuscular function from 7 weeks of competitive distance running without heavy resistance training. Thirteen university runners (age, 19.8±2.2 yrs; height, 1.74±0.10 m; mass, 61.9±9.0 kg) performed 3 CMJ on dual uniaxial force plates at weeks 1 and 7. Running programs were constructed by a university coach and consisted of 64-100 km/week. Variables used to indicate neuromuscular function of RFD and power were height (JH, cm), reactive strength index (RSI, m/s), and RFD (N/s) for both eccentric (loading) and concentric (propulsion) phases of the CMJ. Paired *t*-tests showed significant decreases in concentric RFD (1291.1±874.1 vs. 686.8±506.2 N/s, p=0.025). While there were decreases in eccentric RFD (2545.9±1767.7 vs. 2293.9±1616.6 N/s) and JH (27.1±6.7 vs. 26.8±7.2 cm), these were not statistically significant, p>0.05. RSI (0.27±0.11 vs. 0.27±0.10 m/s) remained stable, p>0.05. Seven weeks of distance running without heavy resistance training appears to impair the ability to rapidly increase force development during an explosive task while reactivity remains stable. This finding requires further exploration into how this benefits distance runners from performance and/or injury risk perspectives.

Changes in the NSE and S100B Levels in Plasma Following Treatment with Peripheral Neuropathy-Inducing Chemo Drugs

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Abstract

Peripheral Neuropathy (PN) is a common chemotherapy-induced side effect that impacts 50% of all patients who receive chemotherapy. Treatment with Bortezomib (BTZ), Cisplatin (CIS), and Vincristine (VIN) has been established as the most common triggers of Chemotherapy-Induced Peripheral Neuropathy (CIPN) among cancer patients. Therefore, it was hypothesized that identifying diagnostic/prognostic biomarkers that can accurately predict the onset or progression of CIPN would help to determine the eligibility of the above-mentioned drugs for chemotherapy use and also would help to proactively prepare the patients for protective care. Therefore, our initial goal was to elucidate the molecular mechanisms underlying the onset and progression of CIPN that would first allow for the identification of suitable biomarkers, which can be used for monitoring CIPN before or during chemotherapy with BTZ, CIS, and VIN. We conducted an *in-vivo* study to determine the CIPN-related biomarkers using Sprague-Dawley rats. We used plasma from chemo-drug-treated rats to check the NSE and S100B levels using the ELISA method. Our preliminary study showed an elevation in NSE and S100B levels in the plasma of the experimental rats that showed a steady increase following 8 weeks of treatment with the PN-inducing chemo drugs. We anticipate that this study will enrich our understanding of how chemotherapy drugs induce CIPN in cancer patients and further guide us to validate S100B and NSE as reliable biomarkers. (This project was supported by the PFRDG grant of Nova Southeastern University, Ft. Lauderdale Florida, and the Royal Dames of Cancer Research Inc., Ft. Lauderdale, Florida).

Characterization of Exosomes from Melanoma Cells

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Abstract

Melanoma is a specific type of skin cancer associated with the melanocytes developing into malignancy. Melanocytes produce a pigment that provides protection from the sun's ultraviolet radiation. Melanocytes produce this pigment when ultraviolet radiation hits the skin, causing damage to the epidermis. When the epidermis is damaged, it triggers a signal to produce melanin to protect against ultraviolet radiation. However, too much exposure can cause DNA damage within the epidermis, especially within melanocytes, leading to the inhibition of regulated mitosis. Hence, non-regulated mitosis can lead to excessive melanocyte production, which may result in melanoma. Exosomes are vesicles generated by all nucleated cells and secreted in the extracellular space; they carry nucleic acids, proteins, lipids, and other essential biomolecules. Such biomolecules participate in short and long-distance intercellular communication and can change the physiology of target cells. In the case of melanoma and other cancers, exosomes can carry carcinogenic nucleic acids and proteins facilitating tumor cell proliferation. This is important as exosomes can provide biomarker-type information to facilitate the diagnosis of melanoma. By using exosomes, one can develop an advanced technique when it comes to the detection of malignant melanocytes. This study explores how to use melanoma cells WM-1366, WM-266-4 and A375, to purify and characterize melanoma exosomes. This characterization may provide information on the potential drivers of tumor progression that originate from cell-cell communication. Characterization of melanoma exosomes can also allow one to study approaches that may prevent melanoma cells from progressing toward metastasis.

Characterizing Visual Literacy in Biochemistry: Interpreting the Symbolic Language Embedded within Biochemistry Representations

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Abstract

Representations play a key role in communicating concepts and phenomena in courses such as chemistry, biology, and biochemistry. While representations have the potential to help students develop conceptual understanding of a subject, integrating multiple ideas to interpret and use the representations can be challenging. For example, biochemistry students are faced with the unique challenge of having to combine their knowledge of both chemistry and biology to make sense of complex biological structures and processes. Using the Visual Literacy Framework proposed by Schönborn and Anderson, the objective of our study is to investigate the symbolism embedded within biochemistry representations and how students make sense of these symbols. As part of a larger study, we adapted and expanded a previously published coding scheme to interpret the iconic symbols immersed in biochemistry representations from popular biochemistry textbooks. Our analysis includes the quantification of iconic symbols, styles, and their conceptual meaning and student's interpretation of arrows. During the presentation, preliminary results from this project will be presented.

Christian Monasticism and the Making of Modern Medicine in London

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Faculty Sponsor: **Dr. Amanda Furiasse**
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Abstract

Christian monasteries were the first formal healthcare settings in London. They defined doctors as Jesus-imitators, hospitals as inclusive shelters, and medicine as the holistic treatment of mental, spiritual, and physical maladies. Today, London's medical students are taught to strive towards Christian values like empathy and patience and London's model of free healthcare represents inclusivity and generosity. But because medicine has evolved away from faith, London's healthcare ultimately displays a watered-down image of its roots in love-based monastic service. This paper will examine how three values of monastic medicine in London during the Late Middle Ages— agape love, hospitality, and holism— have been adapted and weakened to suit the modern, secular healthcare system. I present medicine's start as a Christian institution and connect Biblical values to the concept of healthcare as a whole. I then discuss the monastic medical values that shaped London's healthcare, using evidence from museum exhibits, modern scholarship, and historical documentation. Then, I examine medicine's shift to secularity and the values of modern medicine under this context using evidence from current medical school curricula and doctor and patient testimonials. It is concluded that, to strengthen the healthcare system, London should invest more resources into the National Health Service to uphold hospitals' patient-centered promises, medical schools should offer courses on the teachings of monastic medicine and service to provide doctors with an accurate image of compassionate care, and hospitals should incorporate mindfulness practices and centers to address all of a patient's needs, including emotional and spiritual.

Climate Change Attitudes about Human Responsibility among the NSU Community

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College of Psychology

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Department of Health Science
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Abstract

This research is about how people self-report climate change attitudes about human responsibility. Self-reports precede actions (Critchfield & Perone, 1990), so a predictive model of attitudes is important. Ransdell (2016) surveyed a similar NSU sample in 2015 and found that 62% reported a belief that climate change is mostly human-caused. The present study is a replication with some additional questions. As before, all with NSU email addresses were sent the survey once, without any incentive or follow-up. In this survey, the main goal was to predict Question 6 which showed participants' views on climate change as mostly human caused. The present study found the following questions as statistically significant predictors of question 6: Say you would help address climate change (Question 13; 13%), say climate change caused by humans (Question 14; 11%), say willing to contribute to prevention efforts (Question 15; 8%), says has political philosophy of common good (Question 10; 7%), and says health affected by climate change (Question 16; 7%). The results also show that over 90% of all participants now report that climate change is mostly human-caused.

Comparative Genomics Across *Ganoderma* Species to Identify Anti-Cancer Producing Secondary Metabolite Clusters

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Abstract

Ganoderma lucidum is a mushroom-forming fungus that has been used in traditional Chinese medicine for over 2,000 years. *G. lucidum*, also known as lingzhi or reishi, is consumed in several Asian cultures to promote health and longevity. Bioactive molecules with anticancer properties have been isolated and characterized primarily from the species *Ganoderma lucidum*, and the cytotoxic potential of other species in the genus *Ganoderma* remains relatively unclear. Bioactive molecules isolated from mushroom fruiting bodies are demonstrated to have cytotoxicity against different cancer cell lines. Triterpenes and polysaccharides are the two major groups of compounds that exhibit antitumor and anti-inflammatory properties both in *in vitro* and animal studies. Genes involved in the production of triterpenoids are organized into clusters known as secondary metabolite biosynthetic gene clusters and can be easily identified from genome and transcriptome sequencing efforts. Most studies to date have utilized the species *G. lucidum* for anticancer research. In North America, 12 *Ganoderma* species have been reported, but little has been done to explore their potential in human cancer cell research although preliminary results have suggested anticancer potential in a few of these species. This calls for efforts to mine for diversity in the anticancer potential of different species in the genus *Ganoderma* by, 1) analyzing the variation at the nucleotide sequence level and 2) investigating the cytotoxic potential against *in vitro* cancer cell lines. In this review, we discuss the potential of using the North American *Ganoderma* species for cytotoxic evaluations against cancer cell lines. Crude extracts from the mushroom fruiting bodies of these species can be evaluated for their cytotoxicity potential, and publicly available genome sequence datasets can be leveraged to explore secondary metabolite gene clusters associated with terpenoid biosynthesis to determine the correlation between the two studies. Such studies will help establish the pharmaceutical and nutritional role of natural products from the genus *Ganoderma* and create opportunities to develop market-ready health products.

Comparative Genomics across *Streptomyces murinus* strains to study conservation of biosynthetic gene clusters producing antifungal compound pentamycin

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Abstract

Streptomyces are filamentous, Gram-positive bacteria in the phylum Actinobacteria that are known to produce a diverse array of antimicrobial metabolites. A bacterial isolate, labeled *Streptomyces murinus* strain SPC1, recovered in Davie, FL, from ripe berries of foxtail palm (*Wodyetia bifurcata*) exhibited antimicrobial activity against fungal pathogens of palms (Dhillon and Chakrabarti 2023). Interestingly, the genome of *Streptomyces* strain SPC1 contains a complete secondary metabolite cluster for antifungal metabolite pentamycin (fungichromin) biosynthesis. Secondary metabolite clusters (SMCs) or biosynthetic gene clusters (BGCs) are groups of genes responsible for the production of bioactive compounds, such as antibacterial and antifungal agents. In this study, we will use comparative genomics to study the conservation of BGCs across multiple *Streptomyces murinus* strains to identify antifungal metabolites using *Streptomyces murinus* strain SPC1 as the reference genome. We will use a specialized tool, antiSMASH, to identify and annotate the BGC associated with pentamycin and analyze their conservation across different *Streptomyces murinus* strains by specifically looking for shared gene content, order, and presence of regulatory elements. This will be followed by a phylogenetic analysis to understand the evolutionary relationships between the *Streptomyces* strains with conserved pentamycin biosynthetic clusters. This study will generate valuable insights into understanding the evolution, adaptation, and genetic pathways involved in secondary metabolite production.
Reference: *Braham Dhillon and Seemanti Chakrabarti 2023. Microbiology Resource Announcement. Volume 12: Issue 12: 10.1128/MRA.00826-23.*

Comparing Methodologies in 2-2'-Bipyridine Synthesis

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Abstract

The purpose of this study is to determine the most economical and efficient way to synthesize functionalized bipyridine adducts for future incorporation into ruthenium complexes. These complexes show promise in treating bladder cancer and their extensive conjugated system demonstrates strong photovoltaic activity.

Two distinct approaches will be contrasted. The first method uses several disubstituted 2-bromopyridine substrates in homo-coupling reactions to create functionalized bipyridines, at the expense of long reactions times. The second route utilizes unsubstituted 2,2'-bipyridines and functionalizes them in a symmetrical pattern using a microwave synthesizer, to attempt to drastically shorten reaction times.

The first mode utilizes deactivating groups on 2-bromopyridines, as prior studies done in our lab indicated they facilitate palladium catalyzed homo-coupling more efficiently. Thus, the efficiency of two catalysts, $Pd[PPh_3]_4$ and $PdCl_2(PPh_3)_2$, will be compared with each the following substrates: 2-bromo-6(1H-pyrazol-1-yl)-pyridine, methyl-6-bromopyridine carboxylate, 5-acetyl-2-bromopyridine, 2-bromopyridine-5-carboxaldehyde, and 6-bromo-2-pyridinecarbonitrile. Reactions are assembled and carried out under inert gas environment, using glovebox assembly and a Schlenk-line manifold for the duration. After 12-24h, product isolation is completed on a CombiFlash Rf 2000 Automated Flash Chromatography System.
The second mode requires the development of a novel microwave synthesis protocol to brominate unsubstituted 2,2'-bipyridines using a Microwave Reaction System. Based on the nitrogen's directing effect, we expect bromination to occur at the 5,5'-positions, with potential 3,3'-dibromination as well. In future studies dibrominated bipyridines will undergo a hetero-coupling process with either pyrazole or thiophene rings to extend the conjugated framework of the ligand. Products will be characterized by ^{1}H-NMR in both routes.

Comparing the Effects of Invasive Waterhyacinth on Aquatic Communities

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Abstract

Waterhyacinth is an invasive freshwater species that rapidly grows across water bodies, creating dense mats that disrupt local ecosystems. Our goal was to measure the impact of waterhyacinth on aquatic communities. We tested the hypotheses that waterhyacinth supported different fish and invertebrate species than native aquatic plants, used more dissolved oxygen (DO), and provided different levels of support to abundant invertebrates like amphipods. The fish communities under both plant groups were collected using a 1m2 throwtrap and a backpack electrofisher. This allowed for comparison between fish communities and method efficiency. We compared invertebrate community assemblages by collecting samples of roots from both plant groups for invertebrate identification. We collected the largest 20 amphipods of each invertebrate sample, measured, and weighed them. We compared DO used by native plants and waterhyacinth in outdoor aquariums. We tested a range of plant densities at different times of day using a handheld DO meter. Fish communities did not differ among plant types. The throwtrap was more efficient overall, with more than five times as many fish obtained than the electrofisher. No significant difference was found between invertebrate communities. There was no significant difference in amphipod length between sites, but amphipods from the Pennywort sites had lower masses. DO increased during daylight hours for all plants. Waterhyacinth and pennywort used equal oxygen and higher plant density led to lower DO levels. This will provide a baseline for future studies investigating waterhyacinth management techniques and assess their success within an ecosystem.

Conserved Domains in Promoters of Differentially Expressed Genes Under High Night Temperature Stress in Rice: How to Find Them and What Can They Tell Us?

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Abstract

Crop plant response to stress involves changes in gene expression patterns. The complex process of regulation of gene expression involves cis- and trans-acting components. One of the key steps in understanding changes in gene expression associated with a plant's response to stress begins with identifying "conserved domains" in the promoters of differentially expressed genes (DEGs). By providing binding sites for transcription factors, the conserved domains can play a crucial role in gene regulation. In this study, we aim to identify the cis-regulatory elements (CREs) in the promoters of 149 DEGs that were identified in the transcriptomic analysis of two rice varieties- Cypress and LaGrue. These two rice varieties are known to perform well and poorly, respectively, under high night temperatures (HNT) based on their ability to withstand heat stress. It is expected that the DEGs that are up- or down-regulated by HNT stress, either exhibit a shared set of CREs in their promoters or harbor polymorphic patterns that are common to specific DEG patterns, identification of which can help understand the plant's varied response to stress. A variety of computational methods will be used to find cis-acting elements and transcriptional activation motifs involved in HNT stress in rice. This information will be leveraged in machine learning algorithms to develop predictive models for manipulating genes for breeding purposes such as to improve grain quality and yield, enhancing rice plants' resilience to high night temperatures, and contributing to the overall adaptability of rice crops to heat stress conditions.

Dehydration and Traumatic Brain Injury

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Abstract

Boxers lose up to 15% of their body weight and on average 6.7% prior to weigh in. Boxers dehydrate to make the weight class and will rapidly rehydrate before fighting. During fights, boxers receive traumatic brain injuries. There is reason to believe that if boxers are not properly rehydrated the traumatic brain injuries could be exacerbated, however, this hypothesis had never been explored. This study aimed to determine the extent of fluid loss and traumatic brain injuries. This study utilized 48 mice. Half of the mice received dehydration followed by rehydration while the other half had normal fluid intake. Half of the mice in each condition received a traumatic brain injury or sham. Twenty-four hours after brain injury a series of behavior tests were conducted, including open field, elevated zero, sucrose preference, and novel object recognition. Results of this study will inform the boxing community about the potential dangers of the pre-weigh in process. The long-term goal of this line of research is to change the way boxer weigh ins occurs to reduce forced dehydration for weight loss.

Demonstrating Physical Control Over Others Changes One's Sense of Power: Testing a Novel Manipulation of Physical Formidability

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Abstract

The aim of this study is to investigate the relationship between physical formidability and social power in modern humans. Previous research has shown that factors related to physical power, such as height, can affect a person's perception of their own social power. We hypothesized that exercising physical power by engaging in the physical control of the behavior of another individual would affect people's sense of their own social power and influence. To test this hypothesis, we employed a novel manipulation that used a human-to-human Transcutaneous Electrical Nerve Stimulation (TENS) device and a confederate to allow participants to feel as though they were able to use their own muscles to control the movement of another person. As part of a larger study, we collected data from ninety-nine women aged 18 to 26 who were randomly assigned to either a condition in which their attempts to control another person were successful (n = 50) or a condition in which their attempts were unsuccessful (n = 49). All participants also complete assessments of self-reported sense of power before and after the manipulation. The results showed significant findings; in particular, participants who could not cause the movement of the confederate reported a significant decrease in their sense of power from the pre-manipulation to post-manipulation assessment. The participants who were able to cause movement of the confederate did not report a significant difference in pre-manipulation to post-manipulation assessment of social power.

Determining the Function of the Protein of Interest 2QRU Using Bioinformatic Tools and Wet-Lab Experiments

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Abstract

Proteins are complex macromolecules that play a vital role in the facilitation of biological processes. Protein research and documentation are crucial for future advancements. They aid in developing medications, disease diagnosis and treatment, and the understanding of structural biology. Thousands of proteins have been stored in the Protein Data Bank (PDB) since 1971. Although their structures are known, many of their functions have yet to be determined.

This study was conducted in order to shed light on the biological role of a previously uncharacterized protein of interest (POI) with the PDB ID: 2QRU. A two-pronged approach involving both bioinformatics and targeted wet-lab investigations within the framework of the CURE model and BASIL experiments was utilized. Such bioinformatic tools included Chimera, BLAST, SPRITE, DALI, and InterPRO to determine the active site. It was concluded that the active site consisted of the catalytic triad: ASP 219, HIS 247, and SER 102. In depth use of SwissDock was employed to find the most efficient substrate binding and interactions with the active site. Laboratory experiments included cell lysis, affinity chromatography for protein purification, Bradford assay to determine the POI concentration, and SDS-PAGE to assess the purification and size of the POI.

Through these procedures, 2QRU was found to most likely be a carboxylesterase in the alpha/beta hydrolase superfamily, specifically known for their ability to hydrolyze carboxylic acid esters into alcohol and carboxylic acid components. Further research is required to conclude the exact function of 2QRU, including ligand synthesis and enzyme activity assay.

Determining the Optimal Infection Temperature and Burst Size of *Gordonia rubripertincta* Bacteriophage

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Abstract

Antibiotic resistance represents a significant global health crisis, especially within hospitals, creating a necessity for the search for alternative therapeutic agents to combat drug-resistant pathogens. One source of treatment is phages specifically targeting *G. rubripertincta*, a gram-positive, aerobic actinomycete bacterium which has shown intrinsic resistance to some antibiotics. Furthermore, *G. rubripertincta* can cause endocarditis and CNS infections in immunocompromised individuals. Several phages such as Alyssamiracle, Fribs8, Genamy16, and NovaSharks, have been discovered that successfully target *G. rubripertincta*. The goal of this research is to determine the optimal infection temperature and the burst size of these phases. By growing *G. rubripertincta* in PYCa agar in the presence of phages, the spot test was conducted to observe the activity of phages on the bacteria at temperatures of 25°C, 30°C, 35°C, and 40 °C. For all four phages, it was found that 30°C was the ideal infection temperature. The phages work in a lytic manner, bursting the bacteria and releasing its viral progeny further enhancing the targeting of the bacteria. The burst size will be determined by gathering the total number of phage progeny in one round of infection over the total number of infected cells, through a one-step growth curve. As aforementioned, with *G. rubripertincta's* inherent resistance, knowing the phages ideal infection temperature and burst size will aid in the development of more effective phage therapy.

Developing a better animal model of Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS)

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Abstract

Myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS) is a rare but extremely debilitating disease characterized by severe fatigue, even after only mild exertion. In fact, ¼-⅓ of patients are house- or bedridden, underscoring the urgent need for effective treatment. Patients with ME/CFS display hypocortisolism, overactive serotonergic systems, and elevated TGF-β levels, suggesting that ME/CFS includes dysfunction of the endocrine, nervous, and immune systems. Current animal models of ME/CFS use immune activators but lack the complex multisystemic nature of the disease and bear a closer resemblance to depression than ME/CFS. One recent study showed that an adrenalectomy (ADX) better matched the characteristics seen in patients with ME/CFS, reducing cortisol levels and increasing serotonergic tone and TGF-β levels in mice. We aim to combine ADX and immune activation in rats, providing a new and improved rodent model of ME/CFS. Rats will undergo ADX or sham surgeries and receive either an immune activator or vehicle injections. Then, each rat will be tested for pain sensitivity, muscular strength, fatigue, depressive and anxious behaviors, as well as glucocorticoid levels, serotonergic activity, and TGF-β levels. We predict that ADX will replicate disease features better than immune activation, but we hypothesize that ADX will interact with immune activation, together bringing about disease-related outcomes that more closely replicate features of ME/CFS than either one does alone. If so, this new model will provide opportunities to test potential therapeutic targets that could help ameliorate symptoms for patients with ME/CFS.

Diabetes progression: From statistical analysis to mathematical modeling

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Abstract

Diabetes constitutes one of the leading neuroendocrine conditions with nearly 9.4 % of the US population showing symptoms of it. Noteworthy, type 2 diabetes (T2D) accounts for 90 to 95 % of all cases. It is a chronic disease, and the clinical manifestations include hyperglycemia (prolonged blood glucose levels above normal), hyperinsulinemia (excess levels of insulin circulating in the blood) along with insulin resistance. This presentation includes a statistical analysis based on a cohort of 440 individuals where both, demographic and laboratory measurements are included. Based on these results, a mathematical model accounting for the obtained associations is solved. It includes the level of glucose, insulin, and the functional beta cells mass as an indicator of beta cell functions. Additionally, an external factor is included to account for obesity and the association with the BMI. The adopted approach constitutes the first step in developing a model that integrates glucose and insulin dynamics with the behavior of the Hypothalamic Pituitary Thyroid (HPT) and Hypothalamic Pituitary Adrenal (HPA) axes. Such an integrated systems modeling will permit analyzing the connection of diabetes with metabolic, endocrine, and neurological responses and finding strategies for a better health management of this condition.

Distributional Patterns of Mesopelagic Scyphozoa Within the Monterey Submarine Canyon, California

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Abstract

Scyphozoans are a historically understudied taxonomic class, and it is unknown how genera that potentially compete coexist in resource-limited environments within the Mesopelagic Zone (200-1000m depth). Monitoring the affinities of various genera to fine-scale water mass differences demonstrates how apparent competitors in resource-limited environments occupy different habitats. Remotely Operated Vehicle (ROVs) pinpoint location information and oceanographic conditions of individual specimens, while providing better identification than other survey method options. During a 21-year period (2000 - 2020), images obtained by ROV operators annotated visual captures of scyphozoans, while integrating *in situ* sensor measurements of conductivity, temperature, depth, and dissolved oxygen (CTDO) in the Monterey Submarine Canyon, CA. Six scyphozoan genera were observed, with each having abundances of over 90 individuals: *Atolla, Deepstaria, Periphylla, Periphyllopsis, Poralia,* and *Stellamedusa.* CTDO metrics were collected at two regional reference stations to differentiate water masses for fine-scale habitat affinities to be identified through metrics of oxygen levels and spiciness values. Spiciness values relate temperature and salinity, orthogonally to density for water mass characterization. There are significant differences among genera with respect to depth, temperature, oxygen, and salinity (Kruskal-Wallis Test, $p<<<0.001$). Pairwise comparisons (Wilcoxon rank sum test) revealed that each genus is significantly different from each other ($p<0.01$) for all parameters, except for the comparison between *Deepstaria* and *Periphyllopsis* ($p>0.05$). This documents that mesopelagic jellyfish genera aggregate in different distributional patterns, with *Deepstaria, Periphyllopsis*, and *Poralia* inhabiting deeper, colder, and saltier environments; while *Atolla, Stellamedusa,* and *Periphylla* inhabiting shallower, warmer, and fresher strata of the mesopelagic.

Eating Disorders: A Public Health Perspective

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Abstract

There are six primary eating disorders, including anorexia, bulimia, binge eating disorder (BED), avoidant restrictive food intake disorder, pica, and rumination disorder. The purpose of this project is to identify the underlying patterns between cultural taboos and/or low food insecurity (FI) and the likelihood of developing an eating disorder. It was hypothesized that if either cultural taboo about eating or low food insecurity is present, then the development of an eating disorder is more likely. A comprehensive literature review extracted keywords and reoccurring patterns from various primary and secondary sources. The hypothesis was partially supported, as the two factors have no direct correlation. However, both FI and cultural taboos share underlying psychological, economic, and social pressures factors to the development of an ED. Specifically, children who experience food insecurity are consistently linked to a higher risk of (ED) factors and symptoms, including a preoccupation with weight management and an increased link to BED in the future. Additionally, cultural influences, societal standards, and dissatisfaction with body weight, especially among ethnic minorities, contribute to the risk of developing eating disorders. Current interventions, including questionnaires and food programs, are in limited progress. Changes in government funding and adaptive education programs in diverse settings are needed. It is vital to address the underlying issue of an ED in vulnerable populations with an early and practical plan. Ensuring support and providing comprehensive eating disorder (ED) interventions are crucial and impactful strides towards positive change.

Effective Use for Design

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Abstract

Flyers, which foster human connection and communication, are integral when looking at human interaction throughout various stages of life. They require a balance between attractability and simplicity through both words and visuals, and they can create and/or foster a space for discussion and discourse. In this study, I examine the relationship between texts, visuals, phrasing, and audience in the process of making flyers. Relevant scholarship suggests that the wording/framing on the flier has a large part in whether people are influenced by it. Using my own primary research methods, I also found that participants paid a lot of attention to the images, colors, and lettering on the flyers. In other words, the visual and textual appeal of the flier has to be easily digestible. Readers can use this information to create more appealing and digestible flyers.

Effects of Altered TPP-1 Expression in Human Neural Progenitor Cells

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Abstract

Batten's Disease or neuronal ceroid lipofuscinosis type 2 (CLN2) is a pediatric autosomal recessive, neurodegenerative lysosomal storage disorder due to a deficit of the lysosomal protease tripeptidyl peptidase (TPP-1). The lack of TPP-1 leads to an accumulation of lysosomal waste and cell death. CLN2 is characterized by language delays, seizures, cognitive and motor decline, blindness, and early death. Currently, a clinical trial of the experimental treatment Brineura® (Cerilponase Alfa) is the only approved treatment for CLN2. The clinical trial involves infusion of human recombinant TPP-1 (rhTPP-1) into the ventricles of the brain. Diffusion models suggest the protein will spread along a concentration gradient through the brain. However, it is unclear how altered TPP-1 concentrations will affect ongoing neurogenesis in the subventricular zone. This study aims to examine proliferation, cell cycle kinetics, differentiation, and cell death in cultured human neural progenitor cells (hNPCs) following rhTPP-1 exposure. Altered levels of TPP-1 will be assessed using western blot analysis. Proliferation and differentiation were assessed using immunostaining, fluorescent microscopy, and CellProfiler™ analysis. Preliminary data on cell cycle kinetics was assessed using EdU-incorporation assays and suggest no changes in cell proliferation. Induced cell death indicated by apoptosis was assessed using ApopTag (TUNEL) assay. Results demonstrate increased levels of rhTPP-1 induced a significantly higher rate of cell death in healthy hNPCs; revealed through a one-way ANOVA: $F(4,34) = 6.87$, $p = .0003$, attributing increased protein concentration to increased cell death. These results may have implications in clinical trials using intracerebroventricular infusion for enzyme replacement therapies.

Key Words: neurogenesis, neural progenitor, TPP-1, Batten's disease, CNL2

Evaluating a Research Course Designed to Help Students Understand Protein Structure and Function

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Abstract

An educational curriculum has been implemented through the Farquhar Honors College (FHC) to integrate computational biology research for undergraduate students. Since its time as an independent study course, it has evolved into an Honors interdisciplinary course that is co-taught by professors from both the Departments of Biological Sciences and Chemistry & Physics with support from the NSF-funded Connecting Researchers, Educators, and STudents program, and 3D Molecular Designs. The course is intended to be applicable to FHC students regardless of their academic background. Throughout the Fall 2023 semester, peer mentors worked with student groups to assist in literature comprehension, protein selection, bioinformatic tool manipulation, poster formation, and presentation feedback. The coursework was modeled after research lab experiences and required students to utilize a Literature Guided Assessment worksheet to help understand details of a scorpio-toxin peer-reviewed article and protein-based bioinformatic tools to aid in selecting their protein of interest. Continuous checkpoints throughout the semester encouraged students to actively apply the scientific process and understand the molecular mechanisms of their chosen protein. Students collaborated to create the final products of the course: a protein model description sheet, poster, oral presentation, Jmol script, and 3D printed protein. After these products are uploaded to NSUWorks (https://nsuworks.nova.edu/protein_modeling_reports/), students present their work at conferences across all levels. Data from an altered Research on the Integrated Science Curriculum post-semester survey demonstrated improvements in student learning and confidence in research skills as indicators of success in this course-based undergraduate research experience.

Evaluating Telmisartan's Impact on Metabolic Health and Cognitive Function in Mice Subjected to a High-Fat Diet

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Abstract

A high-fat diet can induce metabolic syndrome, a group of risk factors for developing cardiovascular disease and diabetes. In turn, metabolic diseases increase the likelihood of developing neurodegenerative and neuropsychiatric disorders (e.g. dementia, anxiety, and depression). While telmisartan, an ARB (angiotensin II type 1 receptor blocker), is known to treat hypertension, it can also reduce weight gain, while improving dyslipidemia and glucose metabolism in male mice fed a high-fat diet. However, it is unknown whether telmisartan can reverse behavioral changes caused by a high-fat diet. This study assesses the effects of treatment with telmisartan on metabolic outcomes and cognitive-behavioral function, including determining whether these occur in a dose- and sex-dependent manner. Male and female mice were provided a low-fat or high-fat diet from 3-9 months of age. A subset of mice on high-fat diet were treated with a low (1 mg/kg/day) or high (5 mg/kg/day) dosage of telmisartan the last two months of high-fat diet. Behavioral testing was conducted to determine exploratory activity, anxiety-like behavior, and cognition. Treatment with high dose telmisartan significantly decreased body weight and systolic blood pressure in male and female mice fed a high-fat diet, although fasting blood glucose levels were unaffected. High dose telmisartan also improved spatial working memory in the y-maze, and performance in early trials of the Barnes maze, in males. Whereas in females, a low dose, but not a high dose of telmisartan increased exploratory behavior in the y-maze and enhanced performance in early trials of the Barnes maze.

(We acknowledge NIH, grant # 1T34GM145509 for partial support of this research.)

Evaluating the Association Between Undergraduate Major and Telehealth Utilization

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Abstract

Telehealth is a rapidly advancing phenomenon that utilizes technology to provide long-distance healthcare services to patients. The convenience of telehealth services is essential during emergency situations. For instance, the COVID-19 pandemic resulted in increased awareness and reliance of telehealth services worldwide. Additionally, telehealth provides time-saving crisis intervention amongst the recent worsening of the fentanyl and opioid crisis. Telehealth's increased flexibility and convenience benefits populations facing barriers to healthcare access. As telehealth rapidly evolves, it is crucial to understand the factors that influence its adoption. The purpose of this study is to evaluate any associations between undergraduate students' majors and telehealth utilization. This study will be conducted on the Nova Southeastern University - Fort Lauderdale/Davie Campus and participants will be required to complete a survey that collects information on participants' demographics and their experiences with telehealth services. The data collected will be analyzed using one-way ANOVA and a two-tailed t-test. The results for this study are expected to depict that students commonly use telehealth services and those who identified as belonging to science, technology, engineering, or mathematics majors are more likely to use this resource. The findings of this study can be used to increase telehealth awareness and create interventions to make telehealth more accessible for undergraduate students.

Evaluation of the effects of MDMX and MDM2 inhibitors causing cell death in Prostate Cancer cells

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Abstract

Objective: In this research, we examined the molecular mechanisms by which inhibition of the MDM2 and MDMX pathways induces cell death in prostate cancer cells. **Background**: In the United States alone, more than 3 million men are living with prostate cancer. Though significant advances have been made in treating prostate cancer, the need for new anti-cancer drugs and treatment methods still persists to fight this deadly disease. Therefore, our study explored the intracellular link between MDMX and necroptosis, to determine how manipulating this molecular target can lead to cell cycle arrest and cell death. **Methods:** The LNCaP Prostate Cancer cells were treated with NSC-207895 and SJ-172550, which are MDMX inhibitors; and RG-7388, which is a potent MDM2 inhibitor. Following drug treatments, the LNCaP cells were lysed and western blot analyses were performed to determine the expression levels of key proteins responsible for cell death through either the necroptosis or apoptosis pathways. **Results:** The LNCaP cells treated with MDMX inhibitors showed an increase in levels of proteins that promote cell death through necroptosis pathway. However, when the LNCaP cells were treated with the RG-7388, increased levels of apoptotic proteins were detected. **Conclusion:** Our results indicate that treatment with the MDMX inhibitors primarily activates the necroptotic pathway in LNCaP cells. To further assess the intracellular mechanisms of how NSC-207895, SJ-172550, and RG-7388 treatments induce differential cell death in LNCaP cells, additional experiments will be conducted. **Acknowledgment:** This research study was supported by the Royal Dames of Cancer Research Inc., Ft. Lauderdale, Florida.

Evolution of Sequencing Technologies and Implications for Transposon Research

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Abstract

This study explores the complex field of transposable elements (TEs) and how Next Generation Sequencing (NGS) technologies are used to identify them, including their limitations. Transposons, also known as transposable elements, are dynamic DNA segments that have the ability to shift locations within a genome, impacting gene regulation, evolutionary processes, and genomic stability. TEs play vital roles in genetic research. They provide pathways for precise genetic alterations and mutagenesis, which facilitate the investigation of gene function and disease mechanisms in many organisms. Rapid DNA and RNA sequencing capabilities provided by NGS technologies have transformed genetic research. Improvements in DNA sequencing techniques have greatly improved our knowledge of diseases and potential treatments by generating a plethora of sequence information at a relatively low cost. This has also significantly improved the identification and analysis of TEs, even from short-read NGS technologies, resulting in better understanding of the function and implications of TEs in the genome. However, certain limitations exist in TE research. TEs belonging to a given family share high sequence similarity to each other. This along with the fact that TEs are present in multiple copies in the genome, makes their identification and annotation challenging. With advances in NGS long-read technologies, we can better address these issues by effectively standardizing processes for TE identification and annotation. In this study, we compare the advancements in NGS methods and their implications on TE research, with an objective to facilitate efficient identification and characterization of TEs to fully understand their applications in genetic research.

Exercise as a Natural Kappa Opioid Receptor Antagonist to Treat Binge Drinking Withdrawal

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Abstract

Binge drinking is a serious public health problem in the United States especially among college students. Clinical trials demonstrate positive results for the treatment of alcohol abuse with aerobic exercise. Research in animal models aims to answer questions regarding implementation across sexes and age groups by studying underlying neurobiological mechanisms such as kappa opioid receptor (KOR) activation. KOR antagonists have been shown to reduce anxiety and depressive symptoms associated with ethanol withdrawal. Chronic treadmill exercise reduces KOR binding and G-protein activation in rodents, suggesting exercise could have an effect on symptoms of ethanol withdrawal similar to KOR antagonists. Previous research found that exercise treatment concurrent with ethanol exposure attenuated an ethanol-associated increase in KOR expression; however, exercise during withdrawal from binge drinking remains unexplored despite its importance for translational relevance to clinical use. In this study, 9-week-old C57BL6/J mice completed 2 rounds of "Drinking in the Dark" to simulate binge drinking followed by 4 weeks of treadmill exercise. Exercise tended to attenuate anxiety-like behavior in ethanol-exposed mice, demonstrated by an increased % center time in the open field and increased time spent in the open areas of the elevated zero maze. Exercise tended to increase activity in the open field, which was primarily driven by mice who were exposed to ethanol. These results suggest exercise is an effective treatment for the symptoms of withdrawal from binge drinking. Receptor autoradiography will be conducted to determine if there are alterations in KOR expression in brain regions involved in reward and anxiety.

Expanding Shelter Dog Research and Service to Encompass University Campus Communities

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Abstract

Many animal shelters are actively exploring social enrichment (SE) programs to alleviate animal stress and reduce residency times. SE invests in resources for focal animals (e.g. field trips, play groups, and/or augmented cages) to improve health, temperament, and adoption prospects. SE hinges on many factors, including strategic design and resource recruitment (e.g. human volunteers) to implement data-driven protocols. We propose that college students can help expand and refine SE efforts of campus-adjacent animal shelters, while meeting student needs for meaningful service and research opportunities. To demonstrate this, we completed diverse SE-related activities over the last two semesters using public data, scientific literature, experiential work, and organizational development. The tasks described in our poster include: 1) volunteering in the Broward animal shelter to learn their protocols, needs, and SE approaches, 2) analyzing data from >8000 canines transiting the facility in 2020-2024 to identify traits (e.g. breed, sex, age, size) predicting long residency, and therefore meriting SE priority, 3) enumerating diverse personal, professional, and wellness benefits of SE volunteerism, 4) pilot studies of a mitochondrial biomarker-based SE assessment, and 5) establishing a club to bring SE (and focal animals) into contact with more NSU students. These quantitative, qualitative, and organizational activities lay a strong foundation for further connectivity between NSU and Broward animal rescue; we hope they will also provide a case study to inspire similar work at other institutions, thereby benefiting additional higher-ed institutions and animal control facilities.

Exploration of MDM2-AURKB Regulatory Interaction: Implications for Cell Cycle Arrest and Cell Death in Lung Cancer

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Abstract

Lung cancer is the most prevalent cause of cancer-related deaths worldwide, with a 5-year survival rate of 26.6% in the USA contributing to a higher mortality in comparison to other cancers. Among various abnormalities, MDM2 overexpression can positively influence the intracellular mechanisms and contribute to cancer progression through AURKB activation. Also, FOXO3A, a member of the *Forkhead Box* transcription factors linked to MDM2, serve as intermediates for various cellular mechanisms, including tumorigenesis, cell cycle progression, DNA damage, and cell death. Therefore, blocking MDM2 with specific inhibitors has become one of the promising strategies for the restoration of p53 mediated tumor suppressor function that is effective for the treatment of a wide range of cancers. The main objective of this study was to understand the mechanisms linking MDM2 and AURKB by using RG7388, CM272, and SAHA treatments in A549 and H460 lung cancer cells. The effects of individual treatment of these drugs on cell cycle arrest and cell death mechanisms were analyzed using the *in vitro* experimental model. Induction of cell cycle arrest by RG7388 in cancer cells was evidenced by elevated p53, p21, and p27 expression levels, and appears to induce cell death also in a p21-dependent manner. However, more studies are required to fully understand the effects of CM272 and SAHA in disrupting the link between MDM2 and AURKB (This project was supported by the PFRDG Grant of Nova Southeastern University and by the generous support from the Royal Dames of Cancer Research Ft. Lauderdale, FL).

Exploring Alternative Binding Locations Of 5-HT Antagonist Ketanserin In Microtubules; Implications For Future Research

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Abstract

Recently, it's been demonstrated that classic psychedelic action is mediated via intracellular mechanisms rather than action at membrane receptors. This intracellular action elicits neuroplastic effect. The conclusion is that these effects are due to activation of intracellular 5-HT2AR based on using ketanserin as a selective antagonist based on its selectivity to bind to the membrane 5-HT2A serotonin receptor. However, neuroplasticity is dependent upon multiple mechanisms and signaling cascades including the dynamics of neuronal microtubules. As the targets of ketanserin's biological intracellular activity are not fully elucidated, here we investigate the binding potential of ketanserin to domains of the microtubule constituent protein tubulin. Autodock 4.2 was used to conduct molecular docking (MD) simulations within ketanserin to tubulin. Results show that ketanserin has a stronger binding affinity (-9.83 kcal/mol) and lower inhibition constant (62.32 nM) to the colchicine binding site of tubulin than colchicine itself (-9.78 kcal/mol and 67.74 nM); thereby necessitating reevaluation of conclusions based on ketanserin's intracellular selectivity to the 5-HT2AR alone. Experimental microtubule polymerization assays with/without presence of ketanserin are ultimately needed to confirm these predictions. The results of this study may indicate that psychedelic activity is not solely based in the intracellular regulation of 5-HT2AR, but perhaps in microtubule dynamics as well. Further study is warranted.

Exploring Dysphagia in Alzheimer's Disease: A Comprehensive Meta-Analysis Literature Review

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Abstract

Alzheimer's disease and dementia are progressive conditions that develop gradually, potentially heightening the risk of dysphagia, a condition characterized by difficulties in swallowing. As Alzheimer's disease advances, it can impact cognitive and motor functions, potentially causing challenges in coordinating the muscles involved in the swallowing process. The aim of this literature review was to investigate and determine the prevalence of dysphagia among individuals with Alzheimer's disease and dementia, identify symptoms associated with dysphagia associated with Alzheimer's disease and dementia, explore relevant dysphagia interventions employed by healthcare professionals, and pinpoint common assessments used to identify both dementia and dysphagia. The systematic literature review utilized bibliographic databases, such as PubMed, CINAHL, and specific journals, such as *Dysphagia* and the *American Journal of Alzheimer's Disease and Other Dementia.* A total of 33 articles were retrieved, of which 23 were selected after applying inclusion criteria. The review highlighted an increased prevalence of aspiration among Alzheimer's disease and dementia patients.

Additionally, malnutrition emerged as a prevalent and impactful factor. Insufficient motor control in older adults can hinder their ability to self-feed, resulting in inadequate food intake to meet nutritional requirements. Ultimately, leading to weight loss and malnourishment. Common evaluations for assessing participants' cognitive function included the *Mini-Mental State Examination* (MMSE), while *Videofluoroscopy and Fiberoptic Endoscopic Evaluation of Swallowing* (FEES) were frequently used to assess swallowing function. Various interventions were utilized, with food modification being a crucial component in the intervention plan for patients with dysphagia and Alzheimer's disease or dementia disorder. This project is ongoing, with plans to provide a resource booklet to families of patients with dysphagia caused by Alzheimer's disease and dementia.

Exploring the Genetic Elements Regarding the Early Onset of Arthritis due to Crohn's Disease

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Abstract

Crohn's disease is a rare inflammatory bowel disease that negatively impacts the lining of the digestive tract. Crohn's disease increases the probability of early onset arthritis, both of which are commonly associated chronic conditions. An overactive immune response is the primary cause of inflammation in Crohn's disease, and this inflammation can damage not only the digestive tract but also other regions of the body such as the joints. However, patients who are diagnosed with arthritis are typically prescribed nonsteroidal anti-inflammatory drugs which are not recommended for patients with Crohn's disease (ex. aspirin, naproxen, & celecoxib). On the other hand, disease-modifying antirheumatic drugs (DMARDs) such as sulfasalazine and methotrexate have proven to be successful in treating both intestinal problems and arthritis for patients. The All of Us database is a research database that aims to gather the collective health data of at least one million people in the United States. The database aims to improve understanding of the impact of environment on complex disorders and examine their underlying genetic elements. The All of Us database showed upwards of 20 individuals with co-occurrence of Crohn's disease and arthritis. Here we will examine the correlation between these two diseases using patient information from the database using metrics including physical therapy, joint pain, diet, and exercise along with single nucleotide polymorphism data. We will additionally describe the importance of the All of Us database to researchers and explore future potential avenues related to understanding complex diseases.

Exploring the Therapeutic Potential of Telmisartan Against High Fat Diet-Induced Nonalcoholic Fatty Liver Disease: A Dose- and Sex-Dependent Study in Mice

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Abstract

Nonalcoholic fatty liver disease (NAFLD) is a condition where excess fat builds up in the liver, often developing in response to poor diet consumption and associated metabolic disturbances (obesity, Type II diabetes). Telmisartan, an Angiotensin II receptor blocker commonly used for treating hypertension, may hold therapeutic value against the adverse metabolic effects of a high fat (HF) diet, including NAFLD. This project explores whether the effects of Telmisartan are dose- and sex-dependent in obese, prediabetic mice. Male and female C57BL/6J mice were fed high-fat (HF) or low-fat (LF) diet starting at ~3 months old; diet was maintained for the remainder of the study. After 3-4 months on the diet, HF mice were split into three groups and were given either water or a low (1 mg/kg) or high (5 mg/kg) dose of Telmisartan dissolved in drinking water. Mice on LF diet had only plain drinking water. Low-dose Telmisartan did not reduce blood pressure nor benefit metabolic outcomes. However, high-dose Telmisartan attenuated blood pressure, weight gain, and adiposity, with some benefits being sex-dependent. Additionally, high dose but not low dose Telmisartan reduced liver mass in HF diet-fed mice, potentially due to less fat buildup associated with NAFLD. Fixed livers are being stained with hematoxylin and eosin for assessment of steatosis (microvesicular fat), ballooning (macrovesicular fat) and leukocyte infiltration (inflammation), as well as Sirius Red staining for fibrosis, to determine the presence and severity of NAFLD. We hypothesize that high-dose Telmisartan will be more effective in treating mice with NAFLD attributable to chronic HF diet.

Exploring Trends in Hate Crime Statistics and Trauma-related Disorders in Asian and Black Americans, 2017 - 2021

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Abstract

The rise of COVID-19 and social movements (i.e., protests) were also accompanied with the rise of hate crimes, specifically against Asian and Black communities. Along with physical threats from hate crimes, long-term consequences of this include trauma-related responses such as developing feelings of anger and facing higher risks of PTSD compared to other crimes committed against these groups. This project explored a 5-year trend analysis of the relationship between hate crimes and trauma-related mental health disorders among Black and Asian populations in the United States. It was hypothesized that hate crimes and trauma-related disorders would be positively correlated and would increase over the 5-year time period. Failing to understand racial trauma and its effects can perpetuate and undermine current health disparities in these affected communities for symptoms like depression, low self-esteem, and mental distancing. Hate crime statistics from the Federal Bureau of Investigation (FBI) Crime Explorer Database from 2017-2021 were compared with trauma-related disorder prevalence obtained from SAMHSA's Mental Health Client-Level Data (MH-CLD) during the same period. Frequencies of hate crimes (intimidation and simple assault) and mental illness were reported, stratified by race, and fit in a graph, examining for trends. The results support the hypothesis of a positive correlation for both Asian and Black communities from 2017-2021, not causation where hate crimes caused trauma related disorders. Additionally, future research can inform early, specialized interventions for those who have experienced racial trauma and be beneficial for exploring these early relationships in a post-COVID world.

Fish Market

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Abstract

Aria Nicolette Tan was born in the United States and then grew up on an island off the coast of Malaysia. After moving back to America, she moved frequently across the US. Influenced by her time in culturally diverse communities, Tan developed a fascination with the simplicity of the human experience. Generation Z's media is heavily centered in personal identity and how it strengthens the connection of an individual to society. This experience serves as an inspiration for Tan's art. Her creative motivation is to represent a journey that is accessible to anyone.

Her painting portfolio titled "Fish Market" contains themes of connection, community, and silence. The primary narrative within "Fish Market" unfolds through her pieces *Introduction, Boyhood, Adulthood,* and *Conclusion*, following the journey of a boy evolving into a man and the impact on his relationship with the community. Simultaneously, an internal storyline explores the fates of the fish within the market, detailing the diverse ways they are handled. Tan aims to challenge societal perceptions of overlooked products, emphasizing the importance of recognizing creatures like sardines. By acknowledging the significance of fish and fish markets, Tan cultivates a sense of belonging to something greater than oneself, considering the vital role the sea plays in supporting entire communities.

Flirting with danger: A review of mental health factors associated with sexual risk behaviors in young adult women

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Abstract

Sexual risk behavior is a global public health challenge that contributes to transmission of sexually transmitted infection, negatively affecting the health of young people all around the world, particularly young women. Both the World Health Organization and the Centers for Disease Control and Prevention have identified reduction of sexually transmitted infections as a goal for which reducing sexual risk behavior is crucial. In recent years, as the prevalence of mental health issues has risen in young people, several studies have examined the associations between mental health factors and participation in risky sexual behaviors. The present review synthesizes findings from research published in the past 5 years centering on associations between mental health and substance use factors and risky sexual behaviors, as well as any mediators that have been identified. Significant associations were observed between risky sexual behaviors and depressive symptoms, anxiety symptoms, suicide variables, disordered eating behavior, substance use, and post-traumatic stress disorder symptoms. Impulsivity, body image, emotion dysregulation, and maladaptive coping with negative emotions were identified as the most common mediators of these associations. Future research to increase understanding of directionality of association and impact of associations on under-researched population subgroups is required to support development of public health interventions to improve sexual health outcomes in this population.

Fluorescence Analysis of Carboxyphenyl Porphyrins

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Abstract

Studies to analyze the effects of metals on the fluorescence properties of porphyrins were carried out by comparing a metalloporphyrin (Cu(II) meso-Tetra(4-carboxyphenyl) porphyrin, abbreviated as Cu–4-CPP) with it freebase counterpart (meso-Tetra(4-carboxyphenyl) porphyrin, abbreviated as 4-CPP) at various emissions. These porphyrins were selected based on their solubility, structure, and electrochemical properties. A trial was carried out in the UV spectrophotometer to obtain the peak wavelengths of major absorption which were then used to carry out the trials in the spectrofluorometer. In each experiment, the resulting fluorescence peaks were obtained at various emission wavelengths. After analyzing the peaks, it was determined that the metal significantly increases peak intensity at particular emission wavelengths. This research can shed light on the different roles porphyrins and metalloporphyrins have on biochemical reactions that regulate the activity of cardiovascular, neurological, reproductive, and detoxification systems. A computational analysis was performed to correlate the experimental results with the molecular orbital maps.

Fluoride-mediated Gene Expression Regulated Epigenetically via H3ac Modification in Ameloblast-lineage Cells

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Abstract

Objectives: Previously we reported that fluoride-mediated histone acetyltransferase (HAT) activation contributed to p53 acetylation to promote fluoride toxicity in mouse ameloblast-like cells (LS8). However, the roles of fluoride-mediated HAT activation in histone acetylation and epigenetic regulation of fluoride-mediated gene expressions remain unidentified. This study demonstrates that fluoride-mediated gene expression is regulated epigenetically via modification of histone acetylation status (H3K27Ac) in transcription start sites (TSS) in LS8 cells.

Methods: LS8 cells were treated with or without 5 mM fluoride for 24 h and subjected to chromatin isolation followed by immunoprecipitation (ChIP) and DNA purification. ChIP assay was performed using antibodies specific for H3K27Ac followed by ChIP-sequencing. Genes were identified by differential H3K27Ac peaks with fluoride treatment within ± 1 kb from TSS. Identified genes were analyzed by quantitative real-time PCR (q-PCR) to evaluate mRNA expressions.

Results: The differential acetylation status of H3K27 was associated with mRNA expressions (Bax, p21, Mdm2, p53, Bad and Bcl2) that were altered by fluoride. Fluoride increased H3K27Ac peaks of Bax, p21 and Mdm2, while decreased H3K27Ac peaks in p53, Bad and Bcl2. qPCR results showed that fluoride increased mRNAs of Bax, p21 and Mdm2, while suppressed mRNAs of p53, Bad and Bcl2. The H3K27Ac status (increase or decrease by fluoride) in these genes was concordant with mRNA expressions.

Conclusions: Gene expression altered by fluoride was epigenetically regulated via H3K27Ac inLS8 cells. Our results warrant further investigation to elucidate epigenetic regulation in fluoride toxicity to develop a potential novel strategy targeting histone modification.

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Genome Characterization and Annotation of Two Newly Discovered Bacteriophages MakoManhole and Penjamin420

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Abstract

While many bacteria are beneficial, some can have negative impacts on humans, animals, and the environment. One avenue of exploration to combat these effects is using bacteriophages (phage). Phage are viruses that target and kill specific bacterial host cells. While approximately 10^{31} bacteriophages exist, 99% of them are undiscovered. In recent years, scientists have utilized phage in real-world applications including fighting antibiotic resistance, food biocontrol, bioremediation, and treating wastewater. Therefore, it is essential to genetically characterize novel bacteriophages for their use in these different bacterial control applications. The aim of this research was to annotate the genomes of newly discovered bacteriophages, MakoManhole and Penjamin420, in Nova Southeastern University's SEA-PHAGES (Science Education Alliance – Phage Hunters Advancing Genomics and Evolutionary Science) program. Both phages infect the soil bacteria *Gordonia rubripertincta* NRRL B-16540, which has been known to cause catheter infections in immunocompromised individuals and has the ability to be used in bioremediation of oil spills. Using Illumina Next Generation Sequencing followed by auto-annotation using DNA Master along with manual inspection using Glimmer, GeneMark, BLAST, Starterator, HHPred, and Phamerator, it was determined that MakoManhole was from cluster DR, exhibits a genome length of 61,592 nucleotides, and is composed of ~85 genes. In contrast, Penjamin420 belongs to cluster DV, has a genome length of 67,614 nucleotides and has ~100 genes. Together, these phages are two novel bacteriophages that will be added to the Actinobacteriophage Database (https://phagesdb.org) for their possible use and contribution to various bacterial control applications.

How Do Residents of South Florida Perceive Aquaculture

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Abstract

Aquaculture is the raising of fish either extensively, in cages located in public waterways or coastal waters, or intensively, in closed-circuit tanks on land. Aquaculture is mainly done to produce seafood for human consumption. This study used an IRB-approved survey of South Florida residents to assess attitudes regarding the potential ability of aquaculture to produce seafood and how the process of aquaculture is viewed by the public. The survey used voluntary participants for the main results, with stratified sampling to select participants for a subsequent voluntary focus group. The focus group collected additional information about the views of the participants. Results showed that a large portion of respondents were aware of the aquaculture process, which is surprising given the lack of large-scale aquaculture in the region. These results also show that while many were hesitant to completely agree with the processes of aquaculture systems, there might be a willingness to change that view based on alterations made to current techniques. The most common concern from respondents were ethical issues with aquaculture production in general. With global wild fish catches for human consumption now moderating or declining, aquaculture production will increasingly replace the missing market demand. The information gathered will provide policy-makers and aquaculture facility owners insights regarding increasing public awareness and suggesting methods or changes to current techniques to alleviate ethical concerns by the public regarding aquaculture production.

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.

Identification of Genes Implicated in Low-Grade Gliomas and their Progression into Higher Grade Gliomas through Aberrant DNA Methylation

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Abstract

DNA methylation is a critical epigenetic modification involving the addition of methyl groups to DNA as a regulatory mechanism; aberrant patterns contribute to various diseases. Low-grade gliomas (LGG) arise from aberrant cellular differentiation through altered gene expression of various genes, of which DNA methylation plays a crucial role. LGG's are characterized as slow growing tumors from glial cells of the central nervous system (CNS). Grade IV gliomas or glioblastomas (GBM) are one of the most aggressive brain tumor types with a poor clinical prognosis and median survival of only 15 months. The purpose of this investigation is to analyze the DNA methylation patterns in LGG, and reference them with GBM using the 450K DNA methylation datasets from the cancer genome atlas (TCGA). We intend to screen genes that have either gained methylation or have lost DNA methylation in GBM compared to LGG. The genes that have gained or lost DNA methylation will be further correlated to their expression level using multiple datasets such as GEPIA2 in a large cohort of tumors. In addition, we plan to interrogate if the genes we identified are correlated to the patients' clinical prognosis (i.e. patients' survival) using prognostic datasets such as PrognoScan and GEPIA2. The long-term goal of this study is to identify the novel genes dysregulated in LGG and investigate their roles in patients' prognosis, and their progression into higher grade gliomas. Additionally, these genes may help predict tumor behavior and the development of therapeutic strategies.

Identification of Regulatory Roles for Stress Responsive Transposable Elements in Rice

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Abstract

Transposable elements, or mobile DNA sequences, are known for their structural and functional roles in the rice genome. As sources of genetic variation and drivers of evolution, transposable elements have been extensively studied for their role in regulation of gene expression. In addition, transposable elements are shown to be activated in response to various biotic and abiotic stresses and can possibly serve as a contributor to heat stress adaptation by modification of gene expression. As the global temperature rises, heat stress threatens crop production worldwide by affecting optimal rice growth, development, and yield. Concern for food security amidst a growing population thus calls for development of novel methods to study regulation of gene expression in response to heat stress. Two rice varieties, Cypress and LaGrue, are known to perform well and poorly, respectively, under high night temperatures (HNT) based on their ability to withstand heat stress during growth and development. Using these two contrasting genotypes and their varied response to HNT conditions, we aim to explore the role of stress-induced transposable elements in regulating gene expression under heat stress. We have identified 139 unique transposable elements that are differentially expressed in response to heat stress. A comprehensive genomic analysis aims to identify Gene-associated Transposable Elements (GaTEs) and understand their regulatory roles in stress response. This information will be leveraged in Machine Learning algorithms to develop predictive models for manipulating genes, enhancing rice plants' resilience to HNT and ultimately contributing to the overall adaptability of rice crops to heat stress conditions.

Identifying the Binding Residues on CYP3A4 to Naringin using Protein Modeling and Docking

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Abstract

Cytochrome p450 3A4 (CYP3A4) is one of the most abundant cytochrome enzymes and is involved in the detoxification of many medically relevant drugs. Inhibition of CYP3A4 can increase the bioavailability and duration of the availability of medications in the bloodstream and is therefore of great medical relevance. CYP3A4 has been noted to be inhibited by naringin, a flavanone found in grapefruits and other citrus fruits. As no structure exists of naringin bound to CYP3A4, the binding residues to naringin were investigated using 3-D protein modeling and in-silico molecular docking simulations. The CYP3A4 protein structure was obtained from the RCSB Protein Data Bank (8DYC) and modified to remove all substrates except the prosthetic heme group. The PyRx program was used to conduct molecular docking simulations and the resulting docked position of naringin was compared to the positions of other known inhibitors and substrates. The specific residue interactions were identified using the USCF Chimera Contacts/Clashes feature. A 3-D model was developed to show the docked position of naringin in CYP3A4. The residues Arg 372 and Thr 224, which form the opening of the cleft, in addition to the active site residues Glu 374, Arg 106, Arg 105, Ala 370, Phe 215, Arg 212, Phe 304, and Ser 119, and the additional residues Ile 223 and Leu 482 were all found to be involved in the binding to naringin. Overall, our results indicate that naringin may inhibit CYP3A4 by blocking the cleft opening and the active site.

Impacts of pre- and pro- biotic supplements on microbial composition related to colorectal cancers

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Abstract

Early in the field of oncology, colorectal cancer was a rarely diagnosed form of cancer and often went undetected. Today, colorectal cancer is the second most deadly form of cancer and is responsible for over one million deaths annually worldwide. The human gut microbiome is a keystone of daily health and living, serving to help absorb nutrients, boost immune function, and is considered to be another organ within the human body. However, the gut microbiome is also thought to have a role in the prevention and treatment of gastrointestinal disease like colorectal cancer. There has been extensive discussion within the scientific community regarding the effectiveness of pre/probiotics on gut microbiota function, but there lacks concrete consensus on whether they are effective in preventing and treating disease. In this literary analysis, we systematically search within the NCBI PubMed database for studies associated with colorectal cancer and pre/probiotic supplementation using specific keywords and identified 100 unique articles devoted to the topic associated with colorectal cancers. Interestingly, the majority of articles were reviews of previously published data, with those that included novel data primarily focusing on non-human models that may not accurately represent the human response to supplements. Additionally, research in the field predominantly focuses on European and North American populations, severely ignoring underrepresented groups which likely have a myriad of gut microbial compositions. Our investigation stresses the need for an enhanced human global perspective on the impact of pre/probiotic supplementation on preventing and treating colorectal cancers across all populations.

Impaired Mitochondrial Ultrastructure in Peripheral Neurons under Cholinergic Receptor Muscarinic 1 (CHRM1) Loss: Implications for Alzheimer's Disease and Sensory Neurodegeneration

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Abstract

Cholinergic Receptor Muscarinic 1 (CHRM1) is a G protein-coupled receptor expressed in both the central and peripheral nervous systems (CNS and PNS). The degeneration of cholinergic neurons and cholinergic hypofunction are pathologies associated with Alzheimer's disease (AD). Our recent studies have demonstrated a severe loss (≥50% decrease compared to non-demented individuals) of CHRM1 protein levels in the postmortem temporal cortices, which is associated with poor survival in AD patients. Moreover, investigations utilizing an enriched cortical synaptosomal mitochondrial fraction from wild-type and Chrm1 knockout ($Chrm1^{-/-}$) mice have revealed that Chrm1 loss leads to altered supramolecular assembly of oxidative phosphorylation-associated protein complexes and changes in the ultrastructure of cortical mitochondria, correlating with functional deficits in respiration. These findings directly link Chrm1 loss to an impaired mitochondrial phenotype in the CNS, emphasizing its relevance to AD pathogenesis. While the impact of CHRM1 loss in the CNS and its association with AD pathogenesis have been the focus of previous research, the significance of CHRM1 loss in peripheral neurons in AD cannot be overlooked. Reports of declining peripheral nerve conduction in AD patients prompted this study to characterize mitochondrial deficits in mouse dorsal root ganglion (DRG) neurons under Chrm1 loss conditions. Overexpression of C-terminal green fluorescent protein (GFP)-tagged Chrm1 and red fluorescence protein (MitoRFP) tagged with a mitochondrial localization signal peptide in cultured primary DRG neurons resulted in the localization of both proteins to the mitochondria, revealing the mitochondrial localization of Chrm1. Confocal time-lapse fluorescence imaging demonstrated their comigration in the neurites, suggesting potential Chrm1 localization in mitochondria. Additionally, transmission electron microscopy analysis revealed a spectrum of mitochondrial structural abnormalities, including disruption of cristae, in adult mouse DRG neurons following Chrm1 loss, thus suggesting a direct link between Chrm1 loss and mitochondrial degeneration in peripheral neurons. The observed Chrm1-GFP colocalization with mitochondria aligns with the localization of a truncated form of the homologous Chrm2 protein, which has recently been demonstrated to localize in the mitochondria. Overall, our study point to hitherto unknown localization of Chrm1 in neuronal mitochondria and implies that Chrm1 hypofunction in peripheral neurons may underlie mitochondrial malfunction, leading to sensory neurodegeneration.

In their Own Words: Collaborative Assessment of Undergraduate Intellectual Curiosity

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Abstract

For the last decade, college enrollment across the U.S. has trended downward, which has been attributed to factors including increased college tuition and impacts of the pandemic (Welding, 2022). Others predict that digital technologies like AI will end academia as younger generations lean less into their intellectual curiosity (Marche, 2022). Yet, some universities like Nova Southeastern University have seen an increase in enrollment even while college enrollment generally declined by 7% between 2019 and 2022 (Welding, 2022). Much of these educational forecasts do not come from students but from older generations who sense a shift in how students learn. By partnering with graduate and undergraduate professors in research, this study seeks to address how undergraduates, particularly those at NSU, develop and sustain their curiosity and learning in their classrooms, within their family structures and communities, and across digital technologies. The feature of collaborative assessment of both faculty and students in research on university student curiosity and learning is fairly recent. Therefore, this project seeks to fill gaps in collaborative assessments and contribute to the fields of educational psychology, as well as composition and rhetoric. In keeping with NSU's student-centered values, the researchers hope to inform pedagogical approaches based on how students integrate family, school, and technology in their learning processes, as well as how the Covid-19 pandemic impacted their learning and curiosity.

Influence of Growth Efficiency, Bacterial Density, and Metabolism on Antibiotic Resistance in Staphylococcus aureus

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Abstract

Antibiotic resistance presents a formidable challenge in medicine, with rising mortality rates and escalating hospital expenses attributed to infections caused by antibiotic-resistant bacteria. To address this critical issue, comprehending the mechanisms of bacterial resistance is paramount to the development of innovate drugs and treatment strategies. One such mechanism is the inoculum effect (IE), where the initial bacterial population density determines the minimum concentration of antibiotic required to eliminate the population. While previous work has shown that for gram negative bacteria, the relationship between ATP production and growth rate can account for the IE. However, it remains unclear as to if the same holds true in gram positive bacteria. To address this knowledge gap, we grew the gram positive bacterium Staphylococcus aureus in M9 medium with different metabolites in varying concentrations of casamino acids, allowing us to manipulate both growth and ATP production. Our findings reveal that [ATP]/growth rate can determine the strength of IE, defined as the difference in the minimum inhibitory concentration by high and low density bacterial populations. If the [ATP]/growth rate is sufficiently high, IE is effectively abolished. Overall, this work extends a novel mechanism to explain IE to gram positive bacteria. Accordingly, our research contributes to the identification of a new mechanism influencing antibiotic resistance, paving the way for potential novel treatment approaches in clinical settings.

Influence of Variables on Vaping Behaviors Among College Students

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Abstract

E-cigarette use among youth in the United States has increased in the past decade, with the majority of vaping advertisements targeting adolescents and young adults. There are a multitude of individual, interpersonal, and community-level risk factors that influence the uptake of vaping behaviors. This study investigated the influence of the COVID-19 (coronavirus disease 2019) pandemic and parental/guardian vaping and smoking history on vaping behaviors among undergraduate, graduate, and professional students. Additionally, this study evaluated the extent to which vaping history influences the perceived effectiveness of anti-vaping advertisements. A survey was administered to current students to measure their vaping behaviors and to examine the students' evaluation of three anti-vaping advertisements. The anonymous survey was conducted on Redcap®, a data collection tool. Researchers recruited participants by posting QR code flyers around campus, through professors, and through direct campus recruitment. Qualitative analysis was conducted for the survey questions, and Pearson Chi-Square tests were performed to determine significance. A significant association was found between student vaping history and current guardian or parental smoking/vaping (Pearson Chi-Square= 0.038). Student vaping history and perceived efficacy of various anti-vaping advertisements did not have a significant association (Pearson Chi-Square = 0.275). However, student vaping history and perceived effectiveness of a fear-inducing advertisement were significantly associated (Pearson Chi-Square =0.024). The results of this study reveal that a fear-inducing anti-vaping advertisement was perceived to be the most efficacious advertisement among the entire sample. Additionally, over 50% of participants reported the COVID-19 pandemic as influencing their vaping habits.

Interactions between ATP production, growth rate, and antibiotic lethality determine the inoculum effect in β-lactamase-expressing *Escherichia coli*.

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Abstract

Antibiotic resistance is a global threat, claiming approximately five million lives annually and impacting nations worldwide. In the U.S.A., this issue is significant, with 2.8 million diagnosed cases leading to 35,000 deaths each year. One way that bacteria can resist antibiotic treatment is through the inoculum effect (IE). IE explains how the concentration of antibiotics required to kill a population of bacteria increases as a function of bacterial density. Recently it was found that increasing ATP production/growth rate decreases the strength of IE. However, we do not know if this relationship can predict IE in bacteria that express β-lactamases as the expression of such enzymes has been previously shown to impact both ATP production and growth rate. To investigate this, we conducted ATP assays, growth rate assays, and MIC assays using Escherichia coli that express the NDM-1 β-lactamase. Changing the amount of β-lactamase expressed by E. coli altered the strength of the inoculum effect, ATP production, and growth rate. Furthermore, for a given β-lactamase expression level, we found a biphasic relationship between ATP production/growth rate and the strength of IE. Our mathematical model affirmed this relationship, attributing it to the concentration of ATP, β-lactamase expression, antibiotic lethality, and growth. Our mechanism represents the first attempt to understand how and why IE arises during treatment with a β-lactamase. In the long term, our findings may lead to a novel approach to systematically reduce the occurrence of IE in the clinic, potentially saving millions of lives annually worldwide.

Invertebrate Cover Within a Submerged Lava Tunnel, Concha de Perla Lagoon, Isabela Island, Galápagos Islands, Ecuador

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Abstract

Shallow water (<10m depth) coastal benthic invertebrate communities in the Galápagos Archipelago are well-described. However, the submerged Concha de Perla lava tunnel is undescribed, despite being at a main tourist area in a lagoon near (~150m east) the main dock for the town of Puerto Villamil, Isabela Island. The tunnel is oriented along an east-west axis, is ~15m long, with an interior diameter of ~2m. This creates habitat for cavernicolous fauna in the interior, with more typical benthic cover at the entrances. Red mangrove (*Rhizophora mangle*) trees surround and grow on top of the tunnel. Benthic cover on the tunnel interior includes sponges, cnidarians, sea urchins and bryozoans. The most common invertebrates include the endemic sea urchin *Eucidaris galapagensis*, white sponges, bryozoans and the azooxanthellate orange cup coral *Tubastrea coccinea*. Algae is absent except for a patch of crustose coralline algae on the northern wall near the west opening that receives dim light in the late afternoons. This descriptive survey quantifies the contribution of each taxonomic group to the lava tunnel walls, ceiling, and floor. Community structure is distinct from the surrounding benthos outside of the tunnel with similarities to deeper (~20-30m depth) communities on near-vertical walls. The production of a photogrammetric map provides baseline (May 2023) ecological cover for comparisons to future maps planned to be obtained at 2-year intervals.

Investigating the Impact of Lipogenesis Inhibition on the Phospholipid Composition of Melanoma Cells Using High-Performance Liquid Chromatography Mass Spectrometry

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Abstract

Melanoma, the most lethal variant of skin cancer, has a rate of incidence that continues to increase globally. The upregulation of lipogenesis is a primary feature of melanoma. However, the role of phospholipids (PLs) in the onset and progression of melanoma is not well-characterized. In this study we employed high-performance liquid chromatography mass spectrometry (HPLC-MS) to elucidate alterations in the phospholipidomic profile of human melanoma cells after inhibition of fatty acid synthase (FASN), a key enzyme in lipogenesis. Our results show that inhibition of FASN decreased cell viability by ~30%, underscoring the importance of lipogenesis for the survival of melanoma cells. HPLC-MS analyses of the cells showed that the relative abundance of phosphatidylcholine, phosphatidylethanolamine, and phosphatidylinositol PL classes increased, while phosphatidylglycerol (PG), phosphatidylserine, and sphingomyelin (SM) decreased. Furthermore, we determined variations in the composition of the individual molecular species within the PL classes as a function of FASN inhibition. This analysis led to the identification of specific PL molecular species such as 34:1-PG and 40:1-SM, which exhibited more than a ten percent change in their relative abundance upon FASN inhibition, suggesting potentially significant roles in lipogenesis and the survival of melanoma cells (individual PL molecular species are designated as the total number of carbon atoms in the FA chains (or FA chain and sphingosine):total number of double bonds in the FA chains (or FA chain and sphingosine)-name of the PL class). The results from this study offer initial insights into the function of PLs in melanoma pathogenesis.

Ketogenic Diet Improves Cognitive-Behavioral Function in a Mouse Model of Cerebral Amyloid Angiopathy

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Abstract

Cerebral amyloid angiopathy (CAA), characterized by the accumulation of amyloid protein in cerebral vessels, is linked to Alzheimer's disease (AD), stroke, and cognitive impairment. Currently, there is no effective treatment or prevention for this condition. The ketogenic diet (KD), which is characterized by high fat, low carbohydrate, and moderate protein consumption, has gained considerable attention in recent years for its potential therapeutic use in patients with neurodegenerative diseases. Studies in AD rodent models have found that KD and/or ketogenic supplements attenuate cognitive-behavioral impairments and dementia-related pathology. However, it is unknown whether KD can similarly benefit individuals with CAA. Considering KD's promising therapeutic outcomes in AD rodent models, this study sought to examine its effects in a transgenic CAA mouse model. Starting at ~3.5 months of age, male Tg-SwDI mice underwent a three-month dietary intervention with either a standard chow (14.4% fat, 26.1% protein, and 59.5% carbohydrates) or ketogenic diet (93.4% fat, 4.7% protein, and 1.8% carbohydrates). Mice were then subjected to a battery of behavioral tests to assess activity levels, cognitive function, and anxiety, along with metabolic tests to measure glucose and ketone body levels. KD resulted in nutritional ketosis, attenuated body weight and adiposity, lowered fasting glucose levels, improved glucose tolerance, increased physical activity, and enhanced spatial learning and memory. These findings provide compelling evidence that KD positively impacts cognitive performance, suggesting it may be a viable therapeutic option for CAA. Future research should explore the therapeutic potential of KD in females, as well as the diets' long-term efficacy.

Learning from Louisiana: How Legislation and Location Affect LGBTQ+ Youth Mental Health

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Abstract

Queer youth are disproportionately vulnerable to mental health challenges including elevated risks of social isolation and suicide ideation. Disparities in mental health outcomes among queer students exist across states, but the underlying factors contributing to these variations remain unclear. This research aims to understand why certain states exhibit better mental health outcomes among queer youth than others by analyzing nationwide LGBTQ+ mental health statistics. This knowledge can then inform effective programs and approaches to improving outcomes in other states. It is hypothesized that states offering accessible mental health services, safe spaces such as Gender and Sexuality Alliances (GSAs), and LGBTQ-affirming events like pride celebrations will have better mental health outcomes among queer students than states without these services.

This current study utilized data from the Substance Abuse and Mental Health Services Administration (SAMSHA) to explore trends in mental illness among LGBTQ+ youth (e.g., suicide ideation and attempt, depression, anxiety). Data from the Gay, Lesbian, and Straight Education Network (GLSEN) was used to explore disparities in LGBTQ-affirming resources in states. A composite ranking scale system was created and analyzed against state legislation and approval ratings to determine common features that positive increases in mental health. Identifying effective approaches and services can provide guidance for others aiming to improve the mental health of queer students. Ultimately, the goal of the findings of this study is to inform efforts to create a more inclusive and supportive environment for queer youth across the United States.

Linguistics and Math: Using Math to Understand the History Between Languages

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Abstract

We investigate the idea of calculating distances in higher dimensions and then mapping them to 2D data visualizations and observing the results. Applying the experiment to a real-world representation, we consider the linguistic concept of the Swadesh list, a list of 207 standard concepts across languages, and use mathematical methods to analyze the lexical distances between languages. A lexical distance is a measure that defines a method to analyze the similarity or difference between two distinct languages. In Linguistics, the Levenshtien distance represents the number of characters needed to transform one word into another, which fits perfectly with what we are trying to study, since we are looking at how closely written languages are. In this study, our criteria include the Levenshtein distance as the defining metric, a minimum of 100,000 speakers of the language, and a required Latin Alphabet. Once we established our criteria, we filtered the initial data set of over 5,000 languages to 232 that fit the necessary prerequisites. An important note to include is that each language consists of its own individual Swadesh list, which allows us to control the words that are compared between the 232 languages. Next, we used the statistical programming language R to create code that took in the various data and generated matrices of the distances, after which we were able to produce various visualizations representing the data points. Our goal is to identify patterns in the grouping of the languages within these graphs to explore historical relationships among the languages.

Long-term outcomes of COVID-19 survivors with pre-existing dementia

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Abstract

It is known that patients with dementia are at higher risk of SARS-CoV-2 infection due to older age and may be susceptible to worse acute outcomes. Whether or not acute COVID-19 infection predisposes patients with pre-existing dementia to worse longer-term outcomes is unknown and few studies compare COVID-19 survivors with non-COVID controls. This retrospective study evaluated 9,806 patients with dementia in the Montefiore Health System in the Bronx (January 2016 to July 2023), which serves a large minority population in the epicenter of the pandemic. Patients who had pre-existing dementia at the time of COVID-19 infection (COVID-19 group) or the beginning of the pandemic (non-COVID group) and survived the acute infection were selected for the study. Patients who were infected with COVID-19 were younger on average, were more likely to be male, Black, and had more pre-existing comorbidities. After adjusting for demographics and pre-existing comorbidities, those who were infected with COVID-19 had a higher long-term risk of death (adjusted hazard ratio=1.65), major adverse cardiovascular event (aHR=1.58), dysphagia, dyspnea, fatigue, sleep disturbances, altered mental status, and fall ($p<0.05$ for all). COVID-19 infection status was not linked to long-term development of headaches, depression, or anxiety. Cox proportional hazards model was able to predict long-term mortality with 70% accuracy given demographics and comorbidities at presentation. Identifying risk factors for worse long-term outcomes may draw clinical attention to the need for careful follow-up of at-risk individuals post-SARS-CoV-2 infection.

Measuring Drug Metabolism Efficiency of P450 Enzyme

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Abstract

Cytochrome P450 enzyme is responsible for the majority of drug metabolism in the human body, generally increasing the drugs' solubility for secretion. Drug companies have routinely tested how fast drugs are metabolized and the metabolites they produce, but the low efficiency of drug metabolism makes this measurement a challenging task. The purpose of this project was to increase metabolism efficiency by changing the reaction conditions. The drug metabolism of cytochrome P450 enzyme was measured using commonly prescribed medications. The P450 enzyme uses NADPH to reduce the heme iron- O_2 complex making it highly reactive. This highly reactive center is responsible for oxidizing the drug; however, it can also produce superoxide or hydrogen peroxide from the bound oxygen, which decreases the enzyme's efficiency. The goal of this project was to create a reducing environment for the enzyme to minimize side reactions. In this approach, NADPH was saved and redirected to only perform drug metabolism. NADPH was supplied through a regenerative system to the P450 liver microsomes by glucose 6-phosphate dehydrogenase enzyme. This enzyme reduces $NADP^+$ to NADPH by oxidizing glucose 6-phosphate. The reducing environment could also neutralize the damages caused by hydrogen peroxide to the P450 enzyme. The substrate 2,6-di-tert-butyl-4-methylphenol (BHT) was used as a standard, while testing the efficiency of different drugs. The metabolites were detected and quantified using gas chromatography- mass spectrometry (GC-MS) and served as evidence that metabolism occurred.

Metabolic Potentiation of Antibiotic Lethality from Carbon Source Preference in *P. aeruginosa* and *S. aureus*

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Abstract

Antimicrobial resistance (AMR) is a growing public health concern with a dire need for new solutions. This problem has only been exacerbated in recent years due to the misuse of antibiotics and globalization. As new antibiotic drugs are costly and time-intensive, it is imperative to understand and study creative new ways to combat AMR. In both natural ecosystems and clinical infections, microorganisms seldom exist in isolation. Rather, they flourish within polymicrobial communities, presenting unique challenges for therapeutic interventions owing to elaborate inter-species interactions. Two such pathogens are *Pseudomonas aeruginosa* (PA) and *Staphylococcus aureus* (SA); bacteria commonly found in patients with cystic fibrosis, and severe burn wounds. These two pathogens have an intricate relationship involving virulence factors, competitive inhibition, and metabolic hijacking that further drive AMR, making PA + SA co-infections notoriously difficult to treat. Notably, recent work has uncovered a connection between bacterial metabolic state and antibiotic efficacy. Given that antibiotics target energy-consuming processes, the manipulation of bacterial metabolism may serve as a potential avenue to enhance the effectiveness of antibiotic treatment. Our hypothesis is that growth medium supplemented with various carbon sources may increase the metabolic rate of *S. aureus* enough to shield it from the effects of *P. aeruginosa's* virulence factors, increasing the sensitivity of *S. aureus* to aminoglycoside antibiotics. To test for this, adenosine triphosphate (ATP) was quantified for PA and SA with various carbon sources to serve as an indicator of metabolic rate. Additionally, minimum inhibitory concentrations (MIC) were quantified for the aminoglycoside antibiotic, kanamycin, and were found to be altered in response to carbon source supplementation. Next, we found a reduction in MIC for SA when co-cultured with PA, suggesting metabolic state can be altered due to the metabolite source. Taken together, these results show that antibiotic efficacy can be successfully modulated via metabolic perturbations and re-shape the community composition of this infection. This research has implications for future antibiotic adjuvants and personalized medicine, effectively extending the shelf-life of existing antibiotics while new antibiotics are being discovered.

Microbial Insights into Green Iguanas: Unraveling Gut Microbiome Composition and Pathogenic Implications in Invasive Species

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Abstract

Green iguanas (I*guana iguana*) pose a significant threat as invasive species in Florida and parts of the Caribbean, exerting a detrimental impact on local ecosystems. While their herbivorous diet has been recognized for its adverse effects, the microbial composition of their gut remains poorly understood, especially in terms of potential pathogens. This study aims to characterize the gut microbiome of wild Green iguanas in South Florida, focusing on the 16S ribosomal RNA (V4 region) gene. Fecal samples were collected and analyzed using QIIME2, revealing a dominance of Enterobacteraceae, Mycoplasmataceae, and Bilophila genus taxa in Green iguana gut microbiomes. To gain a broader perspective, our findings were compared with data from Galapagos marine iguanas, Fijian crested iguanas, and related lizard species. Having presence of AR pathogens, such as Salmonella and Vibrio in marine iguanas raises concerns about the dispersion of microbial resistant threats in pristine and urban areas. Of significance, our research indicates a higher abundance of unique taxa in the gut microbiomes of island iguanas compared to Florida areas. Furthermore, this study focuses on the unexplored aspect of pathogen presence in Green iguanas, with implications for public health and the preservation of local ecosystems. The identification of unique microbial composition emphasizes the urgency for a targeted culling strategy by the U.S. Fish and Wildlife Service (FWS) to mitigate the ecological impact of these invasive organisms and safeguard the delicate balance of Florida's local ecosystems.

Modeling Cysteinyl Leukotriene Receptor Antagonist KNW for Possible Optimized Asthma Treatment

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Abstract

Under-diagnosed and under-treated, particularly in low- and middle-income countries, asthma has affected 262 million people globally in 2019. Cysteinyl leukotriene receptors (Cys-LTRs) are a δ-branch of class A G protein-coupled receptors associated with physiological functions in airways with allergic inflammation. Current antiasthmatic medications such as pranlukast inhibit CysLT1R, yet many patients still do not respond to this drug. To better understand this process, the related receptor CysLT2R has been identified as a promising drug target for not only asthma but also other conditions such as brain injury and cancer. CysLT1R is associated with bronchoconstriction, inflammation, and mucus production in the airways of the lungs and bronchial tissues. When cysteinyl leukotrienes bind to CysLT1R, these effects are triggered contributing to the symptoms of asthma. CysLT2R functions are more diverse but are still involved in mediating inflammatory responses. While CysLT2R is expressed alongside CysLT1R on various immune cells, its specific functions have not been reported. Through the exploration and modeling of KNW (11a, a dual antagonist of CysLT1R and CysLT2R; PDB ID: 6RZ6), we gain further insight into the structural mechanisms of drug interactions with similar receptors responsible for mediating inflammation and bronchoconstrictive effects of cysteinyl leukotrienes. Enhancing the potency of dual antagonists holds the most potential to improve current treatments for severe atopic asthma.

Modeling the Binding of Tetrodotoxin and Saxitoxin to the Nav1.7 Voltage-Gated Sodium Channel

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Abstract

Approximately 1.5 billion people suffer from chronic pain, with 68 million people suffering in the U.S alone. Chronic pain is pain that persists longer than 12 weeks despite medication or treatment. Within the U.S. about 5.5 million cancer patients experience chronic pain. Around 20% of these pains have neuropathic origins and develop from radiation therapy. Halneuron, a new drug in development, seeks to provide pain relief to those suffering from chemotherapy-induced neuropathic pain. This drug includes Tetrodotoxin (TTX), a potent neurotoxin found in species of pufferfish. Our 3D-printed model displays the structural details of TTX as a pore blocker within the Nav1.7 channel. The model also shows the structural differences between TTX and a similar toxin, Saxitoxin (STX). STX is most concentrated in mussels and other shellfish that can induce paralytic shellfish poisoning. Both toxins are Nav1.7 channel pore blockers that inhibit pain. TTX and STX were chosen from the Protein Data Bank and related literature studying pain inhibition. The PDB files 6J8J and 6J8H were used to develop a 3D molecular model showing how both toxins bind to the channel and inhibit action potentials. The files were imported to Jmol, where interactions and amino acids were highlighted to display binding differences. Our model contains key features such as the alpha subunit, backbone, and alpha helices of the Nav1.7 channel. Overall, constructing this model allowed us to visualize the binding differences between TTX and STX to the Nav1.7 channel, and look into future applications regarding treatment of pain disorders.

Molecular Diagnostics of Toxoplasma *gondii*, the World's Most Interesting Parasite, in Diverse Floridian Avifauna

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Abstract

T. *gondii* is an intracellular parasite that infects terrestrial mammals and birds worldwide; it also has important impacts on human and wildlife health. Data on this parasite's prevalence in our local (South Florida) ecosystem is lacking, which could help inform both public health and conservation efforts. Our questions for this study include: a) how prevalent is this parasite locally? b) do avian species differ in infection rates? c) does parasite abundance differ between localities?

Thus far, tissues have been dissected from carcasses provided by partner conversation facilities, including two very common South Florida bird species: Green Herons (a large wetland-associated wading bird) and Ovenbirds (a small migratory warbler), along with six other local species for a total of 16 individuals. From each individual bird, we have dissected heart, liver, muscle, and brain samples. We then purified total genomic DNA from each tissue sample for PCR testing of T. *gondii* infection.

Our results provide important insight into the prevalence and distribution of T. *gondii* within Southeastern species and landscapes. This is an important gap in current literature and is crucial for reducing rates of infection in humans and wildlife.

More Than Movement

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Abstract

The documentary film "More Than Movement" explores the different aspects that make dance what it is, from the perspective of dancers. There are many different arguments about what dance is considered, such as a sport, an art, a hobby, exercise, or all of the above. Professional dancers spend many hours in rehearsals training their bodies for performances, similar to any athlete who goes to practice to train for a game. It can also be compared to 2-dimensional art, where time and space would be the canvas and the dancer would paint the canvas with the movements of their body. The same way there are different styles of 2-dimensional art, such as drawing and painting, there are many different styles of dance. But all the styles include movement with meaning and purpose. So, dance is used to tell stories, as well as to communicate and express emotions, but without words.

Porphyromonas gingivalis RagA protein induces RANKL-independent osteoclastogenesis

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Abstract

Periodontal diseases (PD; gum diseases) are arguably the highest prevalent disease of mankind (Guinness World Records 2001). Emerging paradigms support that PD can predispose individuals to several systemic diseases, such as, cardiovascular disease, Rheumatoid arthritis, and Alzheimer's disease. Over-reaction of host immune responses to oral pathobionts, including, *Porphyromonas gingivalis* (*Pg*), is responsible for the development of pathogenic inflammatory bone resorption lesions of PD. *Pg* present in deep, but not shallow, periodontal pockets possess Rag gene locus distinctively. However, possible pathogenic roles of RagA and RagB proteins encoded in Rag locus of *Pg* are largely unknown. This study aims to investigate the possible pathogenic effects of RagA/B on inflammatory bone destructive responses by monocytes. Recombinant RagA/B proteins were applied to mouse RAW264.7 monocyte-like cells to monitor 1) proinflammatory cytokine productions, 2) cell-proliferation, and 3) osteoclast (OC)-genesis. The effect of RagA on bone resorption was investigated using a ligature-induced PD mouse model. RagA significantly promoted cell-proliferation and productions of TNF-α and IL-6. Despite the absence of RANKL, RagA, but not RagB, induced TRAP-positive multinucleated cells accompanied by elevated pit area, as well as upregulated mRNA expressions of *ocstamp*, *dcstamp*, and *nfatc1*. Both RagA and RagB promoted the phosphorylation of three key MAPKs, including ERK, JNK, and p38. RagA promoted significantly more alveolar bone resorption in the mice compared with RagB or control ligature alone. These results indicated that RagA, not only elicits proinflammatory responses, but also induces OC-genesis in a RANKL-independent manner, potentially contributing to the pathogenesis of PD.

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Psychosocial Impacts of Celiac Disease: Insights into Quality of Life, Social Challenges, and Coping Mechanisms of Celiac Disease Patients

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Abstract

Celiac disease is an autoimmune disorder that causes one's immune system to launch an inflammatory attack in response to the ingestion of gluten which damages the lining of the small intestine and leads to health complications. For optimal management and treatment of celiac disease, a strictly gluten-free diet is essential. This review analyzes the psychosocial effects and well-being of living with a celiac disease diagnosis based on peer-reviewed primary research articles found in PubMed and Google Scholar. Studies reveal a profound impact of celiac disease on psychological and social well-being across various demographic groups. Pronounced psychological distress can be linked to symptomatic presentation, diagnostic delay, and gender. Challenges with adherence, social ostracization, and food access further diminish the quality of life for both adults and youth. However, factors such as educational level, diet compliance, and supportive partnerships offer mitigation strategies for psychological distress. Therefore, addressing accessibility to gluten-free options and fostering societal understanding emerge as crucial interventions to alleviate these burdens.

Quantification of persistent organic pollutants in norther fur seal (*Callorhinus ursinus*) vibrissae: A novel approach

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Abstract

Persistent organic pollutants (POPs) are characterized by their biologically accumulative nature, toxicity to organisms, and persistence in the environment. The physical and chemical properties of these "forever chemicals" enhance their capacity for global transport, and the ocean serves as their ultimate sink. The Eastern Pacific stock of northern fur seals (*Callorhinus ursinus*) on the Pribilof Islands, Alaska, represents of 70% of the global breeding population but has been experiencing a discontinuous decline since 1980. A proposed contributing factor to this decline is contaminant exposure. This study developed a novel technique for analysis of POPs in keratinous tissue. A decadal comparison of 21 organochlorine contaminant (OC) and 39 polybrominated diphenyl ether (PBDE) concentrations was conducted utilizing vibrissae (whiskers) from individual animals collected in 1993 (n=30) and 2013 (n=41) during subsistence harvests on the Pribilof Islands. The quantification of all target analytes validates keratinous tissue as a viable biomarker for POP exposure and introduces the potential for less invasive sampling for future long-term monitoring efforts. PBDEs were found in concentrations one order of magnitude greater than OCs, which may be reflective of the current use versus legacy status of these contaminant classes, respectively. Mean concentrations in 1993 were comparable to 2013 for both åOCs (316 and 357 ng/g) and åPBDEs (1749 and 1876 ng/g), with slightly higher values in 2013, indicating their environmental persistence. The presence of POPs at concentrations within an order of magnitude of other tissues suggests there may be an adaptive advantage to offloading contaminants via this inert tissue.

Quantifying respiratory plasticity of checkered pufferfish under climate change conditions

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Abstract

Increasing water temperatures resulting from global climate change introduce new energetic demands for marine organisms. Higher energy input will be required to cope with a subsequently higher metabolic rate, affecting all aspects of an individual's life and therefore their survival. Because estuaries act as a link between rivers and oceans, they and their inhabitants are considered to be the most threatened by climate change. Therefore, it is crucial to understand how these organisms will respond to increased stressors due to climate change. Checkered pufferfish (*Sphoeroides testudineus*) are among the most common teleost fish in the Indian River Lagoon, and spend much of their life in seagrass beds, mangroves, and tidal marshes, making them an ideal study species. Intermittent-flow respirometry, which estimates standard and maximum metabolic rates by measuring oxygen consumption, is used to make inferences about how this species will cope with higher water temperatures. A decreased aerobic scope, the difference between MMR and SMR, at higher temperatures reveals the inability to modify the allocation of an organism's total energy budget in high stress conditions. Results show that survival favors a species with the affinity to increase its metabolic rates. Findings will contribute to the current knowledge of climate change and estuarine conservation research and will help to better understand and predict population changes of these and similar species.

Red Dog Loess, a Peoria Equivalent, Last Glacial Desert Loess of the White River Badlands, South Dakota, USA

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Abstract

Understanding how ecosystems in the Great Plains responded to droughts and prehistoric climate change is important for interpreting future climate disturbances and water resource planning. There is a correlation between glacial periods and atmospheric dust distribution, with significant dust deposition in the Great Plains during the Last Glacial Maximum, ~23,000 years ago (23ka). Continuous freezing and thawing events in the mid-continent led to erosion in the Great Plains, transporting a significant deposit of windblown dust, or loess, and an ecological collapse of the grassland ecosystems. This research aims to determine if the White River Badlands (WRB) region was the source for Peoria Loess, an agriculturally significant last-glacial deposit. To test this hypothesis, the geochemical and mineralogical composition of Red Dog Loess (RDL), a similar last-glacial dust deposit from the WRB, was compared with samples of Peoria Loess. Preliminary results indicate compositional similarities between the RDL and the WRB, supporting the conjecture of a local origin. In our interpretation of the results, RDL demonstrated equivalent mineralogic immaturity and geochemical signatures to Peoria Loess. Using optically stimulated luminescence (OSL), the periods for deposition of the RDL were identified as 5ka, 9ka, 20ka, and greater than 58ka. These data help understand climate changes in the mid-continent and contribute to a better understanding of regional climate disturbances in the Great Plains, aiding predictions and preparation for future climate events.

Reducing Inoculum Effect by Modulating Growth Productivity through the Superpathway of Purine, Pyrimidine and Histidine Synthesis in Escherichia coli

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Abstract

Antibiotic overuse has driven the evolution of multiple antibiotic-resistant bacteria that complicate infections that were once easily treatable. While mechanisms by which individual bacterium resist or tolerate antibiotics are well explored, less studied are the mechanisms by which populations of bacteria tolerate antibiotics as a collective. One such mechanism bacteria employ to tolerate antibiotic treatment as a collective is the inoculum effect (IE). We recently discovered that growth productivity, which describes the relationship between ATP production and growth rate, can account for IE for multiple antibiotics and pathogens. However, the underlying pathways for determining growth productivity have yet to be discovered. To address this shortcoming, we used flux balance analysis coupled with a whole genome model of E. coli and OptKnock to quantify changes in growth productivity due to single gene removal in silico. We found an overrepresentation of genes related to purine and pyrimidine de novo synthesis and salvage. To assess the impact of this pathway on IE, we measured the IE of carbenicillin and streptomycin with exogenously added nitrogenous bases. We found significant correlations between the nitrogenous base-driven changes in ATP/growth rate and the strength of IE. Further model-guided experimental manipulation of de novo nucleotide synthesis provided additional support for the critical role of this pathway in IE. Our work details a mechanism by which bacteria can tolerate antibiotics as a collective and have implications in both infectious disease and the persistence of microbial populations in the presence of antibiotics.

Relationship Between Amount of Sleep and Academic Focus

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Abstract

Many college students are regularly taking a full course load while simultaneously working a part-time job, studying for graduate school exams, and participating in school activities. With the growing demands inside and outside the classroom, students may find it difficult to maintain a consistent sleep schedule. Generally, individuals with a sleep duration shorter than six hours report many negative effects such as depression, automobile accidents, and cardiovascular disease. The few existing studies that link sleep and academic focus do so by focusing on the effects of sleep deprivation. This study focused on investigating a potential relationship between various amounts of sleep and academic focus. Specifically, it attempted to determine if sleeping an excessive or minimal amount was related to academics. To test this, participants completed daily questionnaires over a period of 14 days to self-report their amount of sleep as well as their levels of academic focus. Following statistical analysis, we found that the data was not significant. This implies that the levels of academic focus in individuals are independent of the amount of sleep they regularly receive.

Relationships Between Emotion Regulation, Self-Directed Behaviors, and Student Learning Outcomes in Online vs. In-Person College Courses

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Abstract

Research examining student learning outcomes in online vs. in-person learning has shown varied results, with some studies showing more favorable outcomes in in-person courses and others showing no major differences between the two course types. Further exploration into additional factors influencing satisfaction and learning outcomes in both course formats highlights the relationships between self-directed learning behaviors (SDLBs), emotion regulation (ER), and quality of sleep with increased academic performance and course satisfaction. Previous research examining SLDBs and ER on student outcomes is limited to either online courses or in-person courses and does not compare the two. Therefore, the purpose of this study is to compare student learning outcomes and self-reported satisfaction in online and in-person courses., and to explore how SDLBs, ER, and sleep are related to learning outcomes and satisfaction. This study is utilizing an online survey that is being distributed via convenience sampling to students at Nova Southeastern University. The survey includes multiple psychological questionnaires that assess ER, SDLBs, sleep quality, and student learning outcomes. The differences in student learning outcomes and satisfaction based on course format will be analyzed using paired sample t-tests, and repeated measures ANCOVAs will be used to assess the impact of ER, SDLB, and sleep on learning outcomes and satisfaction in online and in-person courses. The results of this study will further our knowledge about how individual factors such as emotional regulation and self-directed learning behaviors influence performance in college courses, particularly if the courses are online. Data collection is currently ongoing.

Religiosity, Mental Health Help-Seeking Behaviors, and Treatment Utilization Among Muslim Populations in America

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Abstract

Despite the emphasis Islam gives to mental health practices including prayer and meditation, Muslim populations in the United States, on average, do not seek professional mental health services. Little research has been conducted on the relationship between religion and mental health help-seeking behaviors and treatment utilization among Muslims. This study aims to investigate the utilization of mental health services in Muslim populations. We hypothesize that Muslims with higher levels of religiosity will be less likely to seek professional mental health help or support.

Data was utilized from the National Epidemiologic Survey on Alcohol and Related Conditions III (NESARC-III). Mental health disorders included low mood, anxiety, and PTSD. Inclusion criteria was adults who self-identified as Muslim. Religiosity was defined as currently attending religious services at a mosque and frequency of attendance. Professional help and support variables included: 1) talking to a mental health professional; 2) seeking self-help or support group; 3) emergency room visit; 4) inpatient visit; and 5) prescribed medication. Demographic descriptives and frequencies will be reported. Data will be stratified by mental health disorder. Correlational analysis will determine significant relationships between religiosity and help-seeking behaviors. Independent t-tests will be conducted to determine significant differences in frequency of attendance of religious services. A p value $\leq .05$ was set as statistically significant.

Understanding the mental health help-seeking behaviors of Muslims and how religiosity will shed light on an underrepresented population in the literature. This can better inform future initiatives to connect Muslims with quality mental healthcare.

Remote Blood Pressure Monitoring: An Innovative Intervention for Managing High Risk of Cardiac Diseases for Pregnant Women to Prevent Poor Maternal Outcomes

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Abstract

Pregnant women at high risk of cardiac disease encounter various challenges leading to poor maternal outcomes, and fatalities. Recent studies show how the rate of cardiac disease/hypertension susceptibility has increased to 33.9%, with an associated high rate of negative fetal outcomes of 15% to 17%. In addressing these concerns, researchers are actively exploring alternative treatment strategies for pregnant women at high risk of cardiac diseases, as standard treatment options have limited efficacy. Intriguingly, research points to the success of a new innovative treatment called Remote Blood Pressure Monitoring (RPM), a medical device that utilizes a cuff and sensors to monitor a patient's vitals and promptly transmit readings to their physicians. A wide range of scholarly articles, including those from Stanford CVI, NIH, PubMed, and many others, were used to investigate and highlight the potential of the RPM as a preventive strategy for treating pregnant women at high risk of cardiac disease, as it can improve patient quality of life (QOL) and maternal outcomes. Bringing awareness to this cost-effective innovative technology is one of the many primary objectives for this specific research study.

Reproductive Experience Protects Against Cognitive Decline in a Mouse Model of Dementia

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Abstract

Dementias, including Alzheimer's disease and vascular dementia, are devastating conditions lacking safe and effective treatments. Despite the striking sex/gender difference in the prevalence of dementia, few studies have investigated sex-specific factors that may influence the greater risk and faster progression of disease in females. These factors include but are not limited to prior pregnancy and motherhood. Women with children have slower rates of cognitive decline and lower risk for developing mild cognitive impairment or dementia than women with no children. However, other studies have reported mixed results, suggesting that the influence of reproductive/maternal experience may depend on an individual's number of children and/or their geographical location. Therefore, controlled studies in animal models are needed to determine causality and mechanisms driving this relationship. One common pathological contributor to dementia is cerebral amyloid angiopathy (CAA), the accumulation of beta-amyloid in the cerebral vessels. CAA is highly comorbid with Alzheimer's disease and on its own promotes vascular cognitive impairment and dementia. Here, we compared the cognitive function of reproductively naive female C67BL/6J (wild-type control strain) mice to sexually naive Tg-SwDI (transgenic mouse model of CAA) and reproductively experienced Tg-SwDI female mice at 8-12 months of age. Whereas wildtype mice outperformed sexually naive transgenic mice in two tests of spatial memory, the Object Placviement Test and the Barnes maze, the performance of reproductively experienced Tg-SwDI females more closely resembled the naive C57BL/6J females than the naive Tg-SwDI females. These data suggest that reproductive/maternal experience attenuates cognitive impairment in a transgenic mouse model of dementia.

Repurposing renin-angiotensin system-targeting medications for later stage treatment of cerebral amyloid angiopathy and associated cognitive-behavioral deficits in Tg-SwDI mice

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Abstract

Cerebral amyloid angiopathy (CAA), the accumulation of amyloid proteins in the cerebral vasculature, is highly comorbid with Alzheimer's disease, and on its own, increases the risk of stroke and vascular dementia. Epidemiological studies suggest that certain renin-angiotensin system (RAS)-targeting drugs, commonly used for treating hypertension, decrease the risk of dementia. This study assesses whether two FDA-approved RAS-targeting drugs: telmisartan [a moderately brain-penetrant angiotensin receptor blocker (ARB)], and lisinopril [a brain-penetrant angiotensin-converting enzyme (ACE) inhibitor]; can be repurposed to treat CAA. At ~8 months of age, male and female Tg-SwDI mice (CAA model) began treatment with telmisartan (1 mg/kg/day) or lisinopril (15 mg/kg/day) or received plain water only. C57BL/6J mice receiving plain water served as wild-type controls. At ~12 months, mice underwent blood pressure measurement, behavioral testing, and post-mortem brain analysis. Voluntary oral consumption delivered doses similar to the target dose for both drugs. Telmisartan and lisinopril treatment did not significantly reduce blood pressure in Tg-SwDI mice; these results are as expected since the goal was to supply subpressor doses. While neither drug treatment normalized the decreased activity levels displayed by Tg-SwDI mice in the open field, lisinopril decreased anxiety-like behavior. Preliminary findings suggest that drug treatment, particularly lisinopril, may mitigate cognitive deficits observed in Tg-SwDI mice in the Barnes maze. Ongoing experiments are being completed to increase sample sizes and investigate the potential benefits of telmisartan and lisinopril on neuropathology in Tg-SwDI mice. If findings support our hypothesis, this will demonstrate that these drugs could be repurposed to treat CAA.

Resveratrol-inspired Synthetic Compounds for Glioblastoma Stem Cell Cytotoxicity

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Abstract

Glioblastoma is an aggressive brain tumor that poses a formidable challenge in terms of treatment due to its infiltrative nature and lack of effective conventional therapies. The presence of treatment resistant glioblastoma stem cells (GSCs) is hypothesized to be responsible for tumor growth; therefore, successful elimination of GSCs is necessary to prevent post-therapy tumor recurrence and patient death. Resveratrol (RSV) is a natural polyphenolic stilbene found vastly in plant products, such as the skin of red grapes. RSV and its analogs are known for their antimicrobial, neuroprotective, antiaging, anti-inflammatory, cardioprotective, and blood-sugar lowering properties. A challenge of utilizing RSV in drug treatment is its low systemic bioavailability; however, several studies indicate that key substitutions of certain functional groups on one of the aromatic rings of stilbene optimizes the chemotherapy properties and enhances the aforementioned applications of RSV. Until now, diarylacrylonitrile analogs have not been explored for their cytotoxicity towards GSCs. The objective of this project is to synthesize a series of resveratrol-inspired compounds retaining stilbene moiety and determine their cytotoxic potential toward GSCs. The synthesis was achieved by coupling substituted arylacrylonitriles with aromatic aldehydes by Knoevenagel Condensation. GSC viability in response to compound treatment was determined by MTS assay. Of the 36 compounds synthesized to date, it was observed that arylacrylonitriles coupled with methoxy substituted aromatic aldehydes significantly reduced GSC viability, while nitro-containing compounds appeared to promote cell differentiation. Taken together, these may be promising lead compounds for further development.

Running Kinetic Asymmetry Indices Are Associated with Concentric but Not Eccentric Jump Asymmetry Indices

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Abstract

Decreases in right versus left limb asymmetry of kinetic characteristics of a countermovement jump (CMJ) positively influence running velocity and injury prevention. The relationship between CMJ kinetic asymmetry to kinetic asymmetry during a distance run is less known. The purpose of this study was to determine the association between kinetic asymmetries for both the eccentric (loading) and concentric (propulsion) phases of a CMJ and kinetic asymmetries during a treadmill run. Twenty-two university cross-country runners (age, 20.0±1.8 yrs; height, 1.73±0.09 m; mass, 61.7±8.8 kg) completed a 6-minute run on an instrumented treadmill that collected mean vertical ground reaction forces (vGRF) for both limbs. Runners then performed 3 maximal CMJs on dual force plates to derive kinetics for both limbs. Kinetic asymmetries between limbs were calculated as [(|left-right|)/(left + right) * 100] and expressed as a percent (%). CMJ kinetics included eccentric impulse (ECC-IMP), concentric impulse (CON-IMP), eccentric mean force (ECC-MEAN-FORCE) and concentric mean force (CON-MEAN-FORCE). Pearson Product Correlation Coefficients showed mean vGRF asymmetry (1.2±0.8%) from the run was significantly positively associated with CON-IMP (5.6±4.6%), r=0.477, p=0.037 and CON-MEAN-FORCE (5.6±4.6%), r=0.477, p=0.037 asymmetry from the CMJ. Mean vGRF asymmetry from the run was not associated with CMJ ECC-IMP (9.6±7.0%) r=-0.29, p=0.899 or ECC-MEAN-FORCE (7.7±6.0%), r=0.198, p=0.378 asymmetry. ECC asymmetries were also larger than CON and running asymmetries. Measuring CMJ propulsion phase forces throughout a runner's competitive season or rehabilitation program may provide insight into monitoring kinetic asymmetry during an actual run. CMJ loading phase asymmetries do not appear related to running asymmetries.

Selective Loss of the Iron-Sulfur Subunit of the Succinate Dehydrogenase Enzyme Complex in Alzheimer's Brains: Implications for Mitochondrial Function and Disease Pathogenesis

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Abstract

Mitochondria are vital for energy production in neurons. Mitochondrial dysfunction contributes to the pathogenesis of Alzheimer's disease (AD). Neurons primarily rely on glucose as their energy source, which is metabolized through glycolysis and further processed in the mitochondria via Krebs cycle and oxidative phosphorylation (OXPHOS). Succinate dehydrogenase (SDH), an enzyme complex involved in both Krebs cycle and OXPHOS, plays a significant role. SDH comprises soluble and membrane-spanning subunits. The former consists of a flavoprotein (SDHA) and an iron-sulfur protein (SDHB) catalyzing the conversion of succinate to fumarate in the matrix. This reaction is coupled to the conversion of quinol to quinone during OXPHOS by the membrane-spanning subunits (SDHC and SDHD). SDH dysfunction disrupts mitochondrial activity, impairing energy production and cellular metabolism. In AD brains, reduced levels and activity of SDH have been observed, however, the role of specific subunits is not known. Therefore, this retrospective study aims to investigate whether all or specific SDH subunits are affected during the pathogenesis of AD in human brains. This research study's purpose is to unravel the role of Succinate Dehydrogenase (SDH) subunits in the context of Alzheimer's disease (AD). Hence, the retrospective investigation aims to discern whether all or specific SDH subunits are affected during the progression of AD in human brains. Essentially, the goal of this is to pinpoint the precise role of these subunits and focusing on understanding the implications of their dysfunction in AD-related mitochondrial disruption. Providing critical insights into the disease's pathogenesis and potential avenues for targeted therapeutic interventions.

Social Anxiety Disorder in Gerontological Populations: Analysis of Retirement, Spousal Loss, and Heath-Related Challenges in Older Adults

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Abstract

This study will explore Social Anxiety Disorder (SAD) in gerontological populations, specifically examining how it manifests in the context of retirement, spousal loss, and health challenges. Employing surveys, interviews, and clinical assessments, the research will investigate both the subjective experiences and objective markers of SAD among older adults. The study will delve into the impact of retirement on social interactions, identity, and self-esteem to uncover potential contributions to social anxiety symptoms. Additionally, the research will observe the repercussions of spousal loss, using advanced statistical modeling to analyze longitudinal data and identify temporal patterns in the development of social anxiety. The study will also investigate the relationship between health-related challenges and social anxiety, utilizing established clinical assessments like the Mini International Neuropsychiatric Interview (MINI) and social anxiety scales such as the Liebowitz Social Anxiety Scale. By identifying specific triggers and coping mechanisms associated with social anxiety, the goal is to discern whether health-related impediments act as predisposing factors or consequences of social anxiety. This research, focusing solely on psychological aspects, aims to provide valuable insights into the intersection of SAD and gerontological challenges. The findings will inform targeted interventions and mental health strategies tailored to the unique needs of older adults.

Beyond academia, this study may have practical applications for healthcare professionals, caregivers, and policymakers, ultimately enhancing the well-being of the elderly population grappling with social anxiety.

South Dakota Entisol and Paleosol: Bacterial and Secondary Metabolite Identification and Comparison

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Abstract

The Bouquet Table and the Red Dog Table, areas found in the Badlands region of South Dakota, offer diverse environmental settings due to their distinct topographical features and soil properties. The Bouquet Table soil is about 3,000 years old and is considered a young entisol. The Red Dog Table located in Pine Ridge Indian Reservation of South Dakota is unique and has a calibrated 14C age of 12,700 years. It is located close to an undisturbed area of temperate grasslands and has most likely not been touched by machinery for plowing.

We aim to investigate how specific soil conditions and age can influence microbial communities and their antibiotic production capabilities. Our hypothesis is that the distinct elevations and varying soil conditions of the Bouquet Table and Red dog table table soil samples may yield different microbial growth with the potential to produce antibiotics with distinct compositions. To this end, we will utilize next-generation sequencing to examine the microbial distribution in these soils, providing a comprehensive understanding of the microbial communities present. We have already analyzed the collected soil samples for microorganisms and assessed their ability to produce antibiotics against ESKAPE safe relatives, which are akin to the most common drug-resistant pathogens causing hospital-acquired infections. In our preliminary investigations, we have discovered that three bacterial strains isolated from the Bouquet Table soil samples exhibit antibiotic activity against M. smegmatis, while one strain demonstrates efficacy against A. Baylyi. Further, we plan to conduct chemical analyses of these compounds to determine their structure and composition. In collaboration with Tiny Earth, our objective is to identify microorganisms capable of generating novel antibiotic substances, potentially influenced by the unique interplay of elevation and soil conditions.

Spring-mass Model Characteristics in Distance Runners Across a Competitive Season

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Abstract

The spring-mass model (SMM) explains the elastic bouncing nature of the lower limbs during running as the tendons store and release elastic energy. It is primarily used to explain sprinting and is less understood in distance runners. SMM is quantified by evaluating the asymmetries in landing-takeoff and rebound percents (%) determined from ground reaction forces (GRF). Faster runners have less asymmetrical landing-takeoff% and more asymmetrical rebound%. SMM asymmetries may be sensitive to longitudinal training. Therefore, we sought to document changes in elastic bouncing properties over a 7-week competitive season in distance runners. Thirteen university runners (age, 19.8±2.2 yrs; height, 1.74±0.10 m; mass, 61.9±9.0 kg) ran on an instrumented treadmill where GRF data were collected pre- and post-season. Landing-takeoff asymmetry was calculated as relative time durations of push-off (t_{push}) to braking (t_{brake}) horizontal GRF. Rebound asymmetry was calculated as relative time durations of effective aerial (t_{ae}) to effective contact (t_{ce}) vertical GRF. A paired *t*-test showed no significant changes in landing-takeoff asymmetry (pre, 103.7±13.2 vs. post, 102.3±19.2%; $t(12)=0.232$, $p=0.82$), but the mean values showed good symmetry (close to 100). While rebound asymmetry increased, it was not significant (pre, 160.4±16.1 vs. post, 164.4±20.8%; $t(12)=-1.239$, $p=0.239$). Vertical GRF magnitude was also not significantly changed (pre, 25.1±2.8 vs. post, 25.2±2.7 N/kg; $t(12)=-0.074$, $p=-0.942$). While individual runners improved elastic bouncing, SMM characteristics appear to remain stable across a competitive running season. Improving rebound asymmetry may not be as important in distance running. Year-round monitoring may yield further insight into elastic bouncing development.

Stereoscopic 3D Video Games Can Boost Depth Perception

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Abstract

Previous studies have shown that video game play improves a range of visual functions such as contrast sensitivity and visual crowding. Our experiment goal was aimed to test whether playing video games in a virtual 3-dimensional (3D) environment can modify depth perception or not. Altogether, 24 healthy young adults with no previous video game experience were recruited in two groups. In the treatment group (3DVG, n=12), participants were required to play stereoscopic 3D video games for a total of 40 hours over 4-5 weeks. In the control group (2DVG, n=12), participants played the same video games but in 2D mode for the same time course. Stereoacuity was measured using random dot stereograms before and after the video game intervention. A custom-built 4-mirror haploscope was used to present a half monitor screen to each eye. A method of constant stimuli was used to measure stereoacuity. The visual task was to determine the stereoscopic depth of a central square presented on the monitor (in front or behind) relative to an outer reference square. Stereoacuity was defined as the disparity at the 84% correct response rates obtained by fitting a Probit function. After playing 3D video games, a remarkable 33.5% improvement was observed in mean stereoacuity. There was a statistically significant difference in stereoacuity before and after the video game intervention in the 3DVG treatment group (mean difference=11.16 arcsec; paired t=3.63, p=0.004), but not in the 2DVG control group (mean difference=-0.08 arcsec; paired t=0.10, p=0.92). Experiment showed that playing stereoscopic 3D video games for a short period of time can improve depth perception.

Survivorship and bleaching prevalence of nursery-grown massive stony corals in Southeast Florida

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Abstract

Coral cover on Florida's reefs has severely declined due to anthropogenic stressors. A major impact on corals is thermal bleaching, where corals expel their endosymbiotic microalgae, leaving them vulnerable to mortality. Some coral species are more resilient to thermal bleaching and thus may be prime candidates to support coral reef restoration. This study examines post-bleaching survivorship of massive stony coral species in Nova Southeastern University's offshore nursery to identify which species to include in future restoration efforts. In September 2022, 172 fragments (<3cm dia) from six massive species were secured on cement pucks and deployed to mid-water PVC trees in the nursery. Over a 14-month period, the survival and bleaching prevalence of each species were recorded during four monitoring time points. After 14 months in the nursery, total fragment survivorship was 80%, with *Pseudodiploria strigosa* experiencing the highest survival (100%) and *Orbicella favelota* experiencing the lowest (61%). Water temperature was also recorded and the average daily temperature was above the bleaching threshold (>30℃) for 22 days in August 2023. The bleaching prevalence for all fragments was approximately 47% during August 2023, with three species experiencing 100% bleaching. However, almost all fragments recovered their symbionts by December 2023 and the 20% mortality could not be attributed to bleaching. Nevertheless, ocean temperature anomalies are predicted to become more frequent and severe, with potentially compounding impacts on nursery-reared corals. The findings from this study suggest that rearing massive fragments in an offshore nursery is successful even during bleaching events.

Synthesis and Comparative Analysis of Fe_xNi_ySn Magnetic Nanoparticles

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Abstract

Nano synthesis of Heusler alloys holds promise for their potential applications in creating next generation computer hard drives. This research project aims to investigate the synthesis and comparative analysis of Heusler nanomagnets using Ni_2FeSn, Fe_2NiSn, and FeNiSn compositions. The nanoparticles are synthesized using microwave-assisted heating and are then subjected to X-ray diffraction (XRD) analysis and SQUID magnetometry. We are particularly interested in conducting comparative analyses of the three nanomagnet compositions in order to determine which demonstrates superior magnetic properties for potential applications in the field.

Synthetic psychedelic phenethylamine drugs alter microtubule formation and neurogenesis in human neural progenitor cells

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Abstract

Understanding how psychedelic phenethylamines affect neural plasticity is essential in understanding effects associated with recreational drug use. Intracellular scaffolding proteins and downstream effectors, i.e., the microtubule cytoskeleton, have been proposed to modulate the effects of psychedelics. Microtubules are polymers of the protein tubulin that contribute to the cytoarchitecture, protein transport, and synaptic stability in cells. Our group has shown that psychedelic substituted phenethylamines interact with microtubules in a dose dependent manner to affect its ability to form. These interactions would prevent microtubule dependent protein transport within cells leading to altered cytoarchitecture of the cell and may be associated with adverse effects of psychedelic drugs. This study's goal is to determine if the substituted phenethylamines 25B-NBF, 25C-NBF, and DMBMPP affect human neural progenitor cell (hNPC) proliferation, morphology, and survival. hNPCs were exposed to either 50 μM or 100 μM of each of the substituted phenethylamines or vehicle control for 24h. We hypothesize that substituted phenethylamine-induced altered microtubule formation leads to changes in hNPC proliferation, morphology, and survival. EdU cell proliferation assays and immunostaining were used to examine proliferation and cell cycle kinetics; TUNEL assays to examine programmed cell death; And, immunostaining to evaluate neurite formation and cellular morphology. Preliminary findings suggest hNPCs incubated with DMBMPP prevented neurite outgrowth, cell proliferation, and increased cell death. Identifying how substituted phenethylamine-induced changes in microtubule stability alter hNPCs may contribute to our understanding of how psychedelics produce different effects on behavior and identify therapeutic targets to treat their adverse effects.

Tell Your Friends You Love Them

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Abstract

My senior year of high school, the course of my life took an unexpected and tragic turn with the untimely passing of a dear friend, Isabella. Isabella lost her life in a devastating car accident. As the weight of her loss took hold of me, I found myself going through a challenging journey of grief, seeking comfort and understanding from the people I had come to rely on for support: my school counselors, teachers, and relatives. However, to my dismay, I found that their ability to provide assistance was limited, as they struggled with the complexities of my grief in dealing with the consequences of such a profound event at such a young age. After Isabella's passing, I embarked on a reflective journey, contemplating my own life choices and decisions. This introspective exploration culminated in my creation of a talk entitled “Tell Your Friends You Love Them.” In this speech, I engage in a dialogue with my past self, as well as the adults in my life, shedding light on how this tragedy forever changed my life’s course.

The Craniocervical Nerve Plexus: A Microdissection Study

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Abstract

The parapharyngeal space (PPS) is a region adjacent to the pharynx housing crucial structures including the last four cranial nerves (CN), upper cervical spinal nerves, superior cervical sympathetic ganglion (SCSG), jugular vein, and internal carotid artery. This study aims to elucidate the microanatomy of the understudied series of neural anastomoses in this space, the craniocervical nerve plexus (CCP). To expose the CCP, we performed gross and stereomicroscopic dissection on nine bisected heads, accessing the PPS laterally by removing the mandibular ramus and mastication muscles. To delineate the CCP, nerves were traced, and a composite drawing of the neural anastomoses was constructed. In all nine specimens, fusion of CNs X and XII was observed at the level of the C1 transverse process. Examination of CN X revealed the presence of a ganglion distal to the jugular foramen in four specimens. Connections were noted between the C1-C2 nerves and SCSG-CN XII. The carotid sinus received a variable number of branches; specifically, up to eight in one specimen, including contributions from CNs IX and X, the SCSG, and the superior laryngeal nerve. In six specimens, a connection between the pharyngeal branches of CNs IX and X was present. This study unveils the intricate anatomy of the CCP, which can be valuable for surgeons operating in this region. Fusion of CNs X and XII, sporadically reported as a rare finding, was found in all specimens. Further insight into the functional significance of these anastomoses can be gained through histological studies on nerve fiber composition.

The Economic Burden of Celiac Disease: A Comprehensive Analysis of Direct and Indirect Costs Associated with the Diagnosis and Management of Celiac Disease

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Abstract

Celiac disease (CD) is an autoimmune condition where gluten ingestion prompts an immune response, damaging the small intestine and leading to diverse health complications. Effective management of CD necessitates a strict gluten-free diet (GFD). This paper reviews the economic implications of living with CD, drawing on peer-reviewed research from PubMed and Google Scholar databases. The analysis reveals significant direct and indirect costs that contribute to the economic burden faced by individuals with CD. Direct costs stem from medical consultations, diagnostic testing, and treatment of CD and its comorbidities, such as thyroid dysfunction and osteoporosis. Indirect costs arise from the higher price of GFD products, productivity loss due to work absences, and additional expenses associated with comorbid conditions. The review illustrates that the financial impact extends beyond the individual, affecting family budgets and imposing a differential burden across age groups and insurance statuses. Additionally, the paper highlights the need for increased awareness and education about CD to facilitate earlier diagnosis, which can significantly reduce the long-term economic burden and improve health outcomes for patients. Recognition of these economic pressures is vital for the development of policies aimed at reducing the cost of GFD products and enhancing insurance coverage for CD management. Moreover, the findings underscore the necessity for broader societal measures, such as improving food label regulations and increasing the availability of gluten-free options, to lessen the financial strain on affected individuals. Thus, comprehensive approaches to address both direct and indirect costs are essential to support those living with CD.

The Effect of KRAS Mutation in Lung Cancers and Neuroblastomas

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Abstract

Objective: This literature research examined the effects of KRAS mutation and expression in Non-Small Cell Lung Cancer (NSCLC) and Neuroblastomas for using it as a therapeutic target. **Background:** KRAS gene mutations are more common in long-term tobacco smokers with lung cancer than in non-smokers. The KRAS gene mutations in Lung Cancers typically indicate poor prognosis and resistance to several cancer treatments. Patients with KRAS Mutations were often shown to present resistance to certain drugs such as targeted chemotherapeutics, including EGFR inhibitors. **Results:** KRAS mutations in NSCLC are driver mutations, which are known to activate signaling pathways that promote aggressive tumor growth, metastasis, and resistance. Therefore, the presence of KRAS mutation in NSCLC typically indicates more aggressive disease and poorer response to EGFR or similar Receptor Kinase Inhibitors (RKIs). Moreover, the response of several cancers to immunotherapy with KRAS mutations relies on the presence of co-mutations that were also contributing to the cancer progression. Indeed, KRAS mutation in Neuroblastoma is presented with mutations in ALK (Anaplastic Lymphoma Kinase) and PHOX2B (Paired-Like Homeobox 2B). Hence, we speculate that targeting KRAS mutations along with inhibitors of co-mutations would lead to more effective therapeutic approaches and better outcomes. **Acknowledgment:** This research study was supported by the Royal Dames of Cancer Research Inc., Ft. Lauderdale, Florida.

The Impact of Mass Media Coverage and Mass Shooting Copycats

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Abstract

As a business, journalism relies on attention for profit through ad revenue. In order to survive, they need to find ways to remain interesting and worthy for the viewer to watch, and the occurrence of a mass shooting is the perfect opportunity for the media to capture attention from viewers. This easy money grab by saturating the news with mass shooting coverage gives rise to an inadvertent side effect: copycats, or people who attempt to imitate a mass shooting incident, are incentivized to do so by attention and overnight fame given through extensive media coverage. This constant cycle leads to more mass shootings and more resulting coverage, giving rise to another adverse effect: the general public's perception of real-life events is mismatched with reality, and trust in the media is at record lows. The purpose of this research was to determine what role the extensive media coverage of mass shooting incidents played in encouraging mass shooters, as well as its influence on the perception of reality among the public. An observation of a newsroom conducted yielded evidence of deliberate attempts to manipulate stories for the purpose of viewer attention. A survey conducted among students saw similar results, in which students' perception of hot button issues typically covered by the media deviated from reality. The goal of this research is to raise awareness of the unintentional harm the media causes by giving criminals a platform and by manipulating reality, and to repair the trust between the people and the media.

The Impact of the Delivery Style of a Down Syndrome Diagnosis on Familial Attitudes

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Abstract

Down syndrome is a common genetic disorder that is caused by the nondisjunction of chromosome 21 and usually manifests in the form of a third 21st chromosome. Clinical outcomes of Down syndrome include but are not limited to distinct facial features, intellectual disabilities, and developmental delays. According to numerous studies, parents have expressed that physicians often use a biased and directive tone when explaining their child's diagnosis of Down syndrome. This often results in ambiguity for parents regarding future treatment plans, decreased self-efficacy when providing for their child, and negative stigmas associated with the condition. The purpose of this study is to investigate the association of positivity, factual accuracy, and support resources provided by medical professionals on familial attitudes upon receiving a Down syndrome diagnosis. A total of 101 parents of children with Down syndrome were recruited via email through established networks of Down syndrome organizations such as GiGi's Playhouse, Gold Coast Down Syndrome Organization, and On My Own for the study. Online REDCap questionnaires were administered to participants to assess their perspectives on the diagnostic process. Participant responses were evaluated using a 5-tier Likert scale for analysis. The results of this study may be used to identify the best practices for unbiased diagnostic delivery of Down syndrome to parents. Thus, this can ensure families are well informed about their child's condition and how to manage it.

The Impacts of Feeding and Swallowing on Infants and Toddlers with Hypoxic Ischemic Encephalopathy: A Scoping Review of the Literature

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Abstract

Hypoxic ischemic encephalopathy (HIE) is when the brain is deprived of oxygen leading to brain damage. There are two stages- the acute phase and the latent phase. The acute phase is when an initial lack of oxygen to the brain occurs. The latent phase occurs when oxygenated blood flow resumes in the brain, this is known as reperfusion injury. Symptoms can present directly after birth, or later in a child's development, during the early childhood years. It is one of the most common causes of neonatal encephalopathy. It is a prevalent source of morbidity and mortality for infants throughout the world. In the United States alone, there is an estimated incidence of HIE in 2-3 cases per 1000 live births. HIE causes vary, but include placental issues such as abruption, cord accidents, shoulder dystocia, meconium aspiration, and sepsis at the time of delivery. It is well established that infants with HIE are at an increased risk for developmental delays, including feeding acquisition and swallowing safety. The purpose of this literature review is to identify short-term and long-term effects of feeding and swallowing in infants and toddlers with HIE. This will include feeding milestones for the first 3 years of life, oropharyngeal dysphagia prevalence, and safe swallow practices. By capturing this data, the hope is to identify common themes to support caregivers and medical providers knowledge on developmental differences that could impact quality of life, caregiver burden, and functional independence. As such, this scoping review could support future research projects on the role of early intervention for speech, occupational, and physical therapy, as well as frequency and intensity of skilled rehabilitative services.

The Life of Carmen

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Abstract

The Life of Carmen is a short documentary film about the life and experiences of a 94-year-old Ecuadorian raised woman, Carmen Panchana. Her vast encounters allow her to share advice to those who are willing to learn from an elder. We travel back through her life experiences and memories shown through photos and stories about her time in Ecuador, moving to America, and her relationships with her husband and son. The film is directed by Madison Hurtado, Carmen's granddaughter. The film was co-edited by Brooke Bowser.

The New Global Wave of Authoritarianism: An Inevitable Economic Downfall?

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Abstract

After decades of democracy establishing itself as both the norm and most moral form of government, many countries are gradually shifting towards autocracy. Whether it be a natural progression of societal growth or associated with economic instability and government inefficiency, this is an overarching global trend. A debate about the consequences of this phenomenon naturally arises, especially regarding possible economic impacts. The purpose of this paper is to examine whether authoritarianism and democracy are equally capable of positive economic development. Some argue that democracy is essential for capitalist growth, while others promote autocracy's power in implementing policy. However, capitalism and authoritarianism are not mutually exclusive, so any government, under the right leadership, should be able to implement beneficial economic plans. The research is conducted through a literature review, followed by a case study comparing Chinese and Indian economic transformations, as well as several regression analyses in R. The analyses conclude that regime type is not the ultimate predictor of economic growth, and that other elements should be focused on instead, such as policy and leadership.

The Portrayal of Femme Fatale:
The Evolution of Gender Roles in the Depiction of a Femme Fatale

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Abstract

When male authors describe the word ‘femme fatale’, it is always a synonym for a seductive woman who brings disaster to an unfortunate male hero. But, when a female author writes the story, the definition changes to women who become victims of patriarchy. In turn, they transform into unfeeling women who use their charms to survive in a world where they are viewed as subdued, mink, and consenting objects for a male’s pride and satisfaction. There are two femme fatales who although they struggled to obtain their happiness, kept striving forward and did not let any difficulty fracture their minds and hearts: Lilith and Circe. Analyzing sections of the original works and their contemporary versions will establish how society plays a role in setting the stereotype of femme fatales throughout time. *The Book of Lilith* by Robert G Brown demonstrates the evolution of the portrayal of a femme fatale through time. In conjunction with Lilith’s story, *Circe* by Madeline Miller specifies how the author's gender differs in the depiction of a femme fatale.

The Social Benefits of Merit-Based Education Versus Compulsory Education

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Abstract

Are there social benefits to children being placed in specific educational tracks at an early age? The Austrian school system is comprised of four levels of schooling with divergent paths for vocational and academic interests. Students who are not academically inclined can be placed on a vocational pathway at an early age or even stop schooling as early as 14 if they feel their time is better spent in the workforce. This approach, known as ability tracking, groups students by similar interests, which can lead to increased participation and targeted instruction. The Austrian system ensures that every student doesn't surpass schooling they aren't adequately prepared for or have the support for. In America, not only is there a lack of vocational options, but students are also sometimes forced from grade to grade without adequate preparation. In this presentation, we will explore the benefits and challenges of the Austrian system to evaluate whether adopting a similar system in the American education system would benefit the individual student and society as a whole.

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. It would be beneficial to predict the yield of the product such that the most time, money, and waste-efficient method can be used. 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 yield prediction. The primary reaction chosen for this research was the substitution reaction of alcohol to different derivatives of alkyl halides in protic environment. For that reaction, due to the widely known reactivity of the molecules in protic environment, we expect to observe results that are opposite of that which support the UMF. Due to the known reactivity of the molecules, the largest halide is expected to have the largest yield based off nucleophilic properties. However, preliminary results contradicted this and supported the UMF theory as we received higher yields from alkyl halides derivatives with lower molecular weights. 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.

Toxoplasma gondii Seropositivity and Risky Behaviors in College-Age Adults

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Abstract

Toxoplasma gondii is a prevalent parasite that has infected more than 40 million people in the USA. House cats and other felids serve as definitive hosts and acquire *Toxoplasma* by consuming infected prey and intermediate hosts (e.g. rodents). *Toxoplasma* is known to manipulate prey neurophysiology to enhance its transmission. For example, infected rodents exhibit changes in testosterone, vasopressin, and dopamine. These neurophysiological changes elicit remarkable changes in host behavior: *Toxoplasma*-infected rodents are more likely to frequent open spaces and are less responsive to normally aversive stimuli (e.g. cat urine). The manipulation of intermediate host neurophysiology and behavior observed in rodents raises the possibility that *Toxoplasma* may similarly affect infected humans. Indeed, there is anecdotal and epidemiological evidence that infected humans may be more likely to engage in risky activities (e.g., starting their own business, enlisting in the military, dangerous driving) and experience increased rates of traffic accidents. This project explored the relationship between *Toxoplasma* infection and risky behaviors in college-age adults. The Risky, Impulsive, & Self-destructive behavior Questionnaire (RISQ) was used to assess the extent to which participants engaged in risky or self-destructive behaviors. *Toxoplasma* seropositivity was assessed using TOXOPLASMOSE ICT IgG-IgM rapid blood tests. Seropositivity rates were unusually low (2.7%) in the target population. Our results shed light on the interactions of seropositivity and demographics, and their potential correlation with risky behaviors relating to aggression, self-harm, gambling, impulsive spending/driving, impulsive eating, risky sex, illegal behavior, and alcohol and drug use.

True Wilds

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Abstract

"True Wilds" is a documentary filmed in Miami-Dade County covering the concern of the conservation of South Florida's Pine Rockland ecosystem. Miami Wilds, a projected water park, was to be built adjacent to Zoo Miami and within their property, which contained most of the remaining Pine Rocklands acreage. The documentary informs viewers on South Florida's ecological history, displays the opinions of local residents rallying against the construction of Miami Wilds, and brings awareness to the larger ongoing issue of South Florida's loss of nature to urbanization. The film is directed by Justin Abonce and Gabrielle Spankus. Other crew members include Amit Ramdas and Brooke Bowser. Interviewees featured in the documentary include Dr. Jeffery Matthew Hoch, Brian Walters, Will Larkins, Shelby Salem, Lira Gill, and Carrie Teagarden.

Ubiquitinated IL-1β & Defective Inflammasome Formation in Alzheimer's Disease: Implications for Chronic Brain Inflammation

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Abstract

Chronic inflammation, a prolonged and more long-term process, has been implicated in various diseases, including Alzheimer's. Alzheimer's is the most common form of progressive dementia, associated with memory deficits and neuron damage. Multiple hypotheses have been proposed for the development of the disease, and among them, chronic inflammation is increasingly considered as an important underlying factor for the disease's development.

This research explores the role of interleukin-1 beta (IL-1β), a key inflammatory cytokine, in Alzheimer's pathogenesis. Elevated IL-1β levels are found in the cerebrospinal fluid and brain tissue of Alzheimer's disease (AD) patients. The study focuses on the post-translational modification of IL-1β specifically—ubiquitination, an enzymatic process involving the addition of ubiquitin molecules to a protein's lysine residues, which acts as a signal leading to protein degradation and terminating cytokine signaling effects. It was hypothesized that abnormal ubiquitination of IL-1β in Alzheimer's patients may lead to unchecked inflammation, accelerating neurodegeneration.

Using Western blotting, the amount of cleaved and ubiquitinated forms of IL-1β in postmortem brain tissues from Alzheimer's patients and age-matched non-demented individuals were analyzed. Results indicate that Alzheimer's patients exhibit abnormal post-translational modification of IL-1β, varying accumulation of ubiquitinated IL-1β, and inconsistent presence of the inflammasome. These findings underscore the complexity of Alzheimer's inflammatory response and suggest novel areas of research that may help us identify potential targets for modulation to reduce Alzheimer's risk.

Understanding Molecular Packing Using X-Ray Crystallography

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Abstract

Foldamers are molecules that fold into predictable three-dimensional shapes. This project seeks to understand the relationship between foldamer shape, hydrogen bonds and the molecular packing mode. This research represents an interdisciplinary collaboration between KAIST, a research university in South Korea, and NSU. We solved the single crystal x-ray structure of a foldamer and expanded the molecular contacts using Mercury to understand how intermolecular hydrogen bonds influence the solid-state packing mode. Each foldamer has a helical shape and makes two N-H···O hydrogen bonds with molecules on the N-terminus, and also two N-H···O hydrogen bonds with molecules on the C-terminus, creating directional chains consistent with the spacegroup $P2_12_12$. Hydrophobic packing is important along the orthogonal axes. This research demonstrates that the molecular packing mode of a foldamer is strongly influenced by the amount and position of intermolecular hydrogens bonds.

Unraveling the Elasmobranch: A Look at Shark Oral Microbiomes in South Florida

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Abstract

The intricate relationship between host organisms and their associated microbial communities, known as the microbiome, has garnered increasing attention across various fields of biology. Sharks, as apex predators in marine ecosystems, are important organisms to study and understand. Previous studies have shown shark gills and shark mouths are abundant in various types of commensal and pathogenic bacteria. This study examines results from a variety of swabs collected from shark species off the east coast of Florida. Through traditional microbial culturing and Next Generation 16S rRNA (Ribosomal RNA sequencing), we will understand the composition and functional significance of the shark microbiome to discover solutions for mitigating risks to human safety and promoting an understanding of sharks. Furthermore, this research explores the influence of environmental factors on the composition of the shark microbiome, including temperature, geographic location, species, and swab location. We will perform a genetic analysis on samples collected from April to December 2023. From this data, we will generate beta-diversity plots comparing the oral microbiomes of the different species we swabbed from a variety of shark species. We will then perform additional testing for the presence of antibiotic-resistant microbes through traditional plate culturing techniques. This data, compared with previously published shark studies, will help inform our knowledge of the shark oral cavity, which will aid in determining the appropriate measures for medical personnel encountering shark attack events. Our goal is to understand the complexities of sharks and learn to coexist safely with these evolutionary relics in marine ecosystems.

Using 3D modeling to describe the electromotility of the outer hair cell protein prestin, and its role in sound perception among mammals

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Abstract

Prestin is a vital motor protein that enables auditory perception in mammals by modulating the shape of cochlear outer hair cells (OHCs) in response to environmental voltage. Part of the SLC26A5 anion transporter family, prestin excels at binding anions, which facilitates its oscillation through unique conformations. While salicylate has been demonstrated to induce reversible inhibition in prestin, the broader mechanisms of how this protein senses and transduces voltage into cellular movement are not fully understood. Crucial to sound amplification in the cochlea and the ability for OHCs to selectively respond to different sound frequencies is non-linear capacitance (NLC), wherein conformational changes are not linearly related to the voltage applied. Using 3D protein modeling with PyMOL, the inhibited state (7S9E) and sensor-up state (7S8X) of bottlenose dolphin (Tursiops truncatus) prestin were merged to create a new model. This model illustrates the flux in cross-sectional area within the transmembrane regions and emphasizes other key topological elements, such as the 14 gate and core transmembrane helices, the anion binding site, and the STAS domain. Helices TM3 and TM10, along with the active pocked formed by residues Gln97, Phe101, Phe137, Leu397, Ser398, and Arg399, play pivotal roles in ligand-bound dimer movement. Additional noncovalent forces such as pi stacking with Phe137 and hydrogen bonding with Ser398 enhance ligand binding stability. Notably, 13 amino acid replacements in echolocating mammals suggest convergent evolution among bats, whales, and dolphins. This structural exploration of prestin's electromotility thus aims to further unravel the intricate mechanisms of mammalian auditory perception.

Using Physiochemical Properties of Phenylalkylamines *in Silico* as a Predictive Classification of Psychedelic Effect

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Abstract

Rationale: Substituted phenethylamines have been widely used and distributed for religious, therapeutic, and recreational purposes. While some correlations have been reported on small subsets of these molecules and their action, little is known about the fundamental basis of their action at an atomic level. As such, collecting a large collection of computationally predicted physiochemical properties of these compounds in a comprehensive database can serve to aid in predicting their mechanisms of action. Knowing this will ultimately reduce harm among recreational users and increase efficacy in personalized therapies. As such this study aims at establishing a relationship between the calculated atomic properties of substituted phenethylamines and their psychedelic effect.

Materials & Methods: The drug docking program Autodock 4.0 was used to predict the strength and conformation of binding of a list of known phenethylamines to protein targets. The quantum chemistry package Gaussian 09 was used to calculate physiochemical properties such as molecular orbital energies, polarization, and of the same compounds. All calculations were benchmarked against previous experimental data. Classification and feature selection for correlates to psychedelic potency were performed in MATLAB's classification learners.

Results: Extensive data on 102 properties was collected for 202 substituted phenylalkylamines. The variability of psychedelic potency was largely explained by five of these properties: isotropic polarizability (α), aqueous solubility (AS), polar surface area (PSA), molar refractivity (MR), and molecular weight (MW). Among a specific subset of mescaline analogs at high dosage groups, the highest occupied molecular orbital (HOMO) was also highly correlated with psychedelic potency.

Conclusions: Psychedelic potency may be predicted in part from molecular properties after steric requirements are met. The model presented here compliments categorization based on binding affinity and inhibition constants of neural receptors, especially for anomalous compounds. More data is necessary to conclusively classify these compounds on a dosage basis.

Utilizing Item-Analyses Method to Identify Opportunities for Improving Mental Health Literacy Training Programs

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Abstract

Mental health literacy (MHL) refers to the knowledge, attitudes, and beliefs that are linked to actions in recognizing, managing, and preventing mental health disorders. Acknowledging the importance of quantifying this information, the study aims to explore differences in mental health literacy among various groups. Understanding these disparities is crucial for designing targeted educational campaigns that address specific concerns within the training curriculum.

Participants (n = 170) enrolled in a Mental Health First Aid (MHFA) certification course completed a 15-item pre-survey measuring knowledge and attitudes about mental health. Demographic data was collected, and results were stratified by age, race, gender, and community belonging (university or community member). The anticipated results will be analyzed through item analysis, reporting overall scores and percentages of correct and incorrect answers for each question. Correlations tests will investigate the relationship between MHL scores and sociodemographic characteristics while independent samples t-tests will compare the mean scores difference in groups.

Preliminary results show that overall, participants lacked knowledge about psychotic disorders and panic attacks. It is hypothesized that younger-age participants, females, and university members will have higher scores than their community counterparts.

The study not only aims to contribute to the existing body of knowledge about MHL but also highlights practical implications for future trainings. MHFA trainees and their instructors can benefit from insights into teaching curricula, focusing on specific challenges identified through the research. Ultimately, this research provides a foundation for targeted interventions, ensuring that mental health education effectively addresses the diverse needs of different demographic groups.

What Is Categorized as a War Crime Depends On Who Commits It: An Asymmetry In Moral Judgments of Acts of War

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Abstract

Should all acts of aggression carried out in war be categorized as War Crimes? The Geneva Conventions and the International Criminal Court set specific parameters as to what does and does not constitute a war crime. Research in the domain of moral psychology displays that individuals are guided by the justness of cause when making moral judgements about combatant behavior. However, minimal research has evaluated the differentiation of atrocities being categorized as a war crime or not. Across two studies, this research seeks to investigate the role aggressors play in lay people's categorization of war crimes. Do pre-existing beliefs about aggressor versus victim in the context of war determine judgements of war crimes? We believe that in political conflicts, when there is stronger support for a nation, the less their acts will be categorized as war crimes. In a fictional scenario, the victim nation will be less blameworthy and hence, their acts will be categorized as war crimes less than the aggressor nation. The implications of this research will better guide our understanding of support for war, which in turn dictates policy makers' choices in declaring war. This research will also help us better understand lay opinion of war crimes, contributing to the moral psychology domain of morality of war.

What is the level of knowledge and awareness among healthcare providers in Neonatal Intensive Care Units (NICUs) regarding prelinguistic and linguistic development in premature and newborn infants?

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Abstract

Healthcare professionals in the Neonatal/Newborn Intensive Care Unit (NICU) are charged with education and competencies to maximize life support and viability in premature infants and medically fragile term infants. Often, the neonate's first experiences with communication occur while in the hospital environment. It is well established that neonates and infants who spend more than five days in the NICU are at an increased risk for developmental delays, including language delays, speech sound disorders, motor speech disorders, and/or cognitive delays. Research indicates that 'Up to 50% of infants born less than 32 weeks of gestation develop disadvantaged outcomes, including language and related learning difficulties' (Brignoni-Pérez et al., 2021). This scoping review of the literature will identify healthcare professionals' knowledge and competencies of prelinguistic, linguistic, and communication milestones for the first year of life. By capturing this data, the hope is to identify common gaps in knowledge to support healthcare professionals in the identification of prelinguistic and linguistic developmental milestones and communication opportunities. The ultimate goal is to support healthcare professionals, from any training/education level, to support the development of prelinguistic and linguistics as well as support responsive communication in the developing infant. As such, this scoping review could support future research projects on the role of early intervention for speech therapy and/or ongoing training and competency programs for medical professionals in the NICU.

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Teng Li
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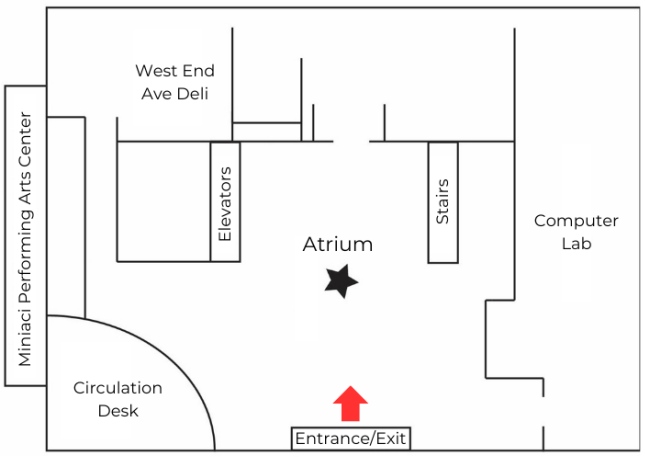
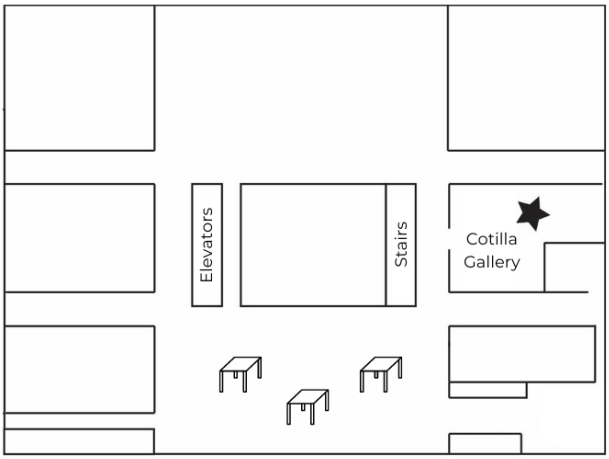
Vladimir Beljanski
Weylin Sternglanz
William Kochen
Yair Solan

Alvin Sherman Library, Research, and Information Technology Center

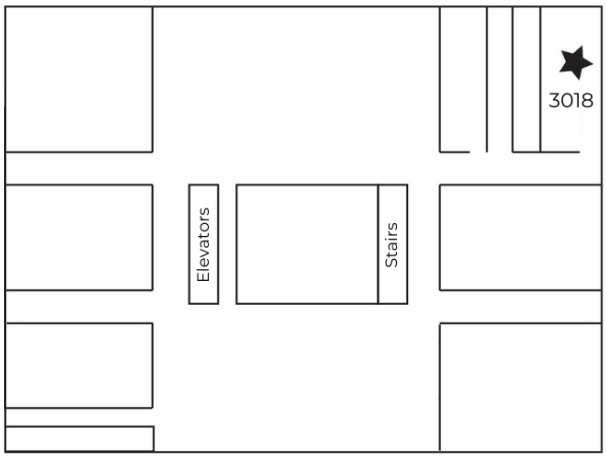
1st Floor



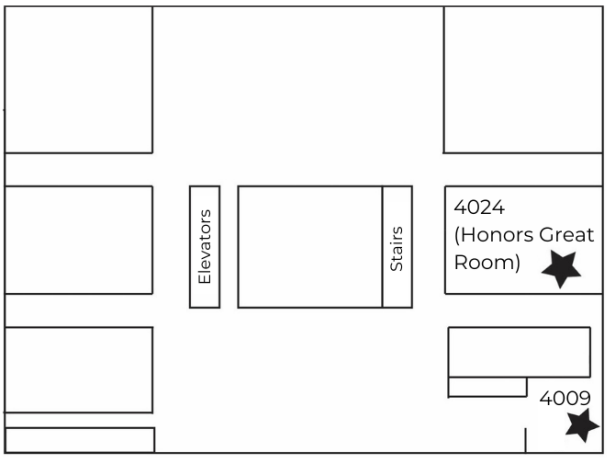
2nd Floor



3rd Floor



4th Floor



2024 USS Schedule

Wednesday, April 3

Opening Ceremony | 12 – 12:30 pm

Alvin Sherman Library, Cotilla Gallery (2nd floor)

Keynote Speaker: Jessica Brown, Ph.D.
Associate Professor, Department of Chemistry and Physics, Halmos College of Arts and Sciences

Poster Presentations | 12:30 – 3:30 pm*

Alvin Sherman Library, Atrium (1st floor) & Levan Center (5th floor)

Oral Presentations | 12:30 – 3:30 pm*

Alvin Sherman Library, Rooms 3018, 4009, 4024 (Honors Great Room), & Cotilla Gallery (2nd floor)

Film and Digital Project Showcase | 12:30 – 3:30 pm

Alvin Sherman Library, Levan Center (5th floor)

Film Panel | 1:30 – 2:30 pm

Alvin Sherman Library, Levan Center (5th floor)

Thursday, April 4

Closing Ceremony | 12:30 – 1:30 pm

Alvin Sherman Library, Cotilla Gallery (2nd floor)

***Scan the QR code below to view the detailed schedule with poster easel numbers and oral presentation room assignments, the digital abstract booklet, and a digital map of the library**

Nova Southeastern University
UNDERGRADUATE STUDENT SYMPOSIUM 2024

Farquhar Honors College
NOVA SOUTHEASTERN UNIVERSITY

NSU Florida